40 YEARS OF UPPER KRISHNA PROJECT

(Three Volumes)
VOLUME-1 : REPORT WITH 18 CHAPTERS

UKP DOCUMENTATION COMMITTEE
BANGALORE
16th January 2004
REPORT ON

40 YEARS OF UPPER KRISHNA PROJECT

(Three Volumes)

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VOLUME-1 : REPORT WITH 18 CHAPTERS
Foreword

The Upper Krishna Project is a mega project and the largest multi-purpose project in Karnataka State. A comprehensive document on this was a long felt need. It is perhaps the first of its kind completed comprehensively in the entire history of Public Works and Water Resources Departments.

This report is purely technical and substantiated by documents. The intended objective of this well documented report is to highlight various important issues / aspects of the project, Krishna water disputes, dispute regarding the height of Alamatti dam, other major problems encountered like financial, managerial, R&R etc., during its execution and efforts made to solve them. Major events that took place during its implementation, major decisions taken to accelerate the project completion, contract management etc., are highlighted and could serve as reference for the successful execution of other irrigation projects. The report would probably prepare us for future and enlighten us better.

The stupendous task completed at minimum time is entirely due to the hard work and devotion of Sri.M.K.Venkataram, Member-Convener of the UKP Documentation Committee constituted specifically for this purpose by the Managing Director, KBJNL.

I hope this Report would be of immense help to all the irrigation engineers working in the office as well as on the field.

K.C. Reddy
Chairman
Technical Advisory Committee
Irrigation Projects
Government of Karnataka.

Bangalore
02.01.2004
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<th>Description</th>
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<td>Krishna Water Disputes Tribunal</td>
</tr>
<tr>
<td>ISWDA</td>
<td>Inter-State Water Disputes Act, 1956</td>
</tr>
<tr>
<td>TFR</td>
<td>Tribunal's Further Report dt 27.05.1976</td>
</tr>
<tr>
<td>SRBC</td>
<td>Srisailam Right Bank Canal</td>
</tr>
<tr>
<td>SLBC</td>
<td>Srisailam Left Bank Canal</td>
</tr>
<tr>
<td>UKP</td>
<td>Upper Krishna Project</td>
</tr>
<tr>
<td>NLBC</td>
<td>Narayanapura Left Bank Canal</td>
</tr>
<tr>
<td>SBC</td>
<td>Shahapur Branch Canal</td>
</tr>
<tr>
<td>MBC</td>
<td>Mudbal Branch Canal</td>
</tr>
<tr>
<td>JBC</td>
<td>Jewargi Branch Canal</td>
</tr>
<tr>
<td>IBC</td>
<td>Indi Branch Canal</td>
</tr>
<tr>
<td>NRBC</td>
<td>Narayanapura Right Bank Canal</td>
</tr>
<tr>
<td>ALBC</td>
<td>Alamatti Left Bank Canal</td>
</tr>
<tr>
<td>ARBC</td>
<td>Alamatti Right Bank Canal</td>
</tr>
<tr>
<td>LIS</td>
<td>Lift Irrigation Scheme</td>
</tr>
<tr>
<td>FRL</td>
<td>Full Reservoir Level</td>
</tr>
<tr>
<td>FSD</td>
<td>Full Supply Depth</td>
</tr>
<tr>
<td>FSL</td>
<td>Full Supply Level</td>
</tr>
<tr>
<td>FB</td>
<td>Free Board</td>
</tr>
<tr>
<td>FIC/FDC</td>
<td>Field Irrigation / Drainage Channel</td>
</tr>
<tr>
<td>ODF</td>
<td>On-farm Development</td>
</tr>
<tr>
<td>MCPC</td>
<td>Mass Concrete Pipe Culvert</td>
</tr>
<tr>
<td>CTC</td>
<td>Cart Track Crossing</td>
</tr>
<tr>
<td>GLSR</td>
<td>Ground Level Storage Reservoir</td>
</tr>
<tr>
<td>TMC</td>
<td>Thousand million cubic feet</td>
</tr>
<tr>
<td>Cumecs</td>
<td>Cubic meters per second</td>
</tr>
<tr>
<td>Cusecs</td>
<td>Cubic feet per second</td>
</tr>
<tr>
<td>CNS</td>
<td>Cohesive Non-Swelling Soil</td>
</tr>
<tr>
<td>CCA</td>
<td>Culturable Command Area</td>
</tr>
<tr>
<td>BC Soil</td>
<td>Black Cotton Soil</td>
</tr>
<tr>
<td>EI</td>
<td>Elevation</td>
</tr>
<tr>
<td>RL</td>
<td>Reduced level</td>
</tr>
<tr>
<td>KWh/MW</td>
<td>Kilowatt hour/ Megawatt</td>
</tr>
<tr>
<td>MU</td>
<td>Million Unit</td>
</tr>
<tr>
<td>SR/CSR</td>
<td>Schedule of Rates / Current Schedule of Rates</td>
</tr>
<tr>
<td>BTDA</td>
<td>Bagalkot Town Development Authority</td>
</tr>
<tr>
<td>R &amp; R</td>
<td>Rehabilitation &amp; Resettlement</td>
</tr>
<tr>
<td>O &amp; M</td>
<td>Operation &amp; Maintenance</td>
</tr>
<tr>
<td>MIS</td>
<td>Management Information System</td>
</tr>
<tr>
<td>PAF</td>
<td>Project affected family</td>
</tr>
<tr>
<td>PDF</td>
<td>Project displaced family</td>
</tr>
<tr>
<td>CAF</td>
<td>Canal affected family</td>
</tr>
<tr>
<td>ECPC</td>
<td>Engineer-in-Chief and Project Co-ordinator</td>
</tr>
<tr>
<td>ECSS</td>
<td>Engineer-in-Chief and Ex-officio Special Secretary</td>
</tr>
<tr>
<td>TAC</td>
<td>Technical Advisory Committee, Irrigation Projects, GOK</td>
</tr>
<tr>
<td>MIPC Board</td>
<td>Major Irrigation Projects Control Board, GOK</td>
</tr>
<tr>
<td>KBJNL</td>
<td>Krishna Bhagya Jala Nigam Limited</td>
</tr>
<tr>
<td>MD</td>
<td>Managing Director</td>
</tr>
<tr>
<td>TSC</td>
<td>Technical Sub-Committee of KBJNL</td>
</tr>
<tr>
<td>KPCL</td>
<td>Karnataka Power Corporation Limited</td>
</tr>
<tr>
<td>KEB</td>
<td>Karnataka Electricity Board</td>
</tr>
<tr>
<td>KPTCL</td>
<td>Karnataka Power Transmission Corporation Limited</td>
</tr>
<tr>
<td>CADA</td>
<td>Command Area Development Authority</td>
</tr>
<tr>
<td>PWD</td>
<td>Public Works Department</td>
</tr>
<tr>
<td>WALMI</td>
<td>Water and Land Management Institute</td>
</tr>
<tr>
<td>WUA</td>
<td>Water Users' Association</td>
</tr>
<tr>
<td>WRDO</td>
<td>Water Resources Development Organisation, GOK</td>
</tr>
<tr>
<td>NIRM</td>
<td>National Institute of Rock Mechanics, KGF</td>
</tr>
<tr>
<td>CWPC</td>
<td>Central Water &amp; Power Commission</td>
</tr>
<tr>
<td>CWC</td>
<td>Central Water Commission</td>
</tr>
<tr>
<td>CWPRS</td>
<td>Central Water &amp; Power Research Station</td>
</tr>
<tr>
<td>MOWR</td>
<td>Ministry of Water Resources, GOI</td>
</tr>
<tr>
<td>CECA</td>
<td>Central Electricity Authority</td>
</tr>
<tr>
<td>IIISC</td>
<td>Indian Institute of Science, Bangalore</td>
</tr>
<tr>
<td>WAPCOS</td>
<td>Water and Power Consultancy Services, Delhi</td>
</tr>
<tr>
<td>TAPCO</td>
<td>The Asia Power Company, USA</td>
</tr>
<tr>
<td>MYRADA</td>
<td>Mysore Rehabilitation and Development Agency, Bangalore</td>
</tr>
<tr>
<td>TRF</td>
<td>Torsteel Research Foundation in India, Bangalore</td>
</tr>
<tr>
<td>TSP</td>
<td>Tungabhadra Steel Products Limited, Hospet</td>
</tr>
</tbody>
</table>
1.0 The Upper Krishna multi-purpose Project in Karnataka is a mega project and has come as a boon to the drought affected areas of Bagalkot, Bijapur, Gulbarga and Raichur districts. It is mainly an irrigation project but power generation is also envisaged under the project. Though the project was conceived more than 50 years back by the erstwhile State of Hyderabad, it took a definite shape only after the reorganization of the States in November 1956. The first project report prepared by GOK was approved by the Planning Commission, GOI during 1963. The work relating to the foundations of Alamatti and Narayanapur dams, which are the main component parts of the project, was started in the year 1963. During the course of execution of the project, especially with World Bank assistance during 1970s and 1980s, the project drew wide attention from environmentalists due to the large scale rehabilitation and resettlement of the project affected families. Further during 1990s, the project once again attracted great attention from all corners due to a dispute raised by Andhra Pradesh relating to the height of the Alamatti dam. The project is considered by the State as a very important and prestigious one from all points of view.

2.0 Considering the magnitude and size of the project, and the importance attached to it, it was thought necessary to prepare a comprehensive history report on the project ever since it was conceived. The idea of getting such a history report for Upper Krishna Project prepared, originated from Sri.K.C.Reddy, Chairman, Technical Advisory Committee, Irrigation projects, who is closely associated with the project as Chairman of the Technical Sub Committee of Krishna Bhagya Jala Nigam limited (KBJNL) for the last 8 years. The Managing Director, vide his order No.KBJNL/DFD/09/2002-04/2311 dated 13.03.2003 (copy enclosed as Annexure-1), constituted a Committee of the following Members for preparing the documentary of the project:-

(i) Sri.H.K.Venkatesha Prasad,
   Executive Assistant (Tech) to MD, KBJNL.

(ii) Sri.M.K.Venkataram,
    Former Secretary, TAC, Irrigation Projects.

(iii) Sri.N.Thyagarajan,
    Retired Executive Engineer.

(iv) Sri.Charles Sujay Kumar,
    Assistant General Manager (Fin), KBJNL.

The Committee was supposed to give its report in four months.

3.0 It was indicated in the subsequent letter dated 19.03.2003 of the Executive Assistant (Technical) to MD, KBJNL that the Committee would be basically functioning under the chairmanship of the Chairman, TAC, Irrigation Projects. The composition of the Committee was slightly modified by the MD, KBJNL vide his order No.KBJNL/DF/9/44/2003-04 dated 11.04.2003 (copy enclosed as Annexure-2) appointing Sri.M.K.Venkataram as the full time Convener.
4.0 The concept of Sri.K.C.Reddy was that the intended documentary of Upper Krishna Project should not be just a report narrating the history of the project like a tale but it should be a well documented report more technically oriented, highlighting therein various important issues like the genesis of Krishna Water Dispute, major problems encountered during execution of the project, efforts made to solve these problems, major events concerning the execution of the project, concrete actions taken to accelerate the progress, rehabilitation and relocation of the project affected families, Bagalkot town relocation, development of Kudala Sangama Complex, source of funding (finance), administrative problems etc. The objective was that all such issues should be brought in one document which would be informative, beneficial and educative.

5.0 Sri.K.C.Reddy was kind enough to provide not only accommodation in his office to the Member-Convener of the Committee but also full logistic support to the Committee, like providing secretarial assistance, meeting hall for holding meetings, computer facility etc. He was also kind enough to impress upon the project authorities about the urgent need for furnishing the required materials and records to the Committee. Sri.D.N.Desai, Chairman of the Alamatti Gates Committee, Sri.B.G.Rudrappa, Chairman of the UKP Pumps Committee, Dr.A.Sridharan, Former Adviser of Indian Institute of Science and Dr.C.S.Viswanatha, Chief Consulting Engineer of TORSTEEL Research Foundation, were also requested by Sri.K.C.Reddy to enlighten the Committee with information on their association and experiences about the project. Simultaneously, the Secretary to Government, Water Resources Department was also requested by him to supply details like old Government Orders and related records to the Committee.

6.0 The tenure of the Committee, which came to be called as "The UKP Documentation Committee", was extended upto end of August 2003 by the MD, KBJNL vide his order dated 28.07.2003 and again upto end of November 2003 through his order dated 23.10.2003. The period of submission of Report by the Committee was finally extended upto 16th of January 2004 by the MD, KBJNL vide his order dated 10.12.2003.

7.0 Sri.M.K.Venkataram, Member-Convener of the UKP Documentation Committee was authorized by the Committee to prepare the draft report chapterwise based on the material available / to be made available and place the chapters, as and when they are prepared, before the Committee for clearance. The Member-Convener visited the project area on 5th & 6th June 2003 and had fruitful discussions at Alamatti and Narayanapur with the project authorities. He also made one more visit to the project area on 14th & 15th October 2003 for collecting some more details from the project authorities.

8.0 Based on the records made available by the project authorities and the Water Resources Department in the Secretariat and also the Reports of Sri.D.N.Desai, Chairman of Alamatti Gates Committee and Sri.B.G.Rudrappa, Chairman of the UKP
Pumps Committee, the draft reports on various important issues connected with the project were prepared in 18 chapters along with the Report of the Committee containing the Synopsis, by Sri.M.K.Venkataram, Member-Convener. In all, the Committee held 10 meetings and all the 18 chapters as well as the Report with Synopsis were discussed in the meetings as and when they were prepared by the Member-Convener and cleared by the Committee. Dr.Masood Sharief, Secretary, TAC, was also invited for all the meetings of the Committee to offer his considered opinion. All the corrections / modifications suggested by the Members have been promptly attended to before finalizing the chapters for adoption in the final report.

9.0 The Report is got up in three volumes. The first Volume contains the Report with synopsis and the main Chapters (18 Nos.) discussed by the Committee, the second Volume contains the Annexures to Chapters 1 to 9 and the third Volume contains the Annexures to Chapters 10 to 18. A project map showing the irrigable area (6.22 lakh ha) under Scheme-A of the Tribunal Award and the irrigation potential created upto end of October 2003 is enclosed as Annexure-3 to this Report. Statements showing the yearwise expenditure on the project & irrigation potential created, since inception, and the salient features of both Stage-I & Stage-II projects, are enclosed as Annexure-4 and Annexure-5, to this Report.

10.0 A synopsis of all the 18 chapters is given in the following paragraphs:-

10.01 Krishna Water Dispute:

(a) The Chapter explains in detail the various agreements made between the earstwhile States of Madras, Mysore and Hyderabad prior to independence in the matter of sharing of Tungabhadra waters in Krishna Basin and construction of several projects in the basin. The post-Independence developments and the contentious issues relating to the water disputes that gathered momentum after re-organisation of the States, are also highlighted in the Chapter. Further, efforts made by GOI to find a solution to the problem, constitution of the Krishna Water Disputes Tribunal, claims putforth by the Party-States of Maharashtra, Karnataka and Andhra Pradesh before the Tribunal and Award of the Tribunal making definite allocations of water out of the 75% dependable yield (called as Scheme-A), have all been exhaustively narrated in the Chapter. As per the final award / order of the Tribunal published in May 1976, the 75% dependable yield of 2060 TMC in Krishna river (upto Vijayawada) under Scheme-A has been allocated amongst the three Party-States as follows:-

(i) Maharashtra...................... 560 TMC + 25 TMC as regeneration.
(ii) Karnataka.......................... 700 TMC + 34 TMC as regeneration.
(iii) Andhra Pradesh..................... 800 TMC + 11 TMC as regeneration.

Total: 2060 TMC + 70 TMC as regeneration.

(b) The Tribunal has stated in its award that the allocations are en-bloc and not project-specific. As regards sharing of surplus waters under Scheme-B (over and above 75% dependable yield), though the Tribunal had drawn up a scheme in this regard, it did not make it a part of the final order for the reason that the final order should contain only such provisions as may be implemented independently of any agreement or law made by Parliament. The complaint letter lodged by the State of Karnataka urging the GOI for constitution of another Tribunal for sharing of surplus waters under Scheme-B, is also brought out in the Chapter.
Though the GOI has recently decided to constitute a Tribunal to look into the dispute of sharing of surplus waters under Scheme-B, the official notification constituting the Tribunal is yet to be issued.

10.02 Project history, proposals and revisions:

(a) In this Chapter, the History of the project ever since it was conceived by the erstwhile State of Andhra Pradesh, including the proposals contained in the project reports prepared on various occasions for Stage-I and Stage-II, important changes made in the concept of the project on these occasions, modification as a multi-purpose project etc., are all explained in brief in the Chapter. Important salient features of the project as per the various project reports prepared at different times and clearances given by the different wings of Government of India, have also been brought out in the Chapter.

(b) The estimated cost of the project for Stage-I, as cleared by the Planning Commission, has increased from Rs.58.20 crores in 1963 (to irrigate 5.99 lakh acres by utilising 103 TMC of water) to Rs.1214.97 crores in 1990 (to irrigate 10.50 lakh acres by utilising 119 TMC of water). The estimated cost of the Stage-II multi-purpose project, as cleared by the Planning Commission, in the year 2000, is Rs.2358.86 crores (Irrigation component) to irrigate 1.97 lakh ha (4.87 lakh acres) by utilising 54 TMC of water. Thus, the Irrigation potential contemplated under both Stage-I and Stage-II is 6.22 lakh ha (15.37 lakh acres) by utilising 173 TMC of water under Scheme-A.

(c) As at the end of October 2003, an expenditure of Rs.11,780.32 crores (including repayment of interest on borrowed funds amounting to Rs.2680.25 crores and repayment of principal amount of Rs.1703 crores) has been incurred on the project and an irrigation potential of 4.39 lakh ha (10.84 lakh acres) has been created. The entire 173 TMC of water allocated to the project under Scheme-A has been fully utilized by adopting higher irrigation intensity, raising summer crops and meeting the drinking water supply needs during persisting scarcity.

10.03 Narayanapur and Alamatti dams:

(a) This Chapter explains various issues like – (i) investigations made in the selection of sites for Alamatti and Narayanapur dams; (ii) consequent attempts made to shift the sites; (iii) alternative alignments examined; (iv) geological features of the sites finally selected for construction of the dams; (v) problems encountered in the construction of Narayanapur dam in the dyke portion; (vi) report of the Panel of Experts that looked into the major designs of the 2 dams like review of design flood / providing additional spillway bays for Narayanapur dam / lowering of crest level of Alamatti dam by 2 m and increasing correspondingly the gate height by 2 m etc; (vii) efforts made for the treatment of the fault zone in Alamatti dam foundations; and (viii) changes made in the design of Alamatti dam at different times depending on the needs and ground realities.

(b) The following Table gives a picture of the design flood originally adopted in the project report and the same finally adopted as per the recommendations of the Experts' Panel:-

<table>
<thead>
<tr>
<th>Alamatti spillway</th>
<th>Narayanapur spillway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Originally adopted in the 1976 project report.</td>
<td>…</td>
</tr>
<tr>
<td>8.25 lakh cusecs</td>
<td>11.00 lakh cusecs</td>
</tr>
<tr>
<td>(26 spillway bays)</td>
<td>(25 spillway bays)</td>
</tr>
<tr>
<td>Finally adopted as per recommendations of Experts' Panel.</td>
<td>…</td>
</tr>
<tr>
<td>10.95 lakh cusecs</td>
<td>13.40 lakh cusecs</td>
</tr>
<tr>
<td>(26 spillway bays)</td>
<td>(25+5=30 spillway bays)</td>
</tr>
</tbody>
</table>

(c) The following Table gives a picture of the changes made in the design of Alamatti dam on different occasions:-
### Year of modifying the design

<table>
<thead>
<tr>
<th>Year of modifying the design</th>
<th>Crest level</th>
<th>Gate height</th>
<th>FRL</th>
</tr>
</thead>
<tbody>
<tr>
<td>As per 1976 PR</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Stage</td>
<td>502.064 m</td>
<td>10 m</td>
</tr>
<tr>
<td></td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Stage</td>
<td>514.256 m</td>
<td>10 m</td>
</tr>
<tr>
<td>1978 (after adopting Experts’ Panel’s recommendations)</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Stage</td>
<td>500 m</td>
<td>12 m</td>
</tr>
<tr>
<td></td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Stage</td>
<td>512 m</td>
<td>12 m</td>
</tr>
<tr>
<td>1982</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Stage</td>
<td>512 m</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Stage</td>
<td>512 m</td>
<td>12 m</td>
</tr>
<tr>
<td>1985</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Stage</td>
<td>509.016 m</td>
<td>15.24 m</td>
</tr>
<tr>
<td></td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Stage</td>
<td>509.016 m</td>
<td>15.24 m</td>
</tr>
</tbody>
</table>

(d) Consequent on the Supreme Court orders in April 2000, in the matter of a dispute raised by Andhra Pradesh about the height of Alamatti dam, the skin plates of the gates which had already been fabricated for the height of 15.24 m, were cut to an extent of about 4.65 m from the top in order to limit the FRL to 519.60 m in the 2<sup>nd</sup> Stage.

#### 10.04 World Bank assistance:

(a) The Chapter explains the features of the World Bank assistance obtained for Phase-I from 1978 to 1986 and for Phase-II from 1989 to 1997. Important provisions / stipulations made in the Development credit agreements / Project agreements / Loan agreements / Staff appraisal reports, project costs as estimated at appraisal and as per actual construction, amount of World Bank assistance envisaged under the agreements and actually obtained during execution till completion, projected irrigation developments and actual achievements, etc are narrated in great detail in the Chapter. The observations made in the Project Completion Report of Phase-I and the Implementation Completion Report of Phase-II, have also been brought out in the Chapter.

(b) The following Table gives a picture of the project costs at appraisal & completion costs, amount of World Bank assistance projected & actually received, and irrigation potential projected & actually created, under Phase-I and Phase-II:

<table>
<thead>
<tr>
<th></th>
<th>Phase – I</th>
<th>Phase – II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Estimated cost of the project</td>
<td>Rs. 244.54 Cr. (as per SAR of 1978)</td>
<td>Rs. 791.67 Cr (as per SAR of 1989)</td>
</tr>
<tr>
<td>(ii) Actual project completion cost</td>
<td>Rs. 490.10 Cr. as per PCR (as in 1986)</td>
<td>Rs. 2417.60 cr. as per ICR (as in 1997)</td>
</tr>
<tr>
<td>(iii) Projected World Bank Assistance</td>
<td>126 million dollars (Rs. 108.30 Cr.) from 1978 to 1984, as per agreement of 1978</td>
<td>325 million dollars (Rs. 474.50 Cr.) from 1989 to 1996, as per agreement of 1989</td>
</tr>
<tr>
<td>(iv) World Bank Assistance actually received</td>
<td>117.60 million dollars (Rs. 119 Cr.) from 1978 to 1986</td>
<td>166.80 million dollars (Rs. 516.26 Cr.) from 1989 to 1997</td>
</tr>
<tr>
<td>(v) Projected irrigation potential as per SAR</td>
<td>1.05 lakh ha. (2.59 lakh acres)</td>
<td>1.48 lakh ha. (3.65 lakh acres)</td>
</tr>
<tr>
<td>(vi) Irrigation Potential actually created</td>
<td>72,210 ha. (1.78 lakh acres)</td>
<td>93,513 ha. (2.31 lakh acres)</td>
</tr>
<tr>
<td>Phase – I</td>
<td>Phase – II</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>(a) Projected at the time of appraisal</td>
<td>44.30%</td>
<td>60%</td>
</tr>
<tr>
<td>(b) Actual at the end of the project</td>
<td>24.28%</td>
<td>21.35%</td>
</tr>
</tbody>
</table>

10.05 Restoration of the distressed Don aqueduct in Narayanapur Left Bank Canal (NLBC):

(a) The chapter explains the features of distress observed in this major aqueduct situated at 23rd KM of NLBC, just 4 years after its construction was completed. Various tests conducted to identify the reasons for distress and measures taken for strengthening the structure are highlighted in the chapter.

(b) Don aqueduct is a major aqueduct constructed across Don river in the Head reach of NLBC. Failure of this structure would have resulted in the entire irrigation system, under and beyond NLBC (irrigating more than 4 lakh ha), coming to a grinding halt. As such, the structure required immediate strengthening to save the atchkat.

(c) Following are the important salient features of the aqueduct:

(i) Designed discharge of the aqueduct .................. 280.02 cumecs
(ii) Designed discharge of Don river...................... 4433.00 cumecs
(iii) Length of aqueduct.................................. 529 meters
(iv) Type of aqueduct...................................... RCC trapezoidal trough supported by buttresses (154 Nos.)

(d) Several buttresses (Nos. 1 to 12 and 140 to 154) at both ends of the aqueduct had developed cracks which were progressive in width and number. The issue of suggesting suitable measures for strengthening the structure was referred to M/s. Torsteel Foundation Research in India, Bangalore, which is a private consultancy firm. Some emergency measures recommended by the Consultants were taken in 1988 to strengthen the structure, which were only interim. As there was further distress subsequently observed, several studies were conducted by the Consultants to identify the reasons for distress. The studies carried out were - (i) rebound hammer test; (ii) concrete core test; (iii) ultrasonic pulse test; and (iv) profo-meter test. After studying the results, the consultants came to the conclusion that the reasons for distress were ~ (i) unsymmetrical loading due to differential earth pressure on transition buttresses; (ii) disturbance of buttresses during construction of trough; (iii) non-verticality of buttresses; (iv) temperature effects; (v) drag / thrust on side walls of trough; and (vi) plate column effect in buttresses.

(e) The recommendations made by the consultants for restoration / strengthening of the structure included – (i) shotcreting of trough; (ii) encasement of buttresses 3 to 12 and 140 to 152; (iii) strengthening of buttresses 1 & 2 and 153 & 154; (iv) providing RCC stiffners connecting the buttresses 1 to 12 and 140 to 154; and (v) sealing of construction joints. The sequence of operations for restoration measures was also suggested by the Consultants.

(f) Considering the urgency for finding a solution with a view to allow water, it was decided to take up the strengthening measures in two phases. Under the 1st phase, the first 5 and last 5 bays were strengthened by providing mass concrete M-100 with plums after providing dowel bars in the rock foundation. Shotcreting of trough in spans 4 & 5 and 149 & 150 was also done. Under the 2nd phase, the buttresses 6, 12 and 140 to 149 were encased with RCC after sand blasting the existing surface and providing shear connectors. All the expansion joints (vertical) in the trough were totally sealed. The shotcreting of the under surface of the trough was also done wherever necessary.

(g) The restoration work was completed in October 1996 at a total cost of Rs.263 lakhs.

10.06 Important Legislations made, but not implemented:

(a) The Chapter deals with two legislations made for accelerating the progress of the project, namely (i) "The Karnataka Resettlement of Project Displaced Persons Bill, 1987" and (ii) "The Karnataka
Krishna Basin Development Authority Bill, 1992”. The first Bill was mooted, in the context of providing R & R benefits as insisted by World Bank under the UKP Phase-II project, for adopting a uniform policy for R & R for all the projects and eliminate any discrimination. The second Bill was enunciated, keeping in view the need for accelerating the progress of UKP and other projects in Krishna Basin, for finding a suitable solution for overcoming the funding constraints, minimizing procedural delays and delivering quick settlement of disputes.

(b) The Karnataka Resettlement of Project Displaced Persons Bill, 1987 was passed in both the houses of legislature in 1987 and sent to GOI for obtaining the assent of the President of India. Various connected Departments / Ministries of GOI raised many points of doubt on the Bill and necessary clarifications / compliances were promptly furnished by GOK. Finally, approval from the President of India was received in August 1994. Subsequently, the Act was published by GOK as “The Karnataka Resettlement of Project Displaced Persons Act, 1987” (Karnataka Act No.24 of 1994). Though the Act was published, it has not yet been given effect to for enforcement. The Act provides for appropriation of compensation payable to the displaced persons under the Land Acquisition Act. It also provides for acquisition of lands in the command area (benefited zone) for allotment to the families displaced due to submersion of lands. Important provisions made in the Act have been highlighted in the Chapter. One of the reasons for not implementing the Act was that, due to delay in obtaining the President's approval, an executive order had already been issued by GOK towards extending R & R facilities to the project affected families of UKP as recommended by the World Bank. As a matter of fact, the World Bank in its Implementation Completion Report of UKP 2nd Phase has categorically stated that, it was unfortunate that the Resettlement Act was never notified and applied to the project and that it was a missed opportunity.

c) The Karnataka Krishna Basin Development Authority Bill, 1992 was passed in the both the houses of legislature and sent to GOI for obtaining the assent of the President of India. The President's approval was received in 1996 and thereafter the Act was published by GOK as “The Karnataka Krishna Basin Development Authority Act, 1992” (Karnataka Act No.12 of 1996). The Act provides, among other things, for borrowing funds by the Authority, land acquisition and constitution of Special Courts. Important provisions made in the Act are highlighted in the chapter. The Authority, as per the Act, would be having jurisdiction over all the projects in the entire Krishna Basin. Though the Act was published, the same has not been given effect to for enforcement. Perhaps considering the delay in obtaining the President's approval, the GOK went ahead in 1994 for the formation of a Company called “The Krishna Bhagya Jala Nigam Limited” under the Indian Company's Act for expediting the works of UKP.

10.07 Major policy decisions taken for accelerating the progress:

(a) The chapter highlights several major policy decisions taken aimed at accelerating the progress of the project. These include — (i) decision for obtaining World Bank assistance for the first and second phase projects implemented from 1978 to 1986 and from 1989 to 1997 respectively; (ii) decision taken in 1983 regarding shifting of Bagalkot town and formation of Bagalkot Town Development Authority (BTDA); (iii) decision taken in 1985 for providing crest gates of full height for Alamatti dam in the 1st Stage itself; (iv) decision taken in 1994 for formation of a Company called the "Krishna Bhagya Jala Nigam Limited" for raising the resources and executing the project; (v) decision taken in 1988 for development of Kudala Sangama Kshethra and in 1994 for formation of Kudala Sangama Development Board; (vi) important Legislations made in 1987 for rehabilitation and resettlement of project affected families and in 1992 for development of Krishna basin projects by the Krishna Basin Development Authority; (vii) decision taken in 1995 for starting of NRBC; (viii) decision taken in 1995 / 1996 for direct entrustment of canal works; (ix) obtaining assistance from GOI under the new programme called "Accelerated Irrigation Benefit Programme" during 1996-1997; (x) decision taken in 1996 and in 2000 for entrustment of survey work and preparation of drawings & estimates to private consultants; (xi) decision taken in 2002 about amendments to contract documents; and (xii) decision taken in 2002 about introduction of E-tendering system.

(b) The issues relating to serial numbers (i) to (vi) above are mentioned only in brief since more details relating to them have been given in separate individual chapters. Regarding issues mentioned in serial numbers (vii) to (xii) above, details have been given in this chapter itself.
Land acquisition and Rehabilitation & Resettlement of project affected families:

(a) The chapter explains in detail the extent of lands (with structures) coming under submersion of the two reservoirs as assessed at different points of time depending on the FRL, number of villagers coming under submersion and number of Resettlement Centers contemplated, policies for rehabilitation and resettlement of project affected families enunciated at the instance of World Bank, modifications made to the R&R policies, etc.

(b) The facilities extended under the R&R package, in accordance with the suggestions / recommendations of the World Bank, are clearly mentioned in the chapter. Some of the important facilities extended are – (i) payment of exgratia amount to the land losers; (ii) providing income generating schemes and providing exgratia payments to the families losing only a part of their lands; (iii) payment of exgratia to landless families; (iv) providing free house plot in the Resettlement Centers; (v) transportation of the belongings of the affected families free of cost; (vi) payment of subsistence allowance for the families in the new locations for the first six months; (vii) providing the adult brothers of displaced persons with residential sites in the Resettlement Centers or alternatively providing cash grant / housing grant for construction of house; (viii) extending the above housing package to not more than two major sons of the displaced person; (ix) extending the above housing facility to the never-married major daughters of the displaced family; (x) payment of exgratia to all adult landless agricultural labourers for suitable income generating scheme; (xi) providing vocational training; (xii) 5% job reservation in Government Departments in C & D categories; (xiii) waiver of stamp duty on purchase of land / house; and (xiv) providing free ration to the family in the first month of displacement, etc.

(c) The present status of land acquisition and R&R is as shown below:-

(i) Total extent of land acquired under the project, for submersion, canals, Resettlement Centers, Ayacut Roads and Link Roads:

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narayanapur</td>
<td>76808</td>
</tr>
<tr>
<td>Alamatti</td>
<td>154236</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>231044</strong></td>
</tr>
</tbody>
</table>

(ii) Number of structures acquired:

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narayanapur</td>
<td>15596</td>
</tr>
<tr>
<td>Alamatti</td>
<td>53589</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>69185</strong></td>
</tr>
</tbody>
</table>

(iii) Total number of villages submerged:

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Villages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narayanapur</td>
<td>40</td>
</tr>
<tr>
<td>Alamatti</td>
<td>137</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>177</strong></td>
</tr>
</tbody>
</table>

(iv) Total number of Resettlement Centers constructed:

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narayanapur</td>
<td>33</td>
</tr>
<tr>
<td>Alamatti</td>
<td>101</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>134</strong></td>
</tr>
</tbody>
</table>

(v) Total number of displaced families...

(vi) Total amount of compensation paid towards acquisition of land / property...

(vii) Amount of housing grant sanctioned...

Rs.173.31 crores
(viii) Amount of land purchase grant sanctioned … Rs.17.44 crores

(xi) Amount of subsistence allowance sanctioned … Rs.3.79 crores

(x) Amount towards income generating schemes sanctioned. Rs.11.14 crores

(xi) Amount sanctioned for reconstruction of temples. Rs.17.67 crores.

10.09 Relocation of Bagalkot Town and development of Kudala Sangama Complex:

(a) The Chapter explains in detail the need for shifting of Bagalkot town, a major portion of which was getting submerged by Alamatti reservoir, to a higher location and the formation of Bagalkot Town Development Authority (BTDA) under the Karnataka Improvement Boards Act, 1976. The BTDA was constituted through G.O. dated 24.08.1983 and after amending the Karnataka Improvement Boards Act, 1976, the amendment making provisions for the BTDA was notified as Karnataka Act No.13 of 1985.

(b) For locating the New Township of Bagalkot, an area of 4,320 acres has been acquired at a higher place near the existing Bagalkot town. Various benefits to the displaced families have been extended through several Government orders. Important facilities extended are:

(i) Allotment of a site free of cost in the New Township.

(ii) Allotment of site to two adult children of the affected family in the New Township.

(iii) Allotment of site to two adult brothers of every displaced joint family in the New Township.

(iv) Allotment of site to unmarried female children of the affected family and also payment of companionate grant.

(v) Free transportation of the belongings of the displaced families.

(vi) Payment of compensation for industrial institutions affected by submersion.

(vii) Payment of compensation to employees of affected institutions.

(viii) Payment of companionate grant for construction of houses in the New Township to authorized / unauthorized /encroached affected families living below the poverty line.

(ix) Exemption from payment of registration fee and stamp duty, to the displaced families purchasing immovable properties.

(c) About 22,000 structures in the Old Township of Bagalkot are affected by the back waters of Alamatti reservoir, the population so affected being 91,596. So far 4,467 structures have been acquired and an amount of Rs. 117.97 Crores has been paid as compensation including enhanced compensation due to Court Awards. 56 sectors have so far been developed in the New Township and 7,579 plots have been distributed. All basic amenities like drinking water supply, electricity, under ground drainage, roads, storm water drains, public utility buildings etc. have been provided in the New Township. The total estimated cost of Bagalkot relocation is Rs. 1037.49 Crores and the expenditure incurred upto end of June 2003 is Rs. 314.26 Crores.
As regards the development of Kudala Sangama Complex, the Chapter explains in detail the various proposals examined for dismantling and reconstruction of Sri. Sangameshwara temple, which was getting affected by Narayanapur reservoir (Basava Sagar), before finally deciding to strengthen the existing temple in accordance with the recommendations made by the Vishwanath Reddy Mudnal Committee. The recommendations of this Committee, which also included various measures for the development of Kudala Sangama Complex, were approved in G.O. dated 22.09.1988 and almost all the recommendations of the Committee have been implemented / under implementation. Further, to oversee the development of Kudala Sangama Complex, a Development Board under the Chairmanship of the Chief Minister has been constituted in Government Notification dated 06.10.1994. A fund head was also created in August 1995 for operation of funds required for the development of Kudala Sangama Complex and the Deputy Commissioner of Bijapur has been appointed as the Drawing Officer.

An Action Plan for implementing the works in Kudala Sangama Complex was prepared by the Commissioner for R & R and land acquisition, UKP and this Action Plan is at present being implemented. The total estimated cost of the work including roads, shops, buildings, Temple complex, water supply, compound wall with side drains and entrance main gates etc., is Rs.41.05 crores out of which an expenditure of Rs. 31.15 Crores has been incurred upto end of February 2003.

The Chapter gives more details of the recommendations made by the Vishwanath Reddy Mudnal Committee, present stage of works, etc.

10.10 Contract management and disputes settlement:

(a) In this Chapter, the importance of effective contract management has been stressed in detail. Some of the main reasons contributing to the disputes resulting in delay in completion of the works, have been analysed in the Chapter.

(b) Three classic cases have been discussed in greater detail in the Chapter, showing therein how certain major disputes cropped up during execution due to ineffective contract management and how the works were badly affected due to not taking prompt and proper decisions at the appropriate time. The cases so analysed are (i) disputes and arbitration cases arising out of ICB / LCB contracts in UKP Phase-I with World Bank Assistance, (ii) dispute regarding classification of hard shale in Mudbal Branch Canal, Slice Nos.1, 2 and 3 in UKP Phase-II with World Bank Assistance and (iii) Interpretation of Clause 52 of ICB / LCB contract agreement in UKP Phase-II with World Bank Assistance.

(c) Regarding the disputes and arbitration cases in UKP Phase-I, which was implemented with World Bank Assistance during in 1978-86, several disputes arose in the initial period of the project regarding fixing up of rates for excess quantities and extra items. The conditions of contract (LCB / ICB) provided for payment of excess quantities and extra items at mutually agreed rates. As no concrete and positive action was taken by the Project Authorities to arrive at mutually agreed rates, the Contractors went to arbitration in accordance with the Arbitration Clause existing in the contracts and stopped the works for nearly 1 to 1 ½ years which badly affected the progress of the project inviting severe comments from the World Bank. Some even went to Courts for redressal of their grievances. Later on, the Government had to intervene in the matter towards finding an amicable solution to the problem. In this direction a norm was derived by the Government during 1983 and the disputes of all the Contractors who came forward to accept the Government norm were settled accordingly. In all, 23 such cases were ultimately settled through G.O. dated 30.03.1984. This decision of the Government played a crucial role in the resumption of suspended works and claim full credit assistance from World Bank.

(d) As regards the dispute concerning classification of hard shale in Mudbal Branch Canal under UKP Phase-II, which was implemented with World Bank Assistance during 1989 – 1997, even though the tender specifications clearly indicated that any rock for the excavation for which blasting is required had to be classified as “hard rock”, the Project Authorities classified hard shale requiring blasting for its removal, as “soft rock” by misinterpreting the wordings in the specifications. This became a major dispute in the initial period of the project seriously affecting the progress of the project. The then ECPC of the project was requested in October 1990 to inspect the site jointly with all the Chief Engineers of UKP and take a final decision on the classification of hard shale at project level itself. The suggested joint inspection never took
place. Later on, the Government constituted an Expert Committee comprising Sri. B.A. Reddi, Retd. Engineer-in-Chief and Sri. H.S. Bhat, Retd. Chief Engineer to examine the issue. The Committee gave its report in June 1991 making specific recommendations for classification of hard shale, requiring blasting for its removal, as hard rock and to make payment for all excess quantities classified as hard rock at tender rates only. The recommendations of the Expert Committee were accepted through G.O. dated 14.08.1991. Even though there was initial Audit objection for the above said G.O., the same was finally cleared by the Accountant General (Audit –II) during November 1994.

(e) Regarding the Interpretation of Clause 52 of ICB / LCB contract agreements in UKP Phase-II, the Project Authorities made their own interpretation of the Clause and decided to make payment for all excess quantities (over and above 125% of the tendered quantities) at SR ± tender premium as per Clause 52 (5). The dispute arising out of this interpretation cropped up in 1990 itself. Since Government had already approved the payment of tender rates for all excess quantities in excavation items of Mudbal Branch Canal in accordance with the recommendations of the Expert Committee, which was subsequently cleared in Audit also, the action so taken by the Project Authorities to make payment for excess quantities at SR ± tender premium as per Clause 52 (5) resulted in a major dispute. The opinion given by Law Department on several occasions right from May 1993 upholding the payment of excess quantities at tender rates as per Clause 52 (1), was also not implemented by the ECSS of UKP, who made back references to Government adding new dimensions to the interpretation of the Clause. Finally, the Advocate General’s opinion was obtained in the matter. The Advocate General, furnishing his opinion in his letter 23.10.1996, categorically stated that all extra or additional work executed will have to be valued in the manner specified by Sub Clause (1) of Clause 52. Thereafter, the MIPC Board in its meeting held on 23.05.1997 under the Chairmanship of the Hon’ble Minister for Major Irrigation resolved to accept the opinion of the Advocate General. The issue thus took more than 6 years to come to a finality.

10.11 Damages to radial crest gate of Narayanapur dam:

(a) The Chapter explains in detail the damage occurred to radial crest gate No.5 of the additional spillway of Narayanapur dam on 03.11.1992 caused due to hitting of the radial gate by the bulkhead. In order to fulfill a commitment made by GOK to World Bank and GOI that water would be stored in Narayanapur reservoir in June 1982, it had become necessary to provide 3 stoplog gates and 2 bulkheads to the 5 additional spillways as the work of providing the radial crest gates to the additional spillways had not been completed. Even though this work was subsequently completed, the bulkheads were not removed for some reason or the other. The damage occurred to the radial gate on 03.11.1992 was so severe that there was heavy leakage to the extent of 1,000 cusecs through the damaged gate. As an area of 70,000 ha. (1.75 lakh acres) had been notified for the Rabi Irrigation of 1992, there was panic among the farming community fearing fast depletion of the reservoir due to heavy leakage through the damaged gate.

(b) Soon after the incident, the site was inspected by the Irrigation Secretary. M/s. Tunghabadhra Steel Products, Hospet, who had done the balance works of the radial crest gates as well as providing bulkheads and stoplog gates, were also consulted in the matter of taking up emergent repair works. Immediately action was taken to plug the leakage by providing gunny bags, cotton waste etc. by doing which the leakage could be reduced to about 500 cusecs. Thereafter, the work of (i) providing latching arrangements for suspending stoplog elements on pier tops, (ii) fabrication, supply and erection of radial gate leaf, (iii) providing steel materials and services etc, was entrusted to M/s. TSP at an estimated cost of Rs. 72.60 lakhs. Simultaneously, the work of raising of piers for providing latching arrangements at an estimated cost of Rs. 27.00 lakhs was also taken up. The repair work was accordingly carried out by M/s. TSP and completed by May 1993.

(c) In the meanwhile, a Committee under the Chairmanship of Sri. S. Venkatesh, I.A.S (Retd), was constituted through G.O. dated 08.01.1993 (read with subsequent corrigendum and further G.O. dated 20.03.1993), to investigate the causes for damage to the radial crest gate and identify the persons responsible for their lapses. The Committee gave its report in July 1993 wherein it had been observed that the field weld joints were most defective and such weak joints, all located right at mid-span of the gate where there was maximum stress due to thrust of water, were the causes for the failure of the bulkhead gate. The Committee also made recommendations for minimizing the chances of recurrence of such mishaps in future,
not only in UKP but also other projects in the State. These recommendations have been broadly classified into 2 categories, viz., (i) recommendations for immediate implementation and (ii) recommendations for phased implementation.

(d) Various measures taken by the Department to get the damaged gate repaired and details of the findings of the above said Investigation Committee along with its recommendations, are highlighted in detail in the Chapter.

10.12 Krishna Bhagya Jala Nigam Limited:

(a) The necessity of forming the Krishna Bhagya Jala Nigam Limited under the Indian Company's Act and its objects have been highlighted in the Chapter. The Nigam was formed through G.O. dated 06.05.1994 with an authorised share capital of Rs. 3,000 Crores. For functioning of the Nigam a Board of Directors headed by the Hon'ble Chief Minister has been constituted with 2 Committees and 1 Sub-Committee viz., -- (i) The Audit Committee headed by Sri. B.S. Patil, Chief Secretary, (ii) The Finance Committee headed by Sri. B.K. Das, Principal Secretary, Finance Department and (iii) Technical Sub-Committee headed by Sri. K.C. Reddy, Chairman, TAC, Irrigation Projects. The Managing Director is the Chief Executive of the Company.

(b) Though the Nigam was earlier having jurisdiction over Upper Krishna Project only, some projects in Bhima Sub-basin were subsequently brought under the fold of the Nigam. The share capital of the Nigam has also been subsequently increased to Rs. 7,000 Crores.

(c) The Nigam has so far mobilised funds through Bonds and Term loans from Banks and Finance Institutions to an extent of Rs. 6,719.12 crores. An amount of Rs. 1,263.05 crores has also been so far obtained from GOI as Central Loan Assistance under the Accelerated Irrigation Benefit Programme. With these resources, the progress of UKP has picked up tremendously. The expenditure incurred on the project since inception upto end of October 2003 is Rs. 11,780.32 crores (including repayment of interest on borrowed funds amounting to Rs. 2,680.25 crores and repayment of principal amount of Rs. 1,703 crores) as against Rs. 1,942 crores incurred upto end of March 1995 since inception (i.e., from 1963).

(d) More details on the objects and activities of the Nigam, funds borrowed, expenditure incurred, irrigation potential created, administrative setup etc., are given in the Chapter.

10.13 Lift Irrigation Schemes:

(a) The features of all the Lift Irrigation Schemes contemplated under the project and their present status are explained in the chapter. One of the Schemes viz., Mulwad L.I. Scheme, meant to benefit the drought stricken Bijapur district, is the biggest L.I. Scheme in Karnataka and perhaps one of the biggest such schemes in the Country. Foundation problems encountered during the execution of this Scheme, geological investigations made thereafter and subsequent shifting of the site of Head works, have been discussed in greater detail in the chapter. Formation of a Pumps Committee to address the problems including designs of all these Lift Irrigation Schemes and its functions and decisions are also highlighted in the chapter.

(b) Four Lift Irrigation Schemes are envisaged from Alamatti reservoir. They are – (i) Mulwad Lift Irrigation Scheme; (ii) Alamatti Left Bank Canal; (iii) Alamatti Right Bank Canal; and (iv) Herkal Lift. One scheme is from Narayanapur reservoir and it is called the Rampur (Navalli) Lift Irrigation Scheme. One more Lift Irrigation Scheme called the Indi Lift Scheme takes off from the Narayanapur Left Bank Canal. Considering the magnitude of these Lift Irrigation Schemes, the size of their intake structures and capacity of the pumpsets and motors, an Experts Committee (generally called as the Pumps Committee) was formed in August 1999 under the chairmanship of Sri. B.G. Rudrappa, Former Chairman of KEB. The main functions of the Committee were to address the various issues like – (i) optimal selection of the pumps to obtain maximum efficiency over the range of operations; (ii) selection of supply voltage from KPTCL; (iii) Design of sub-station & Switchgear, etc., taking into account the reliability and economy. Incidentally, the Pumps
Committee also looked into the design of the intake structures and made changes / modifications in the designs wherever necessary.

(c) The magnitude and size of the L.I. Schemes may be gauged from the features given in the following Table:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Lift Irrigation Scheme</th>
<th>Contemplated CCA (in ha)</th>
<th>Contemplated water utilisation (in TMC)</th>
<th>Pumps</th>
<th>Motors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mulwad L.I.Scheme:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Under Scheme-A</td>
<td>30,850</td>
<td>8.50</td>
<td>4+1 Stand-by (Baluthi Head work)</td>
<td>5 of 1300 KW (1745 HP) each + 3 of 820 KW (1100 HP) each</td>
</tr>
<tr>
<td></td>
<td>Under Scheme-B</td>
<td>1,80,750</td>
<td>56.50</td>
<td>3+1 Stand-by (Hanumapur Head work)</td>
<td>4 of 2150 KW (2880 HP) each + 4 of 1350 KW (1880 HP) each</td>
</tr>
<tr>
<td></td>
<td>Sub-Total:</td>
<td>2,11,600</td>
<td>65.00</td>
<td>Addl. 23 pumps at Baluthi and 22 pumps at Hanumapur.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Alamatti L.B.C.:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Under Scheme-A</td>
<td>20,235</td>
<td>5.60</td>
<td>3+1 Stand-by</td>
<td>4 of 1250 KW each + suitable No. motors of smaller capacity.</td>
</tr>
<tr>
<td></td>
<td>Under Scheme-B</td>
<td>80,940</td>
<td>22.50</td>
<td>Addl. 8 pumps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sub-Total:</td>
<td>1,01,175</td>
<td>28.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Alamatti R.B.C.:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Under Scheme-A</td>
<td>16,100</td>
<td>4.50</td>
<td>2+1 Stand-by Addl. 1 pump</td>
<td>3 of 1050 KW each.</td>
</tr>
<tr>
<td></td>
<td>Under Scheme-B</td>
<td>16,900</td>
<td>5.50</td>
<td>Addl. 1 pump</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sub-Total:</td>
<td>33,100</td>
<td>10.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Rampur L.I.Scheme:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Under Scheme-A</td>
<td>20,235</td>
<td>5.60</td>
<td>2+1 Stand-by (Navali Head work)</td>
<td>3 of 1125 KW (1503 HP) each + 1 motor of 750 KW.</td>
</tr>
<tr>
<td></td>
<td>Under Scheme-B</td>
<td>12,800</td>
<td>4.00</td>
<td>2+1 Stand-by (Anehosur Head work)</td>
<td>3 of 1775 KW each.</td>
</tr>
<tr>
<td></td>
<td>Sub-Total:</td>
<td>33,035</td>
<td>9.60</td>
<td>Addl. 1 pump</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Indi L.I.Scheme:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Under Scheme-B</td>
<td>41,900</td>
<td>11.90</td>
<td>5+1 SB</td>
<td>6 of 2000 HP (Approx) each.</td>
</tr>
</tbody>
</table>

Note: Another Scheme called the Herkal L.I. Scheme is under planning and investigation stage.
10.14 Investigating the capability of Narayanapur Left Bank Canal to carry 10,000 cusecs:

(a) The Chapter explains the features of NLBC and the slope failures / slips that occurred / are occurring at several places of the Canal leading to apprehensions about the capability of the Canal to carry the designed head discharge of 10,000 Cusecs. Various treatment measures carried out for restoration of the slipped portions from time to time are also highlighted in the Chapter.

(b) The NLBC taking off from the Left Bank of Narayanapur dam runs for a length of 78 Km with a contemplated CCA of 4.09 lakh ha under its various branches and distributaries. The Canal was completed during the early 1980’s. During early 1990s, several slope failures and slips occurred at many places of the Canal. This feature has continued causing great anxiety not only to the farmers but also to the Project Authorities. Experts were consulted in the past regarding the treatment measures to be carried out for restoration of the slipped reaches. Several Committees were also constituted to examine the problem in greater detail. Even the Indian Institute of Science, Bangalore was contacted to undertake the studies and make suitable recommendations.

(c) Since the problem persisted, an Expert Committee under the Chairmanship of Sri.K.C.Reddy, Chairman, TAC, Irrigation Projects was finally constituted in KBJNL in September 2003 to address the problem and suggest a long lasting solution for the entire length of the Canal. This Expert Committee inspected the Canal in October 2003 and, after discussing all the related issues in a meeting which was also attended by the Professors of I.I.Sc, submitted its report to the MD of KBJNL on 12.11.2003. Some of the important recommendations made by the Expert Committee are ~ (i) the carrying capacity of NLBC at head may be adopted as 10,000 Cusecs upto 35 Km and 8,155 Cusecs thereafter for purposes of strengthening / improving the NLBC; (ii) the top width of the embankment sections upto 35 Km may be retained as 4.5 m as per State norms and as 6.1 m thereafter as per World Bank norms; (iii) a minimum free board of 1.2 m may be provided above the FSL obtained by computing the back water elevation; (iv) the treatment measures where expansive material is used for casing in the embankment and where slips have occurred, may be carried out as per the recommendations of I.I.Sc until such time permanent measures proposed by the Committee are taken up for execution; (v) all high embankment sections should be checked for stability, after which, improving / widening of the embankment sections on the downstream side including drainage arrangements may be considered for restoring the original / designed slopes of the sections; (vi) RCC lining (with 0.2% reinforcement both ways) should be proposed in the water prism for the full Canal cross section covering FSD + FB for all embankment reaches including cutting reaches in expansive soils; (vii) wherever expansive soils are met with, a well compacted CNS layer should be provided as base for the RCC lining; (viii) RCC lining should be done by paver machines/ slip form / acrow machine; (ix) the entire work should be split up into three convenient packages for purposes of tendering; (x) tender documents should be issued only to the pre-qualified agencies and (xi) the period for carrying out the works may be prescribed as about 8 months during which period the Canal may have to closed for irrigation for atleast one season i.e., Rabi.

(d) More details on the treatment measures suggested by I.I.Sc and the detailed recommendations made by the Expert Committee with a view to providing a long term and lasting solution to the problem of NLBC are given in the Chapter.

10.15 Design, fabrication, transportation and erection of crest gates of Alamatti dam:-

(a) The chapter explains various actions and decisions taken in the design, fabrication, transportation and erection of crest gates of Alamatti dam. The sequence of operations is also highlighted therein.

(b) Considering the intricacy of the designs, fabrication and erection of the crest gates of this size (26 numbers of size 15 m x 15.24 m), and also in the interest of speedy execution of the work of crest gates, an Expert Committee (generally called as the Gates Committee) under the chairmanship of Sri.D.N.Desai, Retired Secretary to Government, PWD, was constituted through Government Order dated 03.08.1995. The terms of reference for this Expert Committee were to scrutinize the designs and supervise the fabrication, erection & commissioning of the crest gates and the stop log gates (3 sets made up of
10 elements each). A moving gantry crane was also designed and fabricated. A CC TV arrangement with cameras (26 Nos) fixed over the cat walk has also been provided along with a remote control operation unit. The control room for monitoring the remote control operations is located at the end of the training wall on the left side of the stilling basin.

(c) The radial crest gates are operated by imported hydraulic cylinders. Though the crest gates had been designed and fabricated for the full height of 15.24 m corresponding to final FRL 524.256 m, the skin plate from the central operation above RL 519.6 m had to be cut in compliance to the order of the Supreme Court, passed in April 2000, limiting the storage of Alamatti to 519.6 m only. The erection of crest gates was completed in all respects by June 2001 and water was stored upto FRL 519.6 m in 2002.

10.16 Dispute regarding the height of Alamatti dam:

(a) The Chapter explains in detail how Andhra Pradesh gave a twist to the water dispute, even after the Tribunals Award / final order was published in May 1976, by strongly contesting the height of Alamatti dam with FRL 524.256 m contemplated by Karnataka. Inspite of repeated attempts made by Karnataka to get the issue of sharing of surplus waters under Scheme–B amicably settled, due to the rigid stand taken by Andhra Pradesh, all these attempts yielded no result. Efforts made by GOI in this direction also proved futile.

(b) The main contention of Andhra Pradesh was that the allocations made by the Tribunal were project specific and that the allocation made to UKP under the Tribunal Award was only 155 TMC but Karnataka had allocated, out of its share, 173 TMC to UKP. It was also made out by Andhra Pradesh that to utilize 155 TMC under the project, a storage of 66 TMC (upto RL 515.09 m) under Alamatti was enough but Karnataka was contemplating to construct the dam to FRL 524.256 m which would enable Karnataka to utilize 400 TMC.

(c) Constitution of an Experts' Committee by the Steering Committee of the then United Front Government at the Center for resolving the dispute, findings of the Experts' Committee, the public interest Writ Petition filed in Andhra Pradesh High Court in July 1996 and the contentions of Maharashtra, Andhra Pradesh, CWC and Karnataka, as put forth in their respective affidavits, are discussed in detail in the Chapter. The original suits filed in the supreme Court of India by Karnataka (on 01.03.1997) and by Andhra Pradesh (on 25.03.1997), presentation made by Karnataka before the Supreme Court, change in the stand of Maharashtra, new meaning given by GOI to “Surplus Water” in its affidavit before the Supreme Court, proceedings of the Court, contempt petition filed by Andhra Pradesh, findings of the Expert Commissioner appointed by the Supreme Court in the matter of the contempt petition, orders of the Supreme Court etc are exhaustively discussed in the Chapter.

(d) While strongly denying the allegations of Andhra Pradesh, it was made out in the affidavit of Karnataka that it is Andhra Pradesh that was going to be benefited more by storing water upto FRL 524.256 m at Alamatti. It was pointed out that power generation in Andhra Pradesh projects would increase by 1065 MU, that too at a time when the demand for power is more, as against the 724 MU increase at Alamatti by having storage at Alamatti upto 524.256 m vis-à-vis 519.6 m. While indicating that Andhra Pradesh's interests (irrigation & power) would not in any way be affected by having storage upto 524.256 m at Alamatti, it was also pointed out that Andhra Pradesh had not established its contentions with facts and figures.

(e) The Supreme Court in its order passed on 25.04.2000 has held that:-

(i) Allocations made by the Tribunal are enbloc and not project specific.

(ii) Scheme–B framed by the Tribunal is not the decision of the Tribunal.

(iii) It is appropriate for the Central Government to exercise the discretion while granting any scheme or project of the lowest riparian State and bearing in mind, what is really meant by the liberty granted, so that the lowest riparian State should not be allowed to proceed ahead with large scale water projects for
utilization of the surplus water in excess of the allocated quantity over which, the State has no right. It is the Central Government which has to exercise this discretion while clearing projects of the lowest riparian State and it should be so exercised that there should not be any apprehension in the minds of the upper States that for all times to come, their right of sharing the surplus water would in any manner be endangered.

(iv) There is no justification for Karnataka to have dam height at Alamatti of 524.256 m and there cannot be any injunction or prohibition to Karnataka for having dam height up to 519.60 m.

(v) ... the question of raising the height up to 524.256 meters at Alamatti could be appropriately gone into by a Tribunal, to be appointed by the Central Government on being approached by any of the three riparian States and such Tribunal could also go into the question of apprehension of submergence within the territory of the State of Maharashtra and give its decision thereon, in the event the height of the Dam at Alamatti is allowed to be raised up to 524.256 meters. The Tribunal would also be entitled to go into the question of reallocation of the water in river Krishna Basin, if new datas are produced by the States on the basis of improved method of gauging.

(f) Consequent to the above said order of the Supreme Court, action was taken by GOK to cut the skin plates of the radial crest gates of Alamatti dam, which had already been fabricated for a height of 15.24 m corresponding to final FRL 524.256 m, suitably so that the storage / FRL is limited to 519.6 m only.

10.17 Master Plan for utilization of Krishna waters:

The Chapter gives a picture of the Plan prepared by GOK for utilization of Krishna waters after the Tribunal gave its report in December 1973 and the first Master Plan prepared in 1977 after the Tribunal gave its further report / order in May 1976. The revised Master Plans prepared in 1987, 1993 and 2001 and the necessity for making such revisions are explained in brief in the Chapter. The allocation made for UKP in the above Master Plans, is as shown below:-

<table>
<thead>
<tr>
<th>Master Plan of</th>
<th>Allocation for UKP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977............</td>
<td>163 TMC (including Hippargi barrage) under Scheme-A and 417.55 TMC under the 1050 TMC Master Plan.</td>
</tr>
<tr>
<td>1987............</td>
<td>173 TMC (119 for Stage-I and 54 for Stage-II) under Scheme-A and 8 TMC for Stage-III out of Godavari diversion.</td>
</tr>
<tr>
<td>1993............</td>
<td>173 TMC (119 for Stage-I and 54 for Stage-II) under Scheme-A. Provision for Stage-III earlier made under Godavari diversion has been deleted.</td>
</tr>
<tr>
<td>2001............</td>
<td>173 TMC (119 for Stage-I and 54 for Stage-II) under Scheme-A. The allocation for Stage-III under Scheme-B is shown as 105.83 TMC.</td>
</tr>
</tbody>
</table>

10.18 Power development in Upper Krishna Project:

(a) The concept of power generation in Upper Krishna Project ever since it was visualized in 1963, has been discussed in great detail in the chapter. Details like changes made in the installed capacity depending on various studies made in this connection, entrustment of the Alamatti Power Project and later on the Narayanapur Cascade Project to a private company (M/s. Chamundi Power Corporation), withdrawal of the project from the private company and entrustment to KPCL etc, are also brought out in the chapter.
(b) The estimated power generation at Alamatti, as per the project report of 1970, was about 520.50 million Kwh with an installed capacity of 150 MW (5 of 30 MW each). As per the latest project report of KPCL, the installed capacity at Alamatti is 290 MW (5 of 55 MW each and one of 15 MW). The Alamatti Power Scheme under execution by KPCL is in brisk progress.

(c) Several Committees were formed to examine the water supply and management agreement drafted by M/s. Chamundi Power Corporation. Several issues were examined by these Committees relating to (i) handing over the intake structures and penstocks; (ii) responsibility of controlling and regulation of water through penstocks; (iii) water releases plan; (iv) payment of royalty by M/s. Chamundi Power Corporation based on the quantity of water released for power generation; (v) development of integrated reservoir simulation model; (vi) impact of storage capacity on power generation due to reasons like – siltation, sudden draw-down; (vii) possibility of generating power in summer months, etc.

(d) Studies on risk sharing arrangement, rule curve simulation, impact on power generation due to ~ (i) delay in upstream utilization, (ii) command area development in UKP, (iii) sedimentation in Alamatti and Narayanapur reservoirs, and the impact of dam height on the Narayanapur Cascade System etc, were also done. The findings of these studies are explained in brief in the chapter.

11.0 As regards the nomenclature to be given to the Report, the matter was discussed by the Committee with Sri.K.C.Reddy. As the project is still not completed and it may take some more years for its completion, it was felt that it is not appropriate to call it a History Report. Since the project works commenced in 1963 i.e., about 40 years back, Sri.K.C.Reddy, aptly suggested to give the nomenclature “40 years of Upper Krishna Project” and the Report has been named accordingly.

12.0 No words are sufficient for the Committee to express its grateful and sincere thanks to Sri.K.C.Reddy who not only gave a definite direction to the Committee but also gave valuable advice and proper guidance in the preparation of the Report. But for his vision, this Report, which perhaps is the first of its kind in the State, would not have been possible at all. The Committee also wishes to thank Sri.R.B.Agawane, Managing Director of KBJNL for all the cooperation extended by him to the Committee in fulfilling its obligations.

13.0 The Committee likes to thank the project authorities for extending full cooperation in furnishing the available details / records as and when required. Smt.Shashikala, Assistant Engineer in the office of the MD, KBJNL, Alamatti deserves special mention for all the pains she took to collect the records and pass them on to the Committee in the shortest time possible. The Committee likes to place on record the services of Sri.T.R.Kashiviswanatha Rao, Stenographer, in the office of the Chairman, TAC, who used to sit late nights computerizing the entire Report and Kum.S.Madhusree, Stenographer in the office of the MD, KBJNL, Bangalore, who also contributed to a great extent in supplementing the computerization of the Report. The Committee also thanks Dr.Masood Sharief, Secretary of TAC for all the valuable suggestions given during the course of the Committee’s meetings, Sri.V.N.Prabhakar Rao, P.S. to Chairman, TAC for assisting the Committee in its interaction with KBJNL, and Sri.I.D.Dhaman, Under Secretary to Government, Water Resources Department, in making available records / details.
14.0 Lastly, the Committee likes to make it clear that the Report now got up, based on records / details made available, may not reflect the entire saga of Upper Krishna Project. Considering the magnitude and size of the project and the very long period it may take for its completion, any amount of efforts to bring all the developments concerning the project into two or three volumes may ultimately prove to be insufficient. It will be like a drop in the ocean. Though the Committee has made an honest attempt to bring out a reasonably modest Report, still the Committee humbly feels that it could have done a better job if more records / details were available. It is for the readers to judge the fairness and sufficiency of the Report. The object of the Committee and the purpose of the Report are served if the Report is found to be useful in whatever manner to the Engineering Community.

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(M.K.Venkataram)  
Former Secretary, TAC, Irrigation Projects, Bangalore.  
Member-Convener

(N.Thyagarajan)  
Executive Engineer (Retd.)  
Bangalore.  
Member.

(S.Charles Sujaya Kumar)  
Assistant General Manager (Fin.)  
KBJNL, Bangalore.  
Member

(H.K.Venkatesh Prasad)  
Executive Assistant (Tech.)  
to MD, KBJNL, Bangalore.  
Member
CHAPTER 1*

KRISHNA WATER DISPUTE

1.0 Genesis:

Before the middle of the 19th century, there was little development of water resources of Krishna basin. No major work had been constructed. The rivers of Krishna basin raising in Western Ghats had plentiful supplies during monsoon months but most of the water was being wasted to the sea. From about 1855 onwards, major irrigation works were taken up for construction and upto about 1928, the Krishna Delta Canal System, the Kurnool Cuddappah Canal, the Mutha Canals, the Nira Left Canal, the Vanivilas Sagar and the Nira Right Canal were constructed. During the period 1918 to 1930, Tata Hydel Project for generating hydro power by Westward diversion of water was constructed. Though the Engineering works for development of water resources were few in number, the water supply was ample in relation to the demand and there was, therefore, little scope for any dispute though there were some minor disputes relating to Tungabhadra waters which had been amicably settled through agreements in 1892 and 1933. These agreements were between Madras and Mysore.

(Ref: Page 1 Vol. I of TR)

2.0 Agreements of June & July 1944:

Under the Government of India Act, 1935, water became an exclusive provincial subject and specific provision was made for settlement of water disputes. Before independence in 1947, the provinces of Madras and Bombay, the States of Hyderabad and Mysore and few other princely States had riparian interests in the Krishna basin. The agreements of June 1944 (between Madras and Hyderabad) and July 1944 (between Madras and Mysore) provisionally settled the disputes concerning the sharing of Tungabhadra waters and enabled the States concerned to undertake construction of Tungabhadra Project, Rajolibanda Diversion Scheme, Bhadra Reservoir Project and Tunga Anicut. The Radhanagari Project and Ghataprabha Left Bank Canal were also undertaken before 1950.

(Ref: P 1 Vol. I of TR)

3.0 Memorandum of Agreement of 1951:

3.01 In 1950, when the Constitution of India came into force, the entire Krishna basin fell within the territories of the States of Bombay, Mysore, Hyderabad and Madras. The States of Bombay, Hyderabad and Madras proposed important Schemes for utilisation of Krishna Waters, like the Koyna, Upper Krishna, Lower Krishna, Krishna Pennar and other projects. At an Inter-State Conference held at Delhi in July 1951, a Memorandum of Agreement was drawn up apportioning the available supply of Krishna waters among the four riparian States as under:-

(Ref: P 1 Vol. I of TR)

(i) Accepted dependable annual flow of Krishna Basin … 1715 TMC.

(*)Sources of this chapter:-  
2. Further Report dated 27.5.1976 of the KWDT.  
3. Booklet on ‘Sequence of events’ got up by WRDO.

Abbreviations:-  
2. TFR .. Tribunal’s Further Report dated 27.5.1976.
(ii) Allocations for existing utilisations and for projects under construction were as follows:-

<table>
<thead>
<tr>
<th>State</th>
<th>TMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bombay</td>
<td>176</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>180</td>
</tr>
<tr>
<td>Mysore</td>
<td>98.50</td>
</tr>
<tr>
<td>Madras</td>
<td>290</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>744.50</strong></td>
</tr>
</tbody>
</table>

(iii) Balance flow after meeting the above allocations was taken as 1000 TMC and was allotted as follows:-

<table>
<thead>
<tr>
<th>State</th>
<th>TMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bombay</td>
<td>240</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>280</td>
</tr>
<tr>
<td>Mysore</td>
<td>10</td>
</tr>
<tr>
<td>Madras</td>
<td>470</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1000</strong></td>
</tr>
</tbody>
</table>

(iv) Balance flow in excess of 1000 TMC was allotted as follows:-

<table>
<thead>
<tr>
<th>State</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bombay</td>
<td>30</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>30</td>
</tr>
<tr>
<td>Mysore</td>
<td>1 (provisional)</td>
</tr>
<tr>
<td>Madras</td>
<td>39</td>
</tr>
</tbody>
</table>

(Ref: P 30 Vol.I of TR)

3.02 Apparently this Memorandum of Agreement was aimed to settle the conflicting claims of the riparian states for a period of 25 years. But the settlement was more apparent than real as Mysore State refused to ratify the agreement. In the meantime, the Planning Commission of Government of India continued to clear the projects on the assumption that the 1951 Memorandum of Agreement was binding upon the States.

(Ref: P 1 Vol.I of TR)

4.0 Territorial changes made in 1953 and re-organisation of States made in 1956:-

By the Andhra State Act, 1953 extensive territorial changes were made with effect from 1st October 1953. After the States Re-organisation Act, 1956 the new States of Bombay, Mysore and Andhra Pradesh became the riparian States of Krishna Basin with effect from 1st November 1956. Thereafter, the Central Water and Power Commission (CWPC) drew up a scheme for re-allocation of Krishna waters, which was however not accepted by the States. An Inter-State Conference was held in September 1960 but no settlement could be reached. The legal existence and validity of the 1951 agreement were vigorously challenged and the State Governments began to raise objections to the clearance of new projects.

(Ref: P 1 Vol.I of TR)

5.0 Projects undertaken from 1951 to 1960:-

In the period from 1951 to 1960, the States undertook the construction of several major projects such as Nagarjunasagar, Musi, Tungabhadra High Level Canal Stage-I, Koyna Hydel Stage-I, Khadakwasla Stage-I, Ghataprabha Stage-II, Ghod and Virdam. More schemes were put forward by the State Governments and their aggregate demand was in excess of the available supplies with the result the disputes became more and
more serious. Objections were raised concerning Nagarjunasagar, Srisailam and Koyna projects.

(Ref: P 1 & 2 Vol.I of TR)

6.0 **Formation of Krishna Godavari Commission:-**

In May 1961, the Government of India appointed the Krishna Godavari Commission which submitted its report in August 1962. The Commission found that without further data it was not possible to determine the dependable flow accurately. It also found that the supplies available in Krishna basin were inadequate to meet the demands of all the projects of State Governments. In view of the shortage of river supplies, the Commission indicated the procedure to be adopted with regard to the projects under construction and new projects as well. It also put forward proposals for diversion of Godavari waters into Krishna recommending for further investigations. Further, the Commission recommended for regular gauging at key sites of the river system.

(Ref: P 2 Vol.I of TR)

7.0 **Reference of disputes to the Tribunal:-**

7.01 In January 1962, the Mysore Government applied to Government of India for referring the disputes to a Tribunal. On 23rd March 1963, the Union Minister for Irrigation & Power stated that, according to legal opinion at the highest level, the 1951 agreement had become void, if it was not initially void, at least partially. He stated that new projects should not be held up pending final allocation of Krishna waters and should be cleared on the footing that the withdrawals of supplies by Maharashtra, Mysore and Andhra Pradesh should not exceed 400 TMC, 600 TMC and 800 TMC respectively. The States were, however, not agreeable to this interim allocation. In June 1963, the Maharashtra Government agreed for reference of disputes to the Tribunal.

(Ref: P 2 Vol.I of TR)

7.02 In the meanwhile, the Government of India, since September 1960, gave clearance to several important major projects such as Srisailam, Tungabhadra High Level Canal Stage-II, Upper Krishna, Malaprabha, Bhima, Kukadi, Krishna, Warna and Koyna Hydel Stages II & III.

(Ref: P 2 Vol.I of TR)

7.03 Government of India tried its best to settle the dispute through negotiations by holding a number of inter-state conferences which were futile. Fresh applications for reference of the dispute to the Tribunal were made by State Governments in 1968 and 1969. Eventually the Government of India constituted the Krishna Water Disputes Tribunal on 10th April 1969 for adjudication of the water dispute. In view of the re-organisation of States and the re-distribution of Tungabhadra Valley between Mysore and Andhra Pradesh States, the continuing validity of the earlier Tungabhadra agreements, the use, control and distribution of Tungabhadra waters and the management of certain existing works on Tungabhadra, were also referred to the Tribunal.

(Ref: P 2 Vol.I of TR)

The constitution of the Tribunal was as under:-

1. Sri R.S.Bachawat
   (Judge of the Supreme Court until 31.07.1969) .. Chairman
2. Sri Shamsher Bahadur
   (Judge of Punjab & Haryana High Court until 14.11.1969) .. Member
3. Sri D.M.Bhandari
   (Chief Justice of Rajasthan High Court until 15.12.1969) .. Member
4. Sri M.Prasad
   (Ref: P (i) Vol.I of TR) .. Secretary
8.0 Parties to the dispute, claims and issues examined by the Krishna Water Disputes Tribunal:

8.01 The States of Andhra Pradesh, Maharashtra, Mysore, Madhya Pradesh and Orissa were the original parties to the dispute. The States of Madhya Pradesh and Orissa were made parties as they were interested in the diversion of Godavari waters to Krishna. In April 1971, all the parties jointly stated that none of the States would ask for a mandatory order for such diversion. Thereafter, Madhya Pradesh and Orissa were not interested in the Krishna case and they were discharged from the records of the case.

(Ref: P 3 Vol.I of TR)

8.02 In their statements of case, Maharashtra, Mysore and Andhra Pradesh asserted the following claims to the utilisation of waters of Krishna River System for their existing and future projects:

<table>
<thead>
<tr>
<th>State</th>
<th>Claim for Gross utilisation in TMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maharashtra</td>
<td>828.70</td>
</tr>
<tr>
<td>Mysore</td>
<td>1430.00*</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>1888.10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4146.80</strong></td>
</tr>
</tbody>
</table>

(Ref: P 4 & 5 Vol.I of TR)

(*) Including 442 TMC for UKP

8.03 In addition to the above demands, Maharashtra claimed 325 TMC from regenerated flows and 70 to 80 TMC for industrial use and domestic water supply. Andhra Pradesh claimed 120 TMC for water supply and industrial use whereas Mysore stated that its demand of 1430 TMC did not include its needs of water for domestic and industrial use.

(Ref: P 5 Vol.I of TR)

8.04 The Issues to be considered and deliberated by the Tribunal were finally settled in April 1971. There were 7 main Issues and 16 sub-issues so framed for detailed examination.

(Ref: P 5 to 7 Vol.I of TR)

9.0 Expert witnesses, representatives and advocates of the States and field visits by the Tribunal:

9.01 Following were the expert witnesses called by the States for appearing before the Tribunal on their behalf:

<table>
<thead>
<tr>
<th>State</th>
<th>Expert Witness</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maharashtra</td>
<td>Sri K.K.Framji, Consulting Engineer</td>
<td>Model experiments, sub-basin yields, return flows and carry-over studies generally with particular reference to Srisailam and Nagarjunasagar storage reservoirs.</td>
</tr>
<tr>
<td>Mysore (Karnataka)</td>
<td>Sri B.C.Angadi, Chief Engineer</td>
<td>Carry-over studies in Krishna Valley.</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>Prof. J.V. Rao</td>
<td>Model experiments.</td>
</tr>
</tbody>
</table>

(In addition, Andhra Pradesh called 5 other witnesses to depose before the Tribunal.)

(Ref: P 7 Vol.I of TR)

9.02 Following were the advocates and other representatives who represented the State of Mysore (Karnataka) before the Tribunal:
Advocates:

1. Sri T.Krishna Rao, Ex-Advocate General
2. Sri A.G.Holla
3. Sri S.S.Javali

Following advocates also appeared in the initial stages:

1. Sri M.K.Nambiar
2. Sri V.S.Malimath, Advocate General

Other representatives:

1. Sri B.C.Angadi, Director, WRDO (upto 31.8.1972)
2. Sri S.G.Balekundri, Chief Engineer (from 1.9.1972)
3. Sri B.Subramanyam, Superintending Engineer
4. Sri M.V.Aswathanarayana Setty, Adviser

(Ref: P (vii) Vol.I of TR)

9.03 The Tribunal visited during October and November 1971, various places in Krishna basin to study the local conditions and needs and to see irrigation and power projects, sites of projects under construction or under contemplation and also certain research stations:

(Ref: P 7 Vol.I and Appendix T vol.III, of TR)

10.0 Change of name of Mysore State:-

As per the Mysore State (alteration of name) Act, 1973 the name of Mysore State came to be called as Karnataka State with effect from 1st November 1973.

(Ref: P 7 Vol.I of TR)

11.0 Report dated 24th December 1973 of the Tribunal, its findings and final orders:-

11.01 The Tribunal, after detailed study of the dispute, examination of documents, presentations made by the representatives of the States, cross examination of expert and other witnesses and hearing of arguments, through its letter dated 24th December 1973 addressed to the Ministry of Irrigation & Power, Government of India, forwarded its unanimous report (copy of its Final Order enclosed as Annexure-1). Following is the gist of important findings and orders of the Tribunal on several issues and matters deliberated by it:-

(Ref: P (v) Vol.I of TR)

(i) Sub-basins in the Krishna Basin:-

The following are the sub-basins of Krishna Basin considered by the Krishna Water Disputes Tribunal (KWDT):

<table>
<thead>
<tr>
<th>K-1</th>
<th>Upper Krishna</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-2</td>
<td>Middle Krishna</td>
</tr>
<tr>
<td>K-3</td>
<td>Ghataprabha</td>
</tr>
<tr>
<td>K-4</td>
<td>Malaprabha</td>
</tr>
<tr>
<td>K-5</td>
<td>Upper Bhima</td>
</tr>
<tr>
<td>K-6</td>
<td>Lower Bhima</td>
</tr>
<tr>
<td>K-7</td>
<td>Lower Krishna</td>
</tr>
<tr>
<td>K-8</td>
<td>Tungabhadra</td>
</tr>
<tr>
<td>K-9</td>
<td>Vedavathi</td>
</tr>
<tr>
<td>K-10</td>
<td>Musi</td>
</tr>
<tr>
<td>K-11</td>
<td>Palleru</td>
</tr>
<tr>
<td>K-12</td>
<td>Muneru</td>
</tr>
</tbody>
</table>

F.N.: UKP is in K-2 Sub-basin i.e., Middle Krishna.

(Ref: P 12 & 13 Vol.I of TR)
(ii) **Earlier Agreements:-**

The Tribunal has held that the following earlier agreements are superseded by its final order:-

(a) Agreement of 1892 between Madras and Mysore so far as it related to Krishna River System.

(b) Agreement of 1933 between Madras and Mysore so far as it related to Krishna River System.

(c) Agreement of June 1944 between Madras and Hyderabad.

(d) Agreement of July 1944 between Madras and Mysore so far as it related to Krishna River System.

(e) Supplemental agreement of December 1945 among Madras, Mysore and Hyderabad.

(f) Supplemental Agreement of 1946 among Madras, Mysore and Hyderabad.  
(Ref: P 229 vol. of TR.)

(iii) **Memorandum of Agreement of July 1951:-**

The Tribunal in its findings has concluded that the States of Bombay, Hyderabad and Madras ratified the agreement on the clear understanding that the State of Mysore would also join the agreement and ratify it. As Mysore did not ratify the agreement, there was no operative and concluded agreement and the ratification by the three States was wholly ineffective. Continuing, the Tribunal has held that this was the position in law apart from any Rule of Equity and that the ratifying States or their successor States were not bound at law by any agreement and they need not seek any equitable relief.  
(Ref: P 37 Vol.I of TR)

(iv) **Diversion of Godavari waters to Krishna Basin:-**

The Tribunal has stated that it was inclined to think that all the States should be at liberty to urge their respective contentions before the reviewing authority after 31st May 2000 and not earlier. Accordingly, the Tribunal has passed the following order on this Issue:-

* In the event of the augmentation of the waters of river Krishna by the diversion of waters of any other river, no State shall be debarred from claiming before the aforesaid reviewing authority or tribunal that it is entitled to greater share in the waters of river Krishna on account of such augmentation nor shall any State be debarred from disputing such claim. *  
(Ref: P 70 Vol.I and page 23 Vol.II, of TR)

(v) **Diversion of Krishna waters by one State to another State:-**

The Tribunal has passed the following order:-

* Diversion of the waters of river Krishna by one State for the benefit of another State shall be treated as diversion by the State for whose benefit the diversion is made. *  
(Ref: P 228 Vol.II of TR)

(vi) **Ground Water Use:-**

Following is the order passed by the Tribunal:-

* The Tribunal hereby declares that the States of Maharashtra, Karnataka and Andhra Pradesh will be free to make use of underground water within their respective State territories in the Krishna river basin.
Use of underground water by any State shall not be reckoned as use of the water of river Krishna. “

(Ref: P 226 Vol.II of TR)

(vii) **Determination of dependable flow:-**

The Tribunal has determined the 75% dependable flow of the river Krishna upto Vijayawada as 2060 TMC.

(Ref: P 81 Vol.I of TR)

(viii) **Protection of existing uses:-**

The finding of the Tribunal is as under:

"Priority of existing uses on Krishna River System:- We are satisfied that prima-facie the reasonable requirements of all projects in operation or under construction as on September 1960 should be preferred to contemplated uses and should be protected. Any utilisation made after September 1960 by such projects in excess of the utilisation envisaged in September 1960 should be regarded as a new appropriation made after September 1960. Prima-facie except by special agreement or concession of the parties a project committed after September 1960 is not entitled to any priority over contemplated uses. “

(Ref: P 100 Vol.I of TR)

The total utilisation preferred to contemplated uses (i.e. protected uses) by all the three States is determined by the Tribunal as follows:

<table>
<thead>
<tr>
<th>State</th>
<th>Utilisation including evaporation losses in TMC.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maharashtra</td>
<td>439.65</td>
</tr>
<tr>
<td>Karnataka</td>
<td>504.55*</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>749.16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1693.36</strong></td>
</tr>
</tbody>
</table>

(Ref: P 121 to 123 Vol.I of TR)

(*) includes 103 TMC for UKP

(ix) **Depletion of waters of the river and evaporation losses:-**

The Tribunal has passed the following orders:

"Except as provided hereunder a use shall be measured by the extent of depletion of the waters of river Krishna in any manner whatsoever including losses of water by evaporation and other natural causes from man-made reservoirs and other works without deducting in the case of use for irrigation the quantity of water that may return after such use to the river.

The water stored in any reservoir across any stream of the Krishna River System shall not of itself be reckoned as depletion of the water of the stream except to the extent of the losses of water from evaporation and other natural causes from such reservoir. The water diverted from such reservoir by any State for its own use in any water year shall be reckoned as use by that State in that water year. “

(Ref: P 228 Vol.II of TR)

(x) **Proposals for division of waters of river Krishna among the three party-States:-**

(a) Various schemes came up for examination during deliberations of the Tribunal. After carefully studying all the proposals, the three States submitted to the Tribunal on 4th May 1973, as follows:
1. There will be mass allocation of utilisable dependable flow at 75 per cent.

2. There will be allocation on percentage basis of water in surplus as well as deficit years of flow.

3. There will be restrictions with regard to use, the nature of which restrictions will be decided by the Tribunal.

4. There should be a joint control body to give effect to the decision of the Tribunal. The joint control body shall consist of one person with the rank of a Chief Engineer from each State, and two independent Engineers of equivalent rank and qualification to be appointed by the President of India. Such independent person shall have no connection, direct or indirect, with any of the three States. The cost of the said controlling body and of the establishment and equipment for implementing the Tribunal’s decision shall be borne and paid equally by the three States.

NOTE 1. According to Maharashtra and Mysore 100 per cent of the 75 per cent dependable flow is utilisable. According to Andhra Pradesh some quantity as determined by the Tribunal must be deducted from the dependable flow towards the inevitable waste.

2. There is difference of opinion between the States regarding the percentages, in surplus as well as deficit flows, which difference will have to be adjudicated upon by the Tribunal. Such difference includes the contention of the State of Maharashtra that there are certain tributaries within the territory of a State where the upper States or State are not in a position to provide any relief arising from deficits in the tributaries, a contention which the States of Mysore and Andhra Pradesh dispute, for the said States contend that the overall deficit taking the entire river basin as a unit should be shared on an equitable basis by all the three States.

(b) After thorough discussion, each State Government prepared separate drafts of the Scheme for division of Krishna waters between the three States. Each draft was in two parts viz. Part-I & Part-II. Part-I related to actual sharing of available Krishna waters between the States in accordance with the decision of the Tribunal and Part-II related to the constitution and powers of an authority which was called in the draft “The Krishna Valley Authority” and which was to supervise that the water was shared by the States in accordance with the order of the Tribunal. Though the parties differed in Part-I on material points, a common draft of Part-II was prepared and signed by the representatives of all the three party-States on 26.07.1973 which is enclosed as Annexure-2. It was clearly mentioned in the common draft that it was a tentative draft subject to approval of the State Governments.

(c) Subsequently, on 17.08.1973 Maharashtra stated before the Tribunal that it was agreeable to set up the Krishna Valley Authority having the constitution and power as mentioned in Part-II. Mysore State also agreed for the formation of Krishna Valley Authority as mentioned in Part-II subject to certain modifications. But Andhra Pradesh expressed its inability to give consent not only to set up the Krishna Valley Authority having the constitution and powers as mentioned in Part-II but also to the modifications suggested by the Mysore State.
Schemes devised by the Tribunal:

(a) Eventually, the Tribunal devised two schemes for determining the sharing of Krishna waters among the three riparian States. These schemes were called Scheme-A and Scheme-B. The decision of the Tribunal in this matter is as under:

"After deeply pondering over the matter, we have come to the conclusion that it would be better if we devise two schemes for the division of the waters of river Krishna between the States of Maharashtra, Mysore and Andhra Pradesh. These Schemes will be called Schemes A & B. Scheme-A will come into operation on the date of the publication of the decision of this Tribunal in the official Gazette under Section-6 of the Inter-State Water Disputes Act, 1956. Scheme-B may be brought into operation in case the States of Maharashtra, Mysore and Andhra Pradesh constitute an Inter-State Administrative Authority which may be called the Krishna Valley Authority by agreement between them, or in case such an authority is constituted by Legislation made by Parliament. Scheme-A does not at all depend upon the agreement of the parties and comes into operation by virtue of the order of the Tribunal. It is altogether independent of Scheme-B."

(Ref: P 166 Vol.II of TR)

(b) Under Scheme-A, the Tribunal has divided the 75% dependable flow of 2060 TMC among the States of Maharashtra, Mysore and Andhra Pradesh. Under Scheme-B, the Tribunal has declared that in every water year the parties shall be entitled to use the waters of river Krishna in certain proportion, if the total use made by all the three States in that water year is upto the dependable flow and, if the total use made by the States in a water year is more than the dependable flow, it is to be shared by the three States in certain different proportions. This Scheme has taken note of the fact that in every water year, surplus or deficiency, as the case may be, is to be shared by the three States.

(Ref: P 167 Vol.II of TR)

Allocations under Scheme-A:

(a) As per the final order of the Tribunal, following are the allocations made under Scheme-A for the 75% dependable yield of 2060 TMC, among the three States:

<table>
<thead>
<tr>
<th>State</th>
<th>Allocation for</th>
<th>Allocation for New/contemplated Projects</th>
<th>Total allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maharashtra</td>
<td>565 TMC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Karnataka</td>
<td>695 TMC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>800 TMC</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2060 TMC</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Ref: P 182 and P.226-227 Vol.II of TR)

(b) This includes 1693.36 TMC for protected uses as determined by the Tribunal separately. In effect, the allocations for “protected uses” and “new / contemplated” projects, will be as under:

(Figures are in TMC)

<table>
<thead>
<tr>
<th>State</th>
<th>Allocation for protected uses</th>
<th>Allocation for New/contemplated Projects</th>
<th>Total allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maharashtra</td>
<td>439.65</td>
<td>125.35</td>
<td>565</td>
</tr>
<tr>
<td>Karnataka</td>
<td>504.55*</td>
<td>190.45*</td>
<td>695*</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>749.16</td>
<td>50.84</td>
<td>800</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>1693.36</strong></td>
<td><strong>366.64</strong></td>
<td><strong>2060</strong></td>
</tr>
</tbody>
</table>

(Ref: P 182 Vol.II of TR)

* includes 103 for UKP.
* includes 52 for UKP.
* includes 155 for UKP.

(c) In addition, the mode of determination of the quantity of water from return flows and the allocation of such waters to each concerned State, is also spelt out by the Tribunal in its said final order. The additional quantity so allocated is determined as 7.5% of the excess of the average annual utilisations.

(xiii) **Liberty to Andhra Pradesh for using the remaining waters of river Krishna without acquiring any right:**

While making the aforesaid allocations, the Tribunal in its final order has stated that the State of Andhra Pradesh will be at liberty to use in any water year the remaining water that may be flowing in the river Krishna but thereby it shall not acquire any right whatsoever to use in any water year nor be deemed to have been allocated in any water year water of the river Krishna in excess of the quantities specified thereunder.

(Ref: P 227 Vol.II of TR)

(xiv) **Power or authority of States to regulate the use of water within their boundaries:**

The Tribunal in its final order has stated as follows:

"Nothing in the order of this Tribunal shall impair the right or power or authority of any State to regulate within its boundaries the use of water, or to enjoy the benefit of waters within that State in a manner not inconsistent with the order of this Tribunal.”

(Ref: P 230 Vol.II of TR)

(xv) **Use of Krishna waters by any person and meaning of “Water Year”:**

It is stipulated in the final order of the Tribunal that the use of water of river Krishna by any person or entity of any nature whatsoever within the territories of a State shall be reckoned as use by that State and that the expression “Water Year” shall mean the year commencing on 1st June and ending on 31st May.

(Ref: P 230 Vol.II of TR)

(xvi) **Limitations and restrictions:**

The Tribunal has put certain limitations for use of Krishna water by Karnataka in Tungabhadra sub-basin (K-8), Vedavathi sub-basin (K-9) and the main stream of river Bhima. Restrictions for taking up new constructions in several streams in Karnataka have also been imposed in the final order of the Tribunal.

(xvii) **Review of the Tribunal Order:**

It has been indicated in the final order of the Tribunal that, at any time after 31st May 2000 this order may be reviewed or revised by a competent authority or Tribunal, but such review or revision shall not as far as possible disturb any utilisation that may have been undertaken by any State within the limits of the allocation made to it under the said order.

(Ref: P 230 Vol.II of TR)

(xviii) **Exchange of Data:**

As per orders of the Tribunal, each State should send annually to the other States a summary abstract of all relevant records and data pertaining to uses of water for irrigation / domestic & municipal / industrial, areas irrigated, duties adopted, evaporation losses, etc and that the said records should be open for inspection by the States.

(Ref: P 229 & 230 Vol.II of TR)
While discussing the matter of division of the waters of river Krishna between the parties under Scheme-B, the Tribunal has made the following observations:

"We have already laid stress on the point that for such a Scheme to be workable, an Inter-State Administrative Authority, which may be called the Krishna Valley Authority, should be established by agreement between the parties and failing such agreement between the parties by any law made by Parliament under Entry 56, List-I of the 7th Schedule of the Constitution. For the fuller utilisation of the waters of river Krishna we are of the opinion that such an Authority should be established to supervise and regulate, if necessary, that the water available for utilisation in the river Krishna in each year be shared by the three States. For reasons which we have already mentioned we are not setting up such an Authority under our order. But if such an Authority is set up either by agreement between the parties or under the law made by Parliament, we consider it proper to place on record our views as to how in that case the waters of river Krishna should be divided between the States of Maharashtra, Mysore and Andhra Pradesh. Ultimately, it is for the parties or for the law made by Parliament to draw up a final Scheme and our views are subject to modification in both the cases."

(Ref: P 183 Vol.II of TR)

The Tribunal in its report has also discussed as to how the waters of river Krishna under Scheme-B should be divided among the three States. The duties and the responsibilities of the suggested Krishna Valley Authority and its composition have also been indicated in the report.

The Tribunal has summed up its views on the allocation of Krishna waters as under:

1. An inter-State administrative authority to be called the Krishna Valley Authority may be established by agreement between the parties and failing such agreement between them, such authority may be established by any law made by Parliament.

2. Upon the establishment of the Krishna Valley Authority, the waters of the river Krishna shall be divided between the States of Maharashtra, Mysore and Andhra Pradesh as mentioned hereinafter.

(A) In case the total quantity of water used by all the three States in any water year is not more than 2060 TMC, the States of Maharashtra, Mysore and Andhra Pradesh shall share the water in that year in the following proportions:

| State of Maharashtra | 565 TMC |
| State of Mysore      | 695 TMC |
| State of Andhra Pradesh | 800 TMC |

(B) If the total quantity of water used by all the three States in a water year is more than 2060 TMC, the States of Maharashtra, Mysore and Andhra Pradesh shall share the water in that water year as mentioned below:

Upto 2060 TMC as stated in paragraph 2(A) and remaining water above 2060 TMC equally by all the three States.

(Ref: P 183 & 184 Vol.II of TR)

Admitting the fact that the construction of carry-over reservoirs is one of the essential elements in Scheme-B, the Tribunal has mentioned that the determination as to how much extra water should be impounded by each State in its territory and at which place is mainly a technical job and therefore it is not prudent for the Tribunal to express any opinion on these two aspects. This matter has been left to the Krishna Valley Authority.

(Ref: P 186 Vol.II of TR)
In the end, the Tribunal has left the question of enforcement of such a scheme to the good sense of the parties or to the wisdom of Parliament.  

(Ref: P 187 Vol.II of TR)

12.0 **Clarifications sought by the party-States and Government of India on the decisions of the Tribunal:**

12.01 The three party-States as well as GOI made references to the Tribunal under Section–5(3) of the ISWD Act, 1956 seeking clarifications on several findings and decisions of the Tribunal.  

(Ref: P (i) of TFR)

12.02 Following were the Advocates and other Representatives who represented the State of Karnataka before the Tribunal:-

**Advocates:**
2. Shri.Sachindra Choudhuri, Senior Advocate (From 10.03.1975)
3. Shri.M.P.Chandrakanth Raj Urs, Govt. Advocate (From 20.01.1975)
4. Shri.S.S.Javali, Advocate

**Other Representatives:**
1. Shri.S.G.Balekundy, Chief Engineer (Upto 09.03.1975)
2. Shri.S.P.Bhat, Chief Engineer (From 10.03.1975)
3. Shri.B.Subramanyam, Superintending Engineer
4. Shri.G.M.Shivashankar, Executive Engineer

(Ref: P (ii) of TFR)

12.03 The vacancy in the office of a Member of the Tribunal was filled by fresh appointment made by GOI on 16.09.1975 (Sri.D.M.Sen in place of Sri Shamsher Bahadur)

(Ref: P (i) of TFR)

13.0 **Further report dated 27th May 1976 of the Tribunal, its findings and Final Orders:**

13.01 The Tribunal, after detailed examination of the References made by the three party-States & the GOI and hearing of arguments, through its letter dated 27th May 1976 addressed to the Ministry of Agriculture & Irrigation (Department of Irrigation), forwarded its unanimous Further Report (copy of its Final Order enclosed as Annexure-3).
Following is the gist of findings and orders of the Tribunal on several issues and matters deliberated by it:-

(i) **Use of water for power generation:**

GOI sought clarification as to whether the use of water for power generation within Krishna basin is permitted even though such use may exceed the limits of consumptive use specified by the Tribunal for each State. The Tribunal clarified that, as already mentioned in its earlier Report, where the tail-race water after generation of electricity is returned to the river, the hydro-electric use is non-consumptive, except for losses in the water conductor system and storages.

(Ref: P 7 of TFR)

(ii) **Allowance for return flow in the allocation for Tungabhadra Sub-Basin:**

While limiting the allocation to 295 TMC for the Tungabhadra Sub-basin (K-8), the Tribunal in its earlier order had not made any allowance for the return flows. After considering the clarifications sought for by the GOI, Karnataka and AP on all the
connected issues, the Tribunal has deleted the Clause-IX(B) from its earlier order and substituted the same with a more exhaustive clause making provision therein for an additional allocation to the extent of 7.5% of the excess annual utilisations towards return flows over and above the already allocated 295 TMC for the Tungabhadra Sub-basin (K-8). The method of determining the return flows has been clearly elucidated in the final order.

(Ref: P 58-59 and P 96-97 of TFR)

(iii) Allowance for return flows in the allocations for Maharashtra, Karnataka and Andhra Pradesh:

While limiting the allocation of quantities of Krishna waters to the States of Maharashtra, Karnataka and AP to 565 TMC, 695 TMC and 800 TMC respectively in its earlier orders, the Tribunal had made provision for an additional allocation to each State towards return flows at 7.5% of the excess of average annual utilisations. After considering the clarification sought for by Karnataka in the matter of allocating 75% dependable flow, if any, in excess of 2060 TMC, the Tribunal in its final order has increased the percentage of allowance for return flows from 7.5% to 10% for all the three party-States. The Tribunal in its Report has estimated the available return flows as near about:

- 25 TMC for Maharashtra,
- 34 TMC for Karnataka
- 11 TMC for AP.

Total: 70 TMC

(Ref: P 20 & 21 of TFR)

(iv) Inadverent excess allocation made to Maharashtra:

Karnataka in its reference to the Tribunal pointed out that there were several duplicate or triplicate allocations made to Maharashtra by the Tribunal in its earlier Report under the items of Bhandaras, Weirs, Lift Irrigation Schemes and Minor Irrigation works. After detailed examination of the reference and careful analysis of its earlier findings, the Tribunal admitted that there was excessive allocation amounting to 5.42 TMC made by inadvertence to Maharashtra under the said items. Eventually, the Tribunal reduced the allocation for Maharashtra from 565 TMC to 560 TMC and increased the allocation for Karnataka from 695 TMC to 700 TMC.

(Ref: P 36 to 39 and P 43 of TFR)

The final allocations made by the Tribunal under Scheme-A (at 75 % dependability) of the Award are as under:

<table>
<thead>
<tr>
<th>State</th>
<th>Allotted TMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maharashtra</td>
<td>560 TMC</td>
</tr>
<tr>
<td>Karnataka</td>
<td>700 TMC</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>800 TMC</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2060 TMC</strong></td>
</tr>
</tbody>
</table>

(v) Limitation for utilisations under the various canals of Tungabhadra Project:

While restricting the utilisation to 295 TMC under the Tungabhadra Sub-basin (K-8) in its earlier orders, the Tribunal had not imposed any restrictions for use by the various canals of Tungabhadra dam. After examining the clarifications sought for by Karnataka, AP and GOI in their references, the Tribunal introduced a new Sub-clause (E) under Clause-IX of its final order prescribing the limits for utilisations under the various canals of TB dam. The mode of sharing the evaporation losses and deficiencies has also been clearly mentioned in the final order of the Tribunal. It is also clearly stated therein that, if more quantity of water is available than the quantity required for the
canals under TB dam, the TB Board shall keep this additional water in reserve and the State of Karnataka shall have the right to use such excess water under its canals of TB dam, but in no case the utilisation in the Tungabhadra Sub-basin (K-8) shall exceed 320 TMC.

(Ref: P 68-69 and P 97-98 of TFR)

(vi) Right of Andhra Pradesh in the additional 75% dependable flow on account of the return flows:

The statement of the Advocate General of Maharashtra and the remarks of the Tribunal thereon, as recorded in its Further Report, are reproduced below:-

"... ... In this connection, reference may be made to the following statement of the Advocate General of Maharashtra recorded in the order dated 19th August 1974:-

' In connection with the Clarification No.V(iii) and (iv) sought by the State of Karnataka in its reference to this Tribunal, the Advocate General of Maharashtra states that the right, if any, which may be acquired by the State of Andhra Pradesh in the additional 75% dependable flow on account of the return flows until the Tribunal’s order is reviewed by a competent authority at any time after May 31, 2000 arising from the use of water in excess of 800 TMC allotted to the State of Andhra Pradesh by the Tribunal, will be unsubstantial in view of the following considerations:-

(1) The cost of constructing projects utilising 3 TMC and more of water;
(2) The time likely to be taken in constructing such projects and the development of irrigation;
(3) That the right to return flows is restricted to the use of water for irrigation in excess of 170 TMC of water used by Andhra Pradesh for the water year commencing from June 1, 1968 and ending on May 31, 1969; and
(4) That the right to return flows is restricted to return flows from the use of the water for irrigation inside the basin.'

We are in substantial agreement with this statement."

(Ref: P 33 of TFR)

(vii) Sharing of shortages:

On a reference made by GOI, seeking clarifications on sharing of deficiency in flows during lean years, the Tribunal has clarified as follows:-

" The question of sharing of shortages has been dealt with in the original report submitted under Section-5(2) of the ISWD Act, 1956 and elsewhere in the Report. Scheme-B which provides for sharing of both surplus and deficiency in the entire Krishna river basin could not be implemented for reasons given in the Report and on account of the opposition by Andhra Pradesh. In the Scheme of allocation embodied in the final order, Andhra Pradesh will be at liberty to use the excess flow in surplus years and at the same time will have to bear the burden of the deficiency in lean years save as indicated in this Report. We see no ground for further clarification in the matter of sharing the deficiency."

(Ref: P 12 of TFR)

(viii) allocations are enbloc, not project-wise:

The contentions of various parties about the allocation of Krishna waters made to the party-States in the orders of the Tribunal, as recorded in the Further Report of the Tribunal, are as under:-
The Government of India has submitted as follows:

In Scheme-A, which has been ordered for implementation, the Tribunal have made **en-bloc** allocations of water for consumptive use in a 75% dependable year to various States. …

(Ref: P 11 of TFR)

On the 5th March 1976, the Learned Advocate General of the State of Andhra Pradesh made the following statement:

In view of the contention of the State of Andhra Pradesh concerning the scope of Section-5(3) of the ISWD Act, 1956 and that the allocations are **en-bloc**, the State of Andhra Pradesh is not pressing clarification No.4 of Andhra Pradesh Reference No.II/1974.

(Ref: P 16 of TFR)

Mr. T.R. Andhyarujina, Counsel for the State of Maharashtra addressed a general argument with regard to all the matters under Clarification No.IX. He argued that the mass allocations of water to Maharashtra, Karnataka and Andhra Pradesh respectively cannot be vitiated by errors in assessment of their needs as the Tribunal intended to award **en-bloc** 565 TMC, 695 TMC and 800 TMC to them respectively independently of such assessment. We are unable to accept this argument. Pages 582, 595-597 of our Report Volume-II clearly show that the figures of 565, 695 and 800 were arrived at after totaling the demands of the three States held by us as worth consideration at pages 570-582 and 619-770 of our Report Volume-II. As stated in our Report Volume-I pages 321-322 and Volume-II page 599, the allocations of water to the three States were not tied to any specific project or projects, but if it is found that in assessing their needs we have by inadvertence allowed any demand more than once, we are bound to correct the mistake and give consequential reliefs. We must, therefore, examine the merits of Clarification No.IX.

(Ref: P 39 of TFR)

Discussions on Scheme-B:

(a) In regards to the reference made by Karnataka requesting the Tribunal to clarify its decision having regard to the terms of reference and to direct the implementation of Scheme-B irrespective of the consent of parties, subject to clarifications sought for elsewhere, the Tribunal has clarified its position as under:

In our original Report we have discussed Scheme-B and have pointed out that Scheme-B provides for the fuller utilisation of the waters of the river Krishna and for the sharing of the surplus and the deficiency in every water year by all the three States. For the successful implementation of Scheme-B, it is essential that the Krishna Valley Authority should be established and should function harmoniously. On the 26th July, 1973, counsel for the States prepared, subject to approval of the State Governments, a common draft of Part-II of Scheme-B laying down the manner in which the Krishna Valley Authority would be constituted and the powers of the said Authority, see Report Volume-III, pages 99-110 Appendix-R. It was considered that agreement between the parties on Part-II of Scheme-B as drafted by them giving the constitution and powers of Krishna Valley Authority was necessary and essential for the implementation of Scheme-B. However, one of the States did not agree to Part-II of the Scheme, see Report Volume-II pages 521-522. We have pointed out that it is unwise and impractical to impose an administrative authority by a judicial decree without the unanimous consent and approval of the parties, see Report Volume-II page 539. Even today, the State of Andhra Pradesh is opposed to the implementation of Scheme-B and to the constitution of Krishna Valley Authority. Consequently, the Krishna Valley Authority which includes a nominee of Andhra Pradesh as envisaged by the common draft of Part-II of Scheme-B cannot be constituted. Unless the Krishna Valley Authority is constituted, Scheme-B cannot be implemented.

The best method of creating an administrative authority for regulating the distribution of the waters of an inter-State river and river valley including the waters available for use from inter-State projects is by agreement between the interested States or by a law made by Parliament. … … …

(Ref: P 21 & 22 of TFR)
The administrative authority envisaged by Scheme-B should have jurisdiction over the water resources of the entire Krishna river and river valley. At present, the Tungabhadra Board constituted by the President under Section-66 of the Andhra State Act, 1953 exercises jurisdiction over the water resources concerning the Tungabhadra Project mentioned above. This Tribunal has no power to abolish the Tungabhadra Board.

In these circumstances, we do not think it proper that Scheme-B should be implemented by our Order. 

(Ref: P 23 of TFR)

(b) As regards another clarification sought for by Karnataka requesting the Tribunal to provide for equitable allocation of surplus waters under Scheme-B instead of providing for equal distribution (the Tribunal in its earlier order had provided for equal sharing of surplus waters over and above the 75% dependable flow of 2060 TMC), the Tribunal, after hearing full arguments on the issue, has allocated the Krishna waters in its Further Report as under:

1. If the total quantity of water available is up to 2060 TMC, it shall be shared in the proportion of 560 TMC for Maharashtra, 700 TMC for Karnataka and 800 TMC for Andhra Pradesh.

2. If the total quantity of water available is up to 2130 TMC, the excess over 2060 TMC shall be shared in the proportion of 35% by Maharashtra, 50% by Karnataka and 15% by Andhra Pradesh.

3. If the total quantity of water available is over 2130 TMC, the excess over 2060 TMC shall be shared in the proportion stated at (2) above and excess over 2130 TMC shall be shared in the proportion of 25% by Maharashtra, 50% by Karnataka and 25% by Andhra Pradesh.

4. Under Scheme-B all the States would share the surplus as well as the deficiency.

(Ref: P 25 & 27 of TFR)

(c) The Tribunal in its Further Report, while recording the statement of Dr.Seyid Muhammad, counsel for GOI has stated as follows:

"On the 8th May 1975, Dr.Seyid Muhammad, counsel for the GOI, made the following statement before this Tribunal:

' The GOI have examined both Schemes-B and A. They feel that Scheme–B is better and easier to implement than Scheme-A. If Scheme-B comes as part of the final order of this Hon'ble Tribunal, the GOI will take necessary steps for putting it into operation. Scheme-B may be put as part of the final order in the manner as the Hon'ble Tribunal feels fit. We would like to have a complete scheme formulated by this Hon'ble Tribunal. '

As mentioned in our Report, Scheme-B provides for a fuller and better utilisation of the waters of the river Krishna. But we cannot make Scheme-B part of our Final Order as requested by learned Counsel for the GOI, because the Final Order should contain only such provisions as may be implemented independently of any agreement or law made by Parliament. After hearing the parties, we have drawn up a complete Part-I of Scheme-B with all necessary modifications.

The complete Scheme-B drawn up by us is given below:

XXX XXX XXX "

(Ref: P 26 of TFR)

The complete Scheme-B so drawn up by the Tribunal is enclosed as Annexure-4.
Review of the Order:-

The Tribunal in its final order has stated that its Order may be reviewed or revised at any time after May 31, 2000 by a competent authority or Tribunal and that such review or revision shall not as far as possible disturb any utilisation that may have been undertaken by any State within the limits of the allocation made to it under the said Order.

Publishing of the decision of the Tribunal in the Union Gazette:-

The Union Government, under Section-6 of the ISWD Act, 1956 published “The decision of the Tribunal as modified by the explanations and guidance given in its Further Report”, in its Gazette on 31st May 1976.

Further disputes, efforts made to settle them and litigations*:-

After the Tribunal’s Further Report dated 27.05.1976 containing its final order was notified by the Union Government in its Gazette dated 31.05.1976, efforts were made by Karnataka to resolve the disputes relating to sharing of surplus waters under Scheme-B, which proved to be futile. Right from 1978 onwards, Andhra Pradesh was taking strong objections to the proposal of Karnataka for construction of Alamatti dam to an elevation of 524.256 m.

The Chief Ministers of riparian States met at Tirupathi, Mysore and Mahabaleshwar in 1990s to resolve the dispute pertaining to execution of works on new projects viz. Telugu-Ganga, SRBC, SLBC, Bhima Lift Irrigation and Pulichintala Diversion Scheme in Andhra Pradesh, to permanently appropriate the available surplus waters. These meetings were preceded by a number of meetings at official level. However, no solution emerged therefrom.

The GOI initiated discussions in mid-1990s to resolve the disputes, when Karnataka proposed raising the height of Alamatti dam to FRL 524.256 m. as originally planned in 1969. However, the talks did not yield any result.

Karnataka, by its letter dated 17.08.1996, called upon Maharashtra and Andhra Pradesh to give consent for enforcement of Scheme-B formulated by KWDT allocating surplus waters amongst the riparian States. Andhra Pradesh declined to give its consent by letter dated 21.09.1996. Maharashtra, which had earlier supported the sharing of surplus water, changed its stand in its letter dated 05.10.1996.

The disputes, therefore, could not be resolved leading to suits filed before the Supreme Court.

Karnataka filed O.S.No.1 of 1997 before the Supreme Court seeking not only enforcement of Scheme-B formulated by the Tribunal but also a permanent order and injunction restraining Andhra Pradesh from continuing to execute Telugu-Ganga Project, SRBC, SLBC, Bhima Lift Irrigation and Pulichintala Project till the said Scheme-B is put into operation and implemented. Andhra Pradesh filed O.S.No.2 of 1997 before the Supreme Court seeking not only permanent injunction restraining Karnataka from any further construction of Alamatti dam but also to declare that the party-States are entitled to utilise not more than the quantity of water allocated or permitted to individual projects by the decisions of the Tribunal. The main objection of Andhra Pradesh was for the construction of Alamatti dam to its final height (FRL) of 524.256 m as contemplated by Karnataka.

(*) Source:- Complaint letter No.WRD/28/KDM/2001 (P 3) dt.25.09.2002 of Government of Karnataka addressed to GOI.
14.07 The Supreme Court after hearing the three party-States viz. Maharashtra, Karnataka and Andhra Pradesh, passed orders on 25.04.2000 on all the contentious issues raised by the States. The gist of the orders of the Supreme Court on more important contentious issues, is as follows:-

(i) The Scheme-B framed by the KWDT is not the decision of the Tribunal and as such was not required to be notified under Section-6 and consequently cannot be enforced.

(ii) As regards the liberty granted by the Tribunal to Andhra Pradesh to use surplus waters without acquiring any right, it is for GOI to exercise discretion while granting any scheme or project of Andhra Pradesh and bearing in mind, what is really meant by the liberty granted, so that AP should not be allowed to proceed ahead with large scale water projects for utilisation of surplus waters in excess of the allocated quantity over which it has no right. The GOI should so exercise its discretion that there should not be any apprehension in the minds of the upper States that their right of sharing the surplus waters would be endangered in any manner.

(iii) The allocation of water made by the Tribunal was en-bloc and not project-wise excepting those specified projects mentioned in Clauses-IX and X of its decision.

(iv) There is no bar for raising the height of Alamatti dam upto 519.6 m subject to getting clearance from the appropriate authority of GOI. The question of raising the height of the dam upto 524.256 m could be appropriately gone into by a Tribunal to be appointed by GOI, on being approached by any of the three riparian States and such Tribunal could also go into the question of reallocation of Krishna waters.

15.0 **Dispute regarding the height of Alamatti dam:-**

This issue is explained in greater detail in a separate chapter (vide chapter on “Dispute regarding height of Alamatti Dam”).

16.0 **Complaint lodged with GOI by Karnataka requesting for constitution of another Tribunal:-**

16.01 As the disputes could not be settled by negotiations and in view of the above said Supreme Court’s Order dated 25.04.2000, Karnataka through its letter No. WRD/28/KDM/2001(P-3) dated 25.09.2002 (vide Annexure-5) addressed to the Secretary to GOI, Ministry of Water Resources, New Delhi, has lodged complaint under Section-3 of ISWD Act, 1956 read with ISWD Rules 1959 requesting the GOI:-

(i) By notification in the Official Gazette to constitute a Water Dispute Tribunal under Section-4(1) of the ISWD Act, 1956; and

(ii) To refer to the Tribunal so constituted for adjudication and decision, the water disputes and matters connected with or relevant to the water disputes (as well interim measures) emerging from the said letter of complaint dated 25.09.2002 of Karnataka.

16.02 The above said letter of complaint of Karnataka has emerged due to the following actions of Andhra Pradesh and Maharashtra:-

(i) The executive action of Andhra Pradesh in utilising (even before allocation) the surplus waters by way of permanent construction of large scale projects and water reservoirs and refusing to share the surplus waters i.e. waters in excess of 2130 TMC (2060 TMC + 70 TMC return flow) at 75% dependability.

(ii) The executive actions of the respective States of Andhra Pradesh and Maharashtra in refusing to agree to the raising of height of Alamatti dam from FRL 519.6 m to 524.256 m as proposed and planned by Karnataka.

(iii) The executive actions of Maharashtra in creating in the Krishna basin a total live storage capacity of 560 TMC having a potential to use the surplus waters way beyond its share and refusing to share the surplus waters i.e., water in excess of 2130 TMC (2060 TMC + 70 TMC return flow) at 75% dependability, and
The executive actions of Maharashtra in failing to maintain adequate summer flows in the Bhima river in Krishna valley at the inter-State border during the months of November to May in every water year; and the consequent failure of Maharashtra to exercise its powers with respect to the use, distribution and control of the waters of Krishna river.

16.03 The three riparian States of Maharashtra, Karnataka and Andhra Pradesh have been named, in the complaint letter of Karnataka, as the parties to the water disputes.

16.04 Following are the specific water disputes raised by Karnataka in its complaint letter for adjudication and consequent decision of the Tribunal:

(i) Whether the surplus water i.e., water above 2130 TMC (i.e., 2060 + 70 TMC of return flow at 75% dependability) is not less than 517 TMC in the inter-State Krishna river and its valley?

(ii) Whether the shares in the surplus water should be allocated as under:

<table>
<thead>
<tr>
<th>State</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of Maharashtra</td>
<td>25%</td>
</tr>
<tr>
<td>State of Karnataka</td>
<td>50%</td>
</tr>
<tr>
<td>State of Andhra Pradesh</td>
<td>25%</td>
</tr>
</tbody>
</table>

(iii) Whether the complainant State of Karnataka is entitled to raise the height of Alamatti dam from FRL 519.6 m to FRL 524.256 m to enable it to utilise a part of its allocated share in the surplus waters?

(iv) Whether the State of Maharashtra, by creating a total live storage of 560 TMC in Krishna basin, has created a potential to utilise surplus waters beyond its share?

(v) Whether the State of Maharashtra is bound to maintain adequate summer flows in the Bhima river at the inter-State border during the months of November-May? If so, to what extent?

(vi) Whether the State of Andhra Pradesh is not entitled to use surplus waters by way of permanent construction of large scale projects and water reservoirs: in particular Telugu-Ganga Project and Srisailam Left Bank Canal Project?

16.05 The following matters connected with or relevant to the water disputes, have also been raised in the complaint letter of Karnataka, for adjudication and consequent decision of the Tribunal:

(i) Whether any mechanism is necessary and / or appropriate to monitor the shares of the respective States in the surplus waters?

(ii) If necessary, what should be the constitution, function and procedure of such body?

(iii) Since Andhra Pradesh has appropriated and is continuing to appropriate the surplus waters, by way of permanent construction of large scale projects and water reservoirs – in particular by the Telugu-Ganga and Srisailam Left Bank Canal Projects, which is prejudicial to the interests of Karnataka and its inhabitants, provisional and interim measures are necessary to protect the interests of Karnataka and its inhabitants.

(iv) Since Maharashtra has appropriated or is likely to appropriate the surplus waters by creating an aggregate live storage capacity of 560 TMC in the Krishna basin prejudicial to the interests of Karnataka and its inhabitants, particularly the drinking water supplies on the banks of river Bhima, provisional and interim measures are necessary to protect the interests of Karnataka and its inhabitants.

16.06 As of now, GOI is yet to constitute the Tribunal.

***
CHAPTER-2*

PROJECT HISTORY, PROPOSALS AND REVISIONS

1.0 **Introduction:**

1.01 **Geographical features of the State:**

Karnataka state is located in the western part of Peninsular India and extends between Lat. 11° 35' N & 18° 26' N and Long. between 74° 5' E & 78° 35' E. The State has common borders with Maharashtra, Andhra Pradesh, Tamil Nadu, Kerala and Goa. It has a coast line with the Arabian sea on the west extending to a length of about 300 Km from North of Karwar to South of Mangalore. With a geographical area of 1,97,204 Sq. Km, it is the eighth in India in respect of area, accounting for 5.85% of the total area of the country. Situated in the Tropical region, the State has diversified soils, climatic conditions, crops and cropping pattern.

1.02 **Water Resources of the State:**

(1) There are seven major river systems in the State that contribute to the water resources. They are:-

<table>
<thead>
<tr>
<th>SI No</th>
<th>River System</th>
<th>Drainage area (Karnataka) (1000 Sq. Km)</th>
<th>Percentage</th>
<th>Estimated average annual yield M Cum. TMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Krishna</td>
<td>113.01</td>
<td>58.93</td>
<td>27451</td>
</tr>
<tr>
<td>2</td>
<td>Cauvery</td>
<td>36.13</td>
<td>18.84</td>
<td>10980</td>
</tr>
<tr>
<td>3</td>
<td>Godavari</td>
<td>4.43</td>
<td>2.31</td>
<td>1415</td>
</tr>
<tr>
<td>4</td>
<td>West flowing</td>
<td>24.53</td>
<td>12.79</td>
<td>56600</td>
</tr>
<tr>
<td>5</td>
<td>North Peninsular</td>
<td>6.94</td>
<td>3.62</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>South Peninsular</td>
<td>3.76</td>
<td>1.96</td>
<td>906</td>
</tr>
<tr>
<td>7</td>
<td>Palar</td>
<td>2.97</td>
<td>1.55</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>191.77</td>
<td>100.00</td>
<td>97352</td>
</tr>
</tbody>
</table>

(2) It can be seen that out of the average annual yield of 3440 TMC, a major quantum (2000 TMC) i.e., 58% of the total resource, accounts for yield from west flowing rivers. For various reasons like topography, forests, environment etc., the State has not been able to profitably utilize the yield from the west flowing rivers for providing irrigation facilities.

1.03 **Krishna Basin:**

(1) It can also be seen that Krishna basin contributes nearly 60% of the State's geographical area. Krishna river, the second biggest river in Peninsular India, takes birth in the Mahadev range of Western Ghats at El. 1338 m above sea level in Maharashtra. After flowing for 304 Km in Maharashtra, it enters Karnataka and passes through the State for 480 Km before entering Andhra Pradesh where it flows for a length of 608 Km after which it joins the Bay of Bengal near Bapatla. Thus, the total length of the river is 1392 Km. The river basin is 2.57 lakh Sq. Km comprising 68,800 Sq. Km (26.8%) in Maharashtra, 1,12,600 Sq. Km (43.8%) in Karnataka and 75,600 Sq. Km

(29.4%) in Andhra Pradesh. The main tributaries of river Krishna in Karnataka are Bhima from the North, Ghataprabha, Malaprabha, Tungabhadra and Vedavathy from the South.

(2) The river basin lies in arid zone and the region is sustained by South-West monsoon. Annual rainfall varies from 1575 mm to 341 mm. The river systems gradually raise in June, pickup in July and overflow in August & September, the flood lift reaching as high as 30 m, and again fall through October to January and by February would be almost dry.

1.04 Irrigation development in the States prior to Re-organisation:

In 1950, at the time when the Constitution of India came into being, the Krishna basin was spread in the States of Bombay (now Maharashtra), Mysore (now Karnataka), Hyderabad (now Andhra Pradesh) and Madras (now Tamil Nadu). Under the Andhra Act of 1953, Kannada speaking areas of Bellary district from Madras State were merged with the then Mysore State. Likewise, in 1956 under the States Re-organisation Act, the districts of Belgaum, Bijapur, Dharwad & North Canara from the State of Bombay and the districts of Gulbarga, Raichur & Bidar from the State of Hyderabad, were merged with the State of Mysore. The level of irrigation in these transferred areas was very low when compared to the irrigation development in Andhra Pradesh. The extent of irrigation in the 3 basin States as on 1951, prior to Re-organisation of the States, was as shown under:

<table>
<thead>
<tr>
<th>Year</th>
<th>Maharashtra</th>
<th>Karnataka</th>
<th>Andhra Pradesh</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>2,22,156</td>
<td>4,69,876</td>
<td>16,10,345</td>
</tr>
</tbody>
</table>

(These figures are as furnished in the Krishna-Godavari Commission Report of 1962)

1.05 Drought Prone areas in Krishna basin:

The Irrigation Commission Report of 1972 made it clear that, out of the total drought prone areas in the Country, the largest area lies in the State of Karnataka. The Commission identified 55 taluks lying in 8 districts in the Krishna basin of the State as drought prone areas. These 55 taluks included 4 taluks of Dharwad district, 10 taluks of Gulbarga district, 5 taluks of Raichur district, 8 taluks of Bellary district and 11 taluks of Bijapur district.

2.0 History of Upper Krishna Project before the formation of KWD Tribunal in April 1969:

2.01 The Upper Krishna Project was originally conceived by the earstwhile State of Hyderabad along with the Lower Krishna Project (now known as Nagarjuna Sagar Project). This Upper Krishna Project could not see the light of the day mainly because the submersion was mostly in Bijapur district which was, at that time, a part of the Bombay Presidency. After the re-organisation of States in November 1956, the Gulbarga and Raichur districts, which were to be benefited under this project, came to be situated in the Mysore State (now Karnataka). The Bijapur district, where submersion was involved, also came to Mysore State. Therefore, it was easier for the Mysore State to investigate and take up the Upper Krishna Project.
2.02 The old Hyderabad State had conceived the construction of one reservoir near Narayanpur for irrigation in Gulbarga and Raichur districts. Since the Bijapur district had also to be provided with irrigation facilities, the UKP was modified so as to provide for two storage reservoirs -- one at Alamatti and the other at Narayanpur. A Scheme for irrigating 12 lakh acres under Alamatti Left Bank Canal, Narayanpur Left Bank Canal and Narayanpur Right Bank Canal, was contemplated.

2.03 Project Report of 1963:-

(1) In order to derive maximum benefits as early as possible, an alternative of executing the project in stages was envisaged. In the 1st stage (then called as 1st phase) of the project, the construction of the reservoir at Narayanpur for irrigation to an extent of 6.00 lakh acres by utilising 103 TMC under NLBC was proposed and the project report was sent to Government of India in 1963. The estimated cost of this scheme was Rs. 58.20 crores.

(2) The Planning Commission of GOI cleared this proposal vide its letter No. 2(10) 63 I & P dated 28.11.1963 (vide copy enclosed as Annexure-1). The important features of this 1st Stage Project (called as Phase-I) as cleared by the Planning Commission are as under:-

(a) Estimated cost................................................. Rs. 58.20 crores
(b) Annual utilization................................................... 103 TMC
(c) Annual irrigation.................................................... 5,99,400 acres
(d) Construction of masonry dam with earthen flanks across river Krishna at Narayanpur with live storage of 44.79 TMC of water.
(e) Construction of Narayanpur Right and Left Bank Canal Schemes to benefit Raichur and Gulbarga districts.

(3) A provision of Rs.30 lakhs had been made in the above said estimate for the foundations of Alamatti Dam which was also accepted by the Planning Commission. The work relating to execution of the foundations of Alamatti and Narayanpur dams was taken up in 1963.

(4) In G.O. No. PWD 6 MUK 63 dated 06.05.1964, the Government accorded approval to an estimate amounting to Rs.5 crores for starting the preliminary works of these two dams.

(5) It is mentioned in the project report of 1963 (for Phase-I estimated to cost Rs.58.20 crores) that the UKP had been contemplated for execution in three Stages for an ultimate utilization of 340 TMC. No further details are available from this report.

(6) Provision was also made in the above project report, for power sluices in Narayanpur dam for generation of power at Jaladurga falls where a head of 120 feet was stated to be available.

2.04 Change in the site of Narayanpur Dam and related proposals:-

(1) The then Union Minister of Irrigation & Power inspected the Alamatti and Narayanpur dam sites in April 1964 and suggested to shift the site of Narayanpur dam about 3 to 4 miles upstream near Siddapur. This suggestion was accepted by the State Government vide G.O. No. PWD 11 MUK 63 dated 17.09.1964. It was also ordered in
the same G.O. that the Alamatti dam should be constructed with foundations and width for an ultimate FRL of 1705 feet height, the height being restricted, for the present, to store water at an interim level of RL 1685 feet. As regards the Siddapur dam, it was ordered that the dam should be constructed with full foundations and width, for the present, to store water at an interim level of RL 1607.5 feet.

(2) The project was reexamined, in the light of the changed location of Narayanapur dam as per instructions of the Union Minister, and the modified report was sent to CWPC, GOI, in Government letter No. PWD 11 MUK 63 dated 17.03.1965. According to this report, the features of the project were as under:-

**Under Phase-I:-**

(a) Construction of Alamatti dam to FRL of 1665 feet with a Left Bank Canal (part) to irrigate 3.20 lakh acres in Bijapur and Gulbarga districts, and  
(b) Construction of a dam at Siddapur to FRL of 1577.50 feet with Left Bank Canal to irrigate 2.80 lakh acres in Gulbarga district.

**Under Phase-II:-**

(a) Increasing the FRL of Alamatti reservoir to RL 1695 feet and completing the Left Bank Canal to irrigate an additional area of 2.30 lakh acres in Bijapur and Gulbarga districts, and  
(b) Increasing the FRL of Siddapur reservoir to RL 1607.50 feet and completing the Right Bank Canal to irrigate 3.70 lakh acres in Raichur district.

(3) Considering the subsequent proposal of increasing the irrigable command area under the project from 12 lakh acres to 16 lakh acres (including 2 lakh acres under Lift Irrigation Schemes from Alamatti and Narayanapur reservoirs), it was found that the aggregate live storage provided under Alamatti and Narayanapur reservoirs (i.e., 96 TMC) was not sufficient. It was also found that the aggregate live storage to irrigate 12 lakh acres was about 120 TMC. This required raising the height of Siddapur dam for storing more water. As this proposal was submerging the Sangama temple, it was decided to shift the site of the lower dam back to Narayanapur.

(4) The project estimates were prepared afresh keeping in view the above changes. The estimated cost of the project in the 1st Stage was Rs.65.30 crores to irrigate 6 lakh acres and that for the 2nd Stage, including lift irrigation, was Rs.102.70 crores for irrigating an additional area of 10 lakh acres. Thus, the total cost of the project was Rs.168 crores for irrigating 16 lakh acres. Considering the paucity of funds, it was proposed to take up the 1st phase of Stage-I project only during the Fourth Plan period. The proposals so contemplated under 1st phase costing about Rs.26 crores were as under:-

(a) Raising of Alamatti dam to RL 1650 feet in the spillway portion and to RL 1675 feet in the flanks. This will give a gross storage of 9 TMC required for supplementing rabi irrigation under Narayanapur canals.  
(b) Diversion work at Narayanapur with a truncated section.  
(c) Excavation of NLBC for a portion of the length in the first reach to irrigate 1.2 lakh acres in Gulbarga district.

(5) The above proposals were examined by the Technical Sub-Committee of MIPC Board in its meeting held on 09.02.1967 and the Committee generally approved
the contemplated irrigable area of 16 lakh acres under the project. The Committee recommended that the lift irrigation proposals may also be taken up even during the initial phasing. The MIPC Board in its meeting held on 10.06.1967, while accepting the recommendations of the Technical Sub-Committee, resolved that the work of Upper Krishna Project may be taken up with right earnestness by providing the required funds for completion of the 1st phase of Stage-I during the Fourth Plan period. After considering all factors, Government issued orders in G.O. No. PWD 11 MUK 63 dated 26.08.1967 (copy enclosed as Annexure-2) approving the following:-

(a) Lower reservoir of Upper Krishna Project be constructed at Narayanapur instead of at Siddapur.

(b) The works of the first stage of the project be phased as detailed above so as to provide immediate irrigation over 1.2 lakh acres.

2.05 Modified proposals of 1967:-

(1) In August 1967, an Irrigation Project Zone was created at Dharwad which took up the reinvestigation of Upper Krishna Project. After detailed investigations, a comprehensive proposal to irrigate 19.5 lakh acres with dams at Alamatti and Siddapur was got up. This scheme was approved by the Government in G.O. No. PWD 11 MUK 63 dated 22.05.1968. The following were the aspects of Upper Krishna Project approved by the Government:-

(a) Modified proposal of Upper Krishna Project to irrigate 19.5 lakh acres at a cost of Rs.143 crores.

(b) Construction of the foundation for Alamatti dam for an ultimate FRL of 1720 feet (524.256 m).

(c) Location of the lower dam at Upper Narayanapur site.

(d) Construction of NLBC to irrigate 10.1 lakh acres in the 1st Stage.

(e) Completion of Alamatti dam in the 1st Stage upto RL 1620 feet in the river bed and upto RL 1680 feet in the flanks.

(f) Completion of Upper Narayanapur dam fully i.e., upto FRL 1615 feet (2.5 feet lower than the Sangama shrine) in the very 1st Stage.

(2) In the 1st Stage of the project, it was contemplated to take up the construction of – (a) NLBC to irrigate 10.10 lakh acres; (b) Narayanapur dam; (c) Alamatti dam to a partial height in the river bed and full height in the flanks. The estimated cost of the 1st Stage was Rs.75 crores. Accordingly, the work on the construction of Siddapur dam (upper Narayanapur site) and the Alamatti dam was taken up in 1968.

3.0 Project Report of 1970 as placed before the Krishna Water Disputes Tribunal:-

3.01 After the formation of the Tribunal in April 1969, all the three party-States viz. Maharashtra, Mysore and Andhra Pradesh asserted their claims to the utilisation of Krishna waters before the Tribunal. The claim of Mysore State was 1430 TMC which included 442 TMC for UKP. In support of this claim, the modified project report prepared
in 1970 for Upper Krishna Project envisaging an ultimate utilization of 442 TMC for irrigating an area of 20.84 lakh acres was furnished to the Tribunal.

3.02 The project was proposed to be implemented in two stages, as shown below:-

**Under Stage-I (to irrigate 10.10 lakh acres):**

(i) Construction of Narayanapur dam to FRL 492.252 m (1615 feet) with a gross storage capacity of 37.646 TMC.
(ii) Construction of Narayanapur Left Bank Canal to irrigate 10.10 lakh acres with a Head discharge of 10,000 cusecs (283 cumecs)
(iii) Construction of foundations and allied works of Alamatti dam which are liable to periodical submergence under Narayanapur reservoir.

**Under Stage-II (to irrigate an additional area of 10.74 lakh acres):**

(i) Completion of Alamatti dam to FRL 524.256 m (1720 feet) including 10 m height gates (crest level being 514.256 m) with a gross storage capacity (after deducting the storage abstract by Hippargi barrage) of 227.095 TMC.
(ii) Construction of Narayanapur Right Bank Canal to irrigate 4.30 lakh acres.
(iii) Construction of Alamatti Left Bank Canal to irrigate 0.5 lakh acres.
(iv) Construction of Alamatti Right Bank Canal to irrigate 0.70 lakh acres.
(v) Construction of Hippargi barrage with a gross storage capacity of 7.62 TMC for irrigating an area of 1.34 lakh acres by lift.
(vi) Construction of Lift Irrigation works from Alamatti reservoir to irrigate 1.70 lakh acres.
(vii) Construction of Lift Irrigation works from Narayanapur reservoir to irrigate 0.70 lakh acres.
(viii) Construction of Lift Irrigation works from Narayanapur Left Bank Canal to irrigate 1.5 lakh acres.
(ix) Increasing the Head discharge of NLBC to 14,400 cusecs (407.50 cumecs).

3.03 The proposal envisaged a utilization of 103 TMC in the 1st Stage and the balance (339 TMC) in the 2nd Stage. The irrigation intensity was proposed as 144 percent.

3.04 It was also mentioned in the Project Report that it was possible to generate hydro-electric power at the foot of Alamatti dam by making use of regulated releases for being picked up at Narayanapur. It was estimated that five units of 30,000 KW each could be installed and that about 520.50 million KWh of hydro-electric power could be generated at this Power House. Accordingly, provision was made for providing penstocks of 5.5 m dia in each of the five power blocks in the right flank non-overflow dam.

4.0 **Project Report of 1976 (got up after the Tribunal Award was published in May 1976):**

4.01 According to the Award of the Tribunal published in May 1976, Karnataka was entitled for utilization of 734 TMC at 75% dependability under Scheme-A (including regeneration of 34 TMC). Further, another 165 TMC of water (at 50% of surplus flow of 330 TMC over and above the 75% dependable flow) was available to the State under Scheme-B which, however, was not made a part of the final order of the Tribunal.
4.02 Consequent on the Tribunal Award, the Project Report of 1970 was slightly modified retaining the concept of implementing the project in two stages. A fresh Project Report was prepared for Upper Krishna Project Stage-I in December 1976 for irrigating 10.50 lakh acres, with an estimated cost of Rs. 266.11 crores at 1976-77 level of rates and sent to CWC, GOI. The important features of this proposal were as under:-

(i) Construction of Narayananpur dam to FRL of 492.252 m (1615 feet) with a gross storage capacity of 37.646 TMC.

(ii) Provision of 25 Nos. of spillway gates of size 15 m x 12 m for Narayananpur dam to pass the designed flood discharge of 11 lakh cusecs.

(iii) Construction of Narayananpur Left Bank Canal to irrigate 10.10 lakh acres.

(iv) Construction of Alamatti dam to FRL of 512.064 m (1680 feet) including 10 m height gates (crest level being 502.064 m) with a gross storage capacity of 42.238 TMC in 1st Stage.

(v) Provision of 26 Nos. of spillway gates of size 15 m x 10 m for Alamatti dam to pass the designed flood discharge of 8.25 lakh cusecs.

(vi) Construction of Alamatti Left Bank Canal including lifting arrangement to irrigate 0.40 lakh acres.

(vii) Utilisation of 125 TMC in 1st Stage with an irrigation intensity of 104.50 percent.

4.03 It was indicated in the above said Project Report of 1976 that the 2nd Stage of the project to irrigate an additional area of 10.34 lakh acres would comprise the following:-

(i) Completion of Alamatti dam by raising the crest level of the dam to 514.256 m and increasing the FRL to 524.256 m (1720 feet) by providing 10 m height crest gates, with a gross storage capacity of 227.097 TMC (after deducting the storage abstract by Hippargi barrage).

(ii) Construction of Narayananpur Right Bank Canal to irrigate 4.30 lakh acres.

(iii) Extension of Alamatti Left Bank Canal to irrigate an additional area of 0.10 lakh acres.

(iv) Construction of Alamatti Right Bank Canal to irrigate 0.70 lakh acres.

(v) Construction of Hippargi barrage with a gross storage capacity of 7.62 TMC to irrigate 1.34 lakh acres by lift.

(vi) Construction of Lift Irrigation works from Alamatti reservoir to irrigate 1.70 lakh acres.

(vii) Construction of Lift Irrigation works from Narayananpur Left Bank Canal to irrigate 1.5 lakh acres.

(viii) Construction of Lift Irrigation works from Narayananpur reservoir to irrigate 0.70 lakh acres.

4.04 It was also indicated in the above Project Report that power generation of 520.50 million KWh had been contemplated at the foot of Alamatti Dam by installing 5 units of 30,000 KW each for which provision of 5.5 m dia penstocks had been made in the power blocks of the right flank non-over flow dam.
4.05 In the meanwhile, it had been decided in 1975-76 to pose the Karnataka Irrigation Project including UKP Phase-I and some components of Malaprabha & Ghataprabha projects, for World Bank assistance. At the instance of World Bank, a Panel of Experts was constituted in 1977 to review the designs adopted in the project. The Experts Panel gave its recommendations in January-February 1978, recommending to adopt a design flood discharge of 10.95 lakh cusecs at Alamatti (as against 8.25 lakh cusecs adopted in the 1976 Project Report) and 13.40 lakh cusecs at Narayanapur (as against 11 lakh cusecs adopted in the 1976 Project Report). Other recommendations made by the Panel were – (i) to increase the number of spillway bays of Narayanapur dam from 25 to 30 to accommodate the increased design flood; and (ii) to lower the crest of Alamatti spillway by 2 m and correspondingly increase the gate height by 2 m. These recommendations were accepted by GOK, GOI as well as by the World Bank. The agreements for the project were entered into with World Bank in May 1978.

4.06 Necessary modifications were effected in the Project Report of 1976 based on the recommendations of the Experts Panel. After detailed examination and clearance by the CWC, the Stage-I project was discussed and accepted by the Advisory Committee of Planning Commission in its meeting held on 20.02.1978. Thereafter, the Planning Commission, GOI communicated its approval to the Stage-I project (revised estimate) vide its letter No. II-20(6)/77/I&CAD dated 22.04.1978 (copy enclosed as Annexure-3) subject to compliance to the technical comments of CWC / Expert Committee. Some of the important features of the project to irrigate 4.25 lakh ha. (10.50 lakh acres), are as under:-

(i) Construction of Narayanapur dam to full height with a gross storage capacity of 37.646 TMC, live storage capacity of 30.473 TMC and spillway capacity of 14.30 lakh cusecs.

(ii) Construction of Narayanapur Left Bank Canal for 78 Kilometers length with a designed head discharge of 230.81 cumecs (8150 cusecs) to irrigate 4.09 lakh ha (10.10 lakh acres).

(iii) Construction of Alamatti dam, in the 1st Stage, to a partial height upto FRL 512.064 m (1680 feet) with a gross storage capacity of 42.238 TMC, live storage capacity of 30.411 TMC and spillway capacity of 10.95 lakh cusecs.

(iv) Construction of Alamatti Left Bank Canal, in the 1st Stage, for a length of 50 Km to irrigate 0.16 lakh ha (0.40 lakh acres).

(v) Utilization of 119 TMC in Stage-I with an irrigation intensity of 108 percent.

4.07 The Planning Commission, while giving its approval to revised Stage-I project as above, indicated that the UKP Stage-II, which included Hydel power generation in addition to additional irrigation, was still under preparation by the State Government and that, for the present, the technical feasibility of only Stage-I had been examined and accepted.

4.08 On receipt of the Planning Commission’s clearance to Stage-I as stated above, administrative approval was accorded to the revised estimate of Upper Krishna Project Stage-I amounting to Rs.283.65 crores vide Government Order No.PWD 123 GUK 78 dated 07.12.1978 (copy enclosed as Annexure-4).

(*) This should be 13.40 lakh cusecs. This is confirmed by the figure of 37,945 cumecs (i.e., 13.40 lakh cusecs) shown as the design flood for Narayanapur spillway in the Planning Commission's letter dated 24.09.1990 clearing the revised Stage-I.
5.0 Modifications in the design of Alamatti dam, made in 1982:-

5.01 As per the Project Report of revised Stage-I cleared by Planning Commission in April 1978, the Alamatti dam was to be constructed in the 1st Stage upto FRL 512.064 m (1680 feet) including 12 m height gates above the crest level of 500 m (1640 feet), the section of the dam being truncated. In the 2nd Stage, it was contemplated to dismantle the gates, raise the crest level of the dam to 512 m and re-erect the crest gates so that the FRL in the 2nd Stage would be 524.256 m (1720 feet). Considering the problems involved in the dismantling and re-erection of gates, it was decided to construct the dam with solid crest upto RL 512 m (1680 feet) in the 1st Stage itself so that the gates of 12 m height could be erected in the 2nd Stage. This proposal was approved by Government in G.O. No. PWD 264 GUK 81 dated 19.04.1982.

5.02 In the meanwhile, the Draft Tender Papers for raising the spillway of Alamatti dam from RL 1620 feet to RL 1640 feet for full width of the section in accordance with the above change (instead of truncated section as envisaged earlier) were sent to World Bank. The Bank, while communicating its no-objection to the changed design of the dam suggested to obtain clearance from GOI. Accordingly, the CWC was requested in GOK letter No. PWD 264 GUK 81 (P) dated 25.03.1982 to give clearance to the modified design of the dam. The subject was discussed in the 20th meeting of the Advisory Committee of Planning Commission held on 10.05.1982 and the Committee gave its acceptance to construct the dam for full width of the section upto RL 1640 feet (500 m) so as to convey the concurrence of GOI to World Bank. The CWC, while communicating the clearance of the Advisory Committee, vide CWC letter No. 11/3/79-TE/2793 dated 30.06.1982 (copy enclosed as Annexure-5), desired that the State Government may submit the modified revised estimate for Stage-I expeditiously.

6.0 Project Report of 1982 for UKP Stage-II:-

6.01 A Comprehensive Project Report for UKP Stage-II was in the meanwhile got up in January 1982 covering both the Stage-I and Stage-II, to irrigate a total area of 15.60 lakh acres (10.50 lakh acres in Stage-I and 5.10 lakh acres in Stage-II). The total estimated cost of the project was Rs. 783.44 crores (Rs. 441.39 crores for Stage-I and Rs. 342.05 crores for Stage-II) including Rs. 14.69 crores for the power component. The total utilization proposed under the project was 173 TMC (119 TMC in Stage-I and 54 TMC in Stage-II) with an irrigation intensity of 106%. The important salient features of the project were as under:-

Under Stage-I:-

(i) Construction of Narayanapur dam to FRL 492.252 m (1615 feet) with a gross storage capacity of 37.646 TMC.

(ii) Construction of Alamatti Dam to FRL 512.064 m (1680 feet) without gates (this was also the solid crest level).

(iii) Construction of Narayanapur Left Bank Canal to irrigate 10.10 lakh acres.

(iv) Construction of Alamatti Left Bank Canal to irrigate 0.40 lakh acres.

Under Stage-II:-

(i) Completion of Alamatti Dam to FRL 524.256 m (1720 feet) by providing 12 m height gates.
(ii) Construction of Narayanapur Right Bank Canal to irrigate 4.30 lakh acres.

(iii) Construction of Alamatti Right Bank Canal to irrigate 0.50 lakh acres.

(iv) Construction of Narayanapur Reservoir Lift to irrigate 0.30 lakh acres.

6.02 It was mentioned in the DPR that the storage level required at Alamatti reservoir to utilize 173 TMC under the project under Scheme-A is RL 1711 feet (521.64 m) and that the storage from RL 1711 feet to 1720 feet (524.256 m) would be used for power generation.

6.03 Power generation of 600 million KWh by having an installed capacity of 218 MW (5 of 40 MW and one of 18 MW) at Alamatti Dam was also contemplated under Stage-II and in this direction, provision had been made in the estimate for providing 5 penstocks of 7 m dia and 1 penstock of 5 m dia in the 6 power blocks of the non-over flow masonry dam in the right flank.

6.04 The above said Project Report was sent to CWC in Government letter No. PWD 264 GUK 81 (P) dated 04.02.1982.

6.05 Since the 2nd Stage project came up for re-examination / review by the State Government and the comments of CWC were yet to be attended, the CWC informed the State Government through its letter No. 11/3/87-PA-II/277 dated 13.02.1987 that the 2nd Stage project had been deleted from the list of pending projects of CWC. It was also indicated in the above letter of CWC that the 2nd Stage project may be up-dated / modified in the light of the comments and guidelines of CWC after necessary investigations are completed, and resubmitted to CWC for further processing.

7.0 Modified revised project report of October 1982 for UKP Stage-I:

7.01 In accordance with the directions of CWC communicated in its letter dated 30.06.1982, (in the context of giving clearance to construct Alamatti dam for full width of the section upto RL 1640 feet i.e., 500 m), a modified revised estimate for UKP Stage-I was got up in October 1982. The estimated cost of the project was Rs.1039.71 crores including Rs.280.13 crores for CADA component. All the features of this project were the same as per the clearance given by the Planning Commission in April 1978 except that a provision of Rs.4 crores had been made for the Head works of 4 Nos. of L.I. schemes. The break up of the estimated cost, as per the Project Report of 1982 for Stage-I, was as under:-

<table>
<thead>
<tr>
<th>Engineering Component:</th>
<th>Rs. in crores</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Narayanapur dam.</td>
<td>77.62</td>
</tr>
<tr>
<td>(ii) Alamatti dam.</td>
<td>329.88</td>
</tr>
<tr>
<td>(iii) Narayanapur Left Bank Canal.</td>
<td>332.60</td>
</tr>
<tr>
<td>(iv) Alamatti Left Bank Canal.</td>
<td>15.48</td>
</tr>
<tr>
<td>(v) Head works of 4 Nos. of L.I schemes</td>
<td>4.00</td>
</tr>
</tbody>
</table>

Sub-total for Engineering Component: 759.58

| CADA Component: | |
|-----------------| | |
| (vi) Narayanapur Left Bank Canal | 272.63 |
| (vii) Alamatti Left Bank Canal | 7.50 |

Sub-total for CADA Component: 280.13

Total for UKP Stage-I: Rs.1039.71 crores
7.02 The huge increase in cost of the project when compared to the estimated cost of Rs.283.65 crores cleared by the Planning Commission in April 1978, was attributed mainly to the increase in the cost of acquisition of lands and structures coming under submergence of Alamatti reservoir and related rehabilitation and resettlement works. The reason for such increase in cost of acquisition was that the 1982 Project Report provided for construction of Alamatti dam in the 1st Stage with an un-gated spillway upto a solid crest level of 1680 feet (512.064 m) resulting in submersion of large extent of lands and structures including a major portion of Bagalkot town whereas the provision for acquisition of lands and structures had been made in the estimate for Rs.283.65 crores cleared by the Planning Commission in April 1978 considering the spillway as gated upto FRL 1680 feet. As per the figures available in the Project Report of 1982, the increase in cost towards acquisition of lands and structures is to the extent of Rs. 215.30 crores out of Rs.329.88 crores increased due to modification in the design of Alamatti dam.

8.0 Re-examination of the design of the Alamatti Dam and revised estimate of 1985 for UKP Stage-I:-

8.01 The Technical Committee examined the above said Project Report of 1982 for Stage-I in its meeting held on 09.09.1983 and recommended for considering the CADA components of the estimate separately since the CADA cost was borne under a different Head of Account. The Committee also recommended to examine the possibility of having a single common trunnion operative in both the Stages of UKP with a view to avoiding extra submersion for the sake of 1st Stage FRL of 1680 feet. After considering various alternatives for different gate heights and further reviews by the Technical Committee, the issue of changing the design of Alamatti dam was discussed in the meeting held on 26.08.1985 under the chairmanship of Sri.S.G.Balekundry, Chairman, MIPC Board and attended by the Secretary-II, PW, CAD & Elecy., Department, the Director, Gates Design, CWC, and the Chief Engineer, UKP, Dam Zone, Alamatti. It was decided in this meeting (vide copy enclosed as Annexure-6) to have the permanent crest level of Alamatti dam at RL 1670 feet (509.016 m) and to provide radial crest gates of 50 feet height (size 15 m x 15.24 m).

8.02 As regards the Lift Irrigation Schemes from the foreshore of Alamatti and Narayanapur reservoirs, the Technical Committee in its meeting held on 28.05.1984 recommended for execution of the Head works of the following LI schemes in the 1st Stage itself, as it would become difficult to take up their construction in the 2nd Stage under submerged condition:-

(i) Chimmalgi Lift Irrigation Scheme (common Head works for ALBC and Chimmalgi).
(ii) ARBC
(iii) Baluti Lift Irrigation Scheme (Mulwad LIS)
(iv) Herkal Lift Right
(v) Herkal Lift Left
(vi) Narayanapur reservoir Lift near Navali.

8.03 Keeping in view the above decisions, the Chief Engineer, UKP, Alamatti, modified the Project Report contemplating construction of the Alamatti dam to its full height (crest at 1670 feet + 50 feet height gates) in the 1st Stage itself, stating that the following advantages would be gained by the proposal:-
(i) The gated spillway arrangement now considered would reduce considerably the heavy investments in the acquisition of lands / structures with the resultant construction cost of Resettlement Centers in the 1st Stage, and

(ii) Investment on re-location of Bagalkot town in the 1st Stage will also be practically reduced by about 50 percent.

8.04 Though it was proposed to construct Alamatti dam to its full height including gates in the 1st Stage itself, the scope of 1st Stage (as approved by Planning Commission in April 1978) was proposed to be retained in regards to storage (upto FRL 1680 feet), utilization of 119 TMC and CCA of 4.25 lakh ha (10.50 lakh acres). It was proposed to increase the storage to FRL 1720 feet (524.256 m) in the 2nd Stage and bring in an additional CCA of 6.27 lakh ha under irrigation with a total utilization of 302 TMC inclusive of 1st Stage.

8.05 The estimated cost of the revised estimate for Stage-I, after incorporating the Head works of foreshore Lift Irrigation schemes in the estimate and proposing the construction of Alamatti Dam to its full height as recommended by the Technical Committee was Rs. 1071.10 Crores (excluding CADA component) at 1983-84 level of rates. The above Project Report was submitted by the Chief Engineer to Government through his letter dated 26.10.1985 and the same was in turn sent to CWC in Government letter No. PWD 56 WUD 83(P) dated 15.11.1985. Simultaneously, administrative approval of Government was also accorded to this revised estimate of UKP Stage-I amounting to Rs. 1071.10 Crores, to irrigate 4.25 lakh ha (10.50 lakh acres) of CCA with a utilization of 119 TMC vide G.O. No. PWD 56 WUD 83 dated 03.12.1985 (copy enclosed as Annexure-7).

9.0 Project Report of 1987, for revised UKP Stage-I:-

9.01 The CWC, after examining the revised estimate of UKP Stage-I submitted by the State Government in November 1985, informed in its letter dated 21.02.1986 that the scope of the work envisaged under Stage-I was at variance with the project sanctioned by the Planning Commission though it had been made clear that no commitment to Stage-II should be made in the Stage-I project. The CWC also wanted that the need to build Alamatti Dam upto FRL 1720 feet (524.256 m) and taking up the foreshore Lift Irrigation schemes should be clearly established. After series of discussions and correspondences, it was finally decided in the meeting held at CWC on 16.12.1986, as follows:-

(i) Only 3 m height temporary vertical gates may be provided for Alamatti Dam above the crest level of 509.016 m in order to retain the FRL of 512 m cleared by the Planning Commission for the 1st Stage.

(ii) Keeping in view the future planning and the difficulties which may be experienced in the construction at a later stage, the following minimal works may be allowed in the revised Stage-I for advanced planning:-

(a) Installation of embedded parts for 15.2 m (50 feet) height radial gates in Alamatti spillway.

(b) In view of the Alamatti spillway crest level of 509.016 m, raising of the piers of spillway, non-over flow section and earthen section of the dam would be necessary to an elevation of MWL + free board of 3.5 m i.e., a El. 523 m. Construction of spillway piers and non-over
flow section and earthen section of the dam from El. 523 m to 528.75 m will depend upon the relative cost involved in having the bridge work temporarily completed for El. 523 m and later dismantled and raised to higher level.

(c) The Head works of foreshore Lift Irrigation schemes from Alamatti reservoir (5 Nos.) from foundation level to RL 512 m.

(d) The works for power component i.e., construction of intake structures, trash rack and erection of penstocks for proposed 6 Nos. power units which form an integral part of Alamatti dam.

(iii) The State Government should work out the item-wise costs including the cost of submergence and R & R of project affected families and up-date the cost estimate for revised Stage-I project after re-casting the same as per the CWC guidelines.

(iv) The State Government should confirm the proposal of installing 3 m height gates etc.

9.02 The pros & cons of the above proposal was discussed by the Chief Engineer, UKP (Designs) with Shri.S.G.Balekundry, Chairman, MIPC Board on 31.12.1986. The Chairman was of the view not to accept the proposal of having 3 m height vertical gates under any circumstances. He was of the opinion that 3 m height partial radial gates with 2 arms could however be accepted. As regards the other proposal of having a temporary bridge at RL 523 m, later dismantle it and reconstruct the same at a higher level after the dam reaches its final height, the State Government did not agree to this arrangement due to practical difficulties in implementation and other related problems.

9.03 Accordingly, the project report for Stage-I was modified providing for 3.24 m height radial gates over the crest level of 509.016 m for Alamatti dam with the updated revised estimated cost, including provision for Head works of foreshore L.I. schemes, as Rs.1357.37 Crores (at 1986-87 level of rates) which included Rs.6.36 Crores towards power component. This project report was submitted to CWC in Government letter No. PWD 40 WUD 87 dated 06.06.1987.

9.04 Provision had been made in the estimate for providing 6 Nos. of penstocks in the power blocks of Alamatti dam right flank portion, comprising 5 Nos. of 7 m dia and 1 No. of 3.95 m dia for generation of 714 million units of power annually with an installed capacity of 268 MW (5 of 50 MW and 1 of 18 MW). The irrigation intensity adopted was 108% to benefit 4.25 lakh ha with a utilisation of 119 TMC.

10.0 Clearance of UKP Phase-II project posed for World Bank Assistance by GOI:

10.01 In the meanwhile, the Identification Report (Project Report) of UKP Stage-I Phase-II was sent to CWC through GOK letter No. PWD 118 WBM 86 dated 27.08.1986. The estimated cost of the Phase-II project was Rs.550 crores to irrigate an area of 1,44,788 ha. After examining the proposal in detail, the CWC cleared the Phase-II project vide CWC letter No.2/74/86/PPC/Vol.III/129 dated 21.01.1987 (copy enclosed as Annexure-8) subject to the following conditions:-

(i) Radial gates of partial height (about 3 m) should be provided for Alamatti dam in the revised Stage-I with the solid crest level at 509.016 m for utilisation of 119 TMC to irrigate 4.25 lakh ha with FRL 512.2 m. The height of the radial gates would be
increased later by additional arms and skin plates for utilisation of Krishna water allocated to the project.

(ii) Additional cost of submergence and resettlement due to raising of the crest upto RL 509 m with back water effect should be included in the revised Stage-I project including relocation cost of Bagalkot town.

(iii) Following investments for advance planning is agreed:-

(a) Cost of Alamatti dam works from RL 523 m to RL 527.25 m.
(b) Embedded parts for radial crest gates of 15.2 m height.
(c) Head works of 5 Nos. of foreshore L.I. schemes from Alamatti reservoir from foundation level to RL 512 m and one L.I. scheme from Narayanapur reservoir.

10.02 The Ministry of Water Resources, GOI communicated its clearance to the Phase-II project comprising the following items, through its O.M. No.11(12)/85-FA dated 05.02.1987 (copy enclosed as Annexure-9):-

(i) Construction of Alamatti dam spillway crest from RL 500 m to RL 509 m without gates.
(ii) Raising of the piers of Alamatti dam spillway to full height and installation of embedded parts for 15.2 m radial gates.
(iii) Raising of non-over flow masonry and earthen section of the Alamatti dam from RL 515 m to RL 527.25 m.
(iv) Raising of the power portion of the dam from RL 496.5 m to 527.25 m.
(v) Providing intake structures and installation of penstocks for 6 Nos. power units.
(vi) Construction of Head works for 6 Nos. of foreshore L.I. schemes (5 from Alamatti reservoir and one from Narayanapur reservoir).
(vii) Construction of Mudbal and Indi Branch Canals and distribution system for Shahapur, Mudbal and Indi Branches on an area of 1.45 lakh ha and field irrigation channels in 1.24 lakh ha.

11.0 Clearance of Planning Commission, GOI, to the project report of revised UKP Stage-I of 1987:-

11.01 The revised Stage-I project of 1987 was discussed in the 38th meeting of the Advisory Committee of Planning Commission held on 27.01.1988 and the Committee, apart from making several observations, decided that the project should be resubmitted after obtaining clearance from the Department of Environment, Forests and Wild Life. These observations were attended to and necessary corrections were made to the revised estimate by the team of Karnataka officers who had been deputed to Delhi to pursue the clearances from GOI. Thereafter, a supplementary note was put up by CWC to the Advisory Committee and the Committee in its 42nd meeting held on 11.01.1989 recommended the project for approval by the Planning Commission subject to clearance by the Department of Environment.

11.02 The Department of Environment, Forests & Wild Life in GOI, gave its approval for release of 135 ha of forest land in Bijapur district for construction of UKP Stage-I subject...
to certain conditions vide its letter No.8-438/88-FC dated 22.02.1989 (copy enclosed as **Annexure-10**).

11.03 The Ministry of Environment and Forests gave its approval to UKP Stage-I Phase-II subject to effective implementation of several safeguards vide O.M. No. J 12011/41/86-IA dated 05.04.1989 (copy enclosed as **Annexure-11**).

11.04 Thereafter, the Planning Commission conveyed its acceptance to the revised UKP Stage-I at an estimated cost of Rs.1214.97 crores (at 1986-87 level of rates) to irrigate an area of 4.25 lakh ha by utilising 119 TMC, subject to certain conditions vide its letter No.2(10)/88 I&CAD dated 24.09.1990 (copy enclosed as **Annexure-12**). The important salient features of the project, as cleared by the Planning Commission, are as under:-

(i) The Upper Krishna Project is a multi-purpose project proposed to be executed in two stages.

(ii) Construction of Narayanapur dam to FRL 492.252 m with a gross storage capacity of 37.646 TMC and live storage of 30.473 TMC.

(iii) Construction of Narayanapur Left Bank Canal of 78 KM length along with its branches viz. Shahapur Branch Canal (78 KM), Indi Branch Canal (172 KM), Jewargi Branch Canal (73 KM), Mudbal Branch Canal (48 KM) and their distribution systems to irrigate a CCA of 4.08 lakh ha, the Head discharge of Narayanapur Left Bank Canal being 235.02 cusecs (8,300 cusecs).

(iv) Construction of Alamatti Left Bank Canal (105 KM length) to irrigate a CCA of 0.17 lakh ha.

(v) Construction of Alamatti Dam spillway with crest level at 509 m (1670 feet) and installation of 3.2 m height radial gates to as to achieve a FRL of 512.2 m (1680 feet), with a gross storage capacity of 42.238 TMC and live storage of 30.911 TMC.

(vi) Construction of Alamatti dam upto a height of RL 523.80 m as the MWL in Stage-I (flood impinging at FRL 512.2 m with crest at RL 509 m) works out to be 519.80 m and free board of 4.00 m.

(vii) Further, there is no objection to the investments for advance planning for the following works:-

(a) Embedded parts for high radial gates for Alamatti dam.

(b) Construction of Alamatti dam spillway and power dam portion from RL 523.80 m to 528.25 m.

(c) Head works of 5 Nos. of foreshore lift irrigation schemes from Alamatti reservoir from foundation level to FRL 512.20 m and one lift irrigation scheme from Narayanapur reservoir, as follows:-

**From Alamatti reservoir:-**

(1) Chimmalgi Lift Irrigation Scheme and Alamatti Left Bank Canal common Head work.

(2) Alamatti Right Bank Canal Lift Irrigation Scheme.

(3) Baluti Lift Irrigation Scheme.
(4) Herkal Lift Irrigation Scheme (Right)

(5) Herkal Lift Irrigation Scheme (Left)

From Narayanapur reservoir:-

(1) Lift Irrigation Scheme near Navali.

12.0 Proposals and actions of GOK to erect only 15.2 m (50 feet) height radial crest gates for Alamatti dam:-

12.01 The GOK in its letter No. ID 57 WUD 92 dated 07.09.1992 (copy enclosed as Annexure-13), inviting reference to the clearance for revised Stage-I project given by the Planning Commission in September 1990, substantiated the urgent need for construction of Alamatti dam to full height and storing water upto the final FRL 524.256 m by erecting 15.2 m height radial crest gates. Quoting the reservoir operation studies done by the Indian Institute of Science, Bangalore, according to which the FRL required in Alamatti reservoir to utilise 173 TMC under the project was indicated as RL 523 m (1716 feet), it was communicated to CWC that the storage between RL 523 m and RL 524.256 m would be used for power generation for the time being and later on for irrigation purpose when some more water would be available under Scheme-B. The actions initiated by GOK in entrusting the work of Alamatti power project to a private company, which required completion of Alamatti dam in all respects for facilitating early power generation, was also reported to CWC in the above said letter of GOK. Under these circumstances, the CWC was requested in the above letter to give urgent permission for erection of 15.2 m height gates for Alamatti dam.

12.02 The CWC in its DO letter No. 2/74/92-PPO/1165 dated 23.10.1992 indicated that it had agreed only to the investments for the advance action for items pertaining to Stage-II project as communicated under Planning Commission’s letter dated 24.09.1990. The CWC in its letter also referred to the anxiety expressed by Andhra Pradesh about the proposal of Karnataka contemplating impounding of water over and above the allocation for Karnataka for hydro-power generation which comes under Scheme-B. While asking for submission of detailed project report for both irrigation and power to CWC & CEA for necessary TAC clearance, the CWC suggested to initiate action for removing the apprehensions of Andhra Pradesh.

12.03 The CWC held a meeting on 12.11.1992 in connection with the erection of 15 m x 15.2 m size crest gates for Alamatti dam and the Stage-II project, which was attended by the GOK officers also, and a time table was decided upon in the above said meeting for various activities by CWC for techno-economic appraisal from the date of receipt of the detailed project report.

12.04 Considering the urgent need to expedite the progress of the project for utilising the State’s share of Krishna waters before the year 2000, the Government communicated its approval to the project authorities vide Government letter No. ID 57 WUD 92 dated 01.03.1993 (copy enclosed as Annexure-14), for erecting 15.2 m height gates for Alamatti dam in the 1st Stage itself.
13.0 **Project Report of 1993, for UKP Stage-II:**

13.01 The CWC in its letter No. 2/74/86/PPO/716 dated 10.06.1993 reminded the GOK about the firming up of the detailed project report of UKP Stage-II by first week of March 1993 keeping in tune with the time schedule decided in the meeting held at CWC on 12.11.1992. The CWC in its subsequent letter No. 2/74/86-PPO/763 dated 15.06.1993 once again reminded the GOK for sending the detailed project report of 2nd Stage at an early date.

13.02 In GOK letter No. ID 55 WUD 93 dated 29.11.1993, the detailed project report for 2nd Stage at an estimated cost of Rs.1215.88 crores to utilise 54 TMC of water for irrigating 1.97 lakh ha of CCA was sent to CWC for clearance. The proposal envisaged construction of Alamatti dam with spillway radial gates of 12 m (39.36 feet) height. The project also provided for construction of NRBC, two lift irrigation schemes from Alamatti reservoir (Mulwad L.I. Scheme and ARBC), Rampur Lift Canal from the foreshore of Narayanapur reservoir, Indi lift canal from NLBC and extension of ALBC.

13.03 Another important feature of the above said project report was that the level required in Alamatti reservoir for utilising 173 TMC of water under the project was indicated as RL 518.7 m (1702 feet) whereas the top of the 12 m height (crest level being 509 m) gates was proposed as RL 521 m. The CWC, while making several comments on this project report, observed that –

(i) Even though the FRL proposed is 518.7 m, the gate level has been proposed at 521 m. Presumably, the intention is to propose power generation from RL 518.7 m to RL 521.0 m. There is no mention of this in the report. From Inter-State angle, clearance would have to be obtained for utilising the top storage for power generation as examination of 518.7 m level would raise the query as to why the top of gate is proposed at 521 m level. In case power generation is proposed, what is the mechanism to ensure that the utilisation of irrigation is only 173 TMC?

(ii) The Working Table for Alamatti reservoir indicates a FRL of 518.7 m whereas the top of gate is 521 m. Since no permanent controlled flood is envisaged, gate for above FRL is not acceptable. It is understood that the additional storage between RL 518.7 m and RL 521 m is for power generation. The project as envisaged creates the physical capability of additional utilisation through additional storage above FRL, especially if power is not generated. An Inter-State Monitoring Mechanism will have to be set up as was insisted in other projects under the basin with similar possibilities, to which GOK will have to convey its concurrence.

13.04 The project report was discussed in a meeting convened by the Member (P&P), CWC on 28.01.1994 and it was decided that –

(i) The State Government would attend to the comments of CWC in the first instance.

(ii) Thereafter, the project as a multi-purpose project with irrigation and power would be submitted keeping in view the CWC comments on the Working Table.

(iii) Simultaneously, action to get environmental clearance would also be taken as it has already been decided that for new projects, environmental clearance should be available before the project is techno-economically cleared by CWC / Advisory Committee.

(iv) Since the project has a capability to utilise more than 173 TMC for irrigation, an Inter-State Monitoring mechanism would have to be agreed to by the GOK, as already brought out in the comments.
13.05 The decisions taken as stated above in the meeting held at CWC on 28.01.1994 were communicated to the State Government through CWC letter No.11/3/93-PA(S)/26 dated 31.01.1994/01.02.1994 (vide copy enclosed as Annexure-15).

13.06 While sending replies to CWC for their comments on Irrigation, Planning and Inter-State aspects, the ECPC, UKP, Alamatti indicated in his para-wise compliance report that the GOK had agreed to Information Monitoring only by CWC and that the modalities of the same would be worked out soon.

13.07 Subsequently, some more comments were received on the project from different Directorates of CWC.

14.0 Project Report of 1995 for UKP Stage-I Phase-III:

14.01 Ever since the inception of the project in 1963, the project was conceived for implementation in Stages. Considering the financial constraints in funding the project, World Bank assistance was obtained for Phase-I and Phase-II of Stage-I project. The Phase-I was implemented from 1978 to 1986 and the Phase-II was implemented from 1989 to 1997. As against a total area of 4.25 lakh ha contemplated under Stage-I, the total area envisaged for irrigation under Phase-I and Phase-II was about 2.50 lakh ha. As such, there was still substantial work remained to be done under Stage-I and these balance works were proposed to be taken under Phase-III of the Stage-I project.

14.02 The ECPC, UKP, Alamatti, prepared a detailed project report for Phase-III at an estimated cost of Rs.1533.17 crores (at 1994-95 level of rates) including Rs.319.70 crores towards CADA components and this project was cleared by the Technical Advisory Committee for Irrigation Projects in its 5th meeting held on 03.08.1995. The MIPC Board in its 2nd meeting held on 26.08.1995 also cleared the project report. This estimate for Phase-III was administratively approved by the Government in G.O. No.ID 269 WBM 94 dated 27.10.1995 (copy enclosed as Annexure-16).

14.03 Following are the important salient features of the Phase-III project administratively approved by the Government in the above said G.O.:-

(i) Construction of Alamatti dam to its full height including crest gates and rehabilitation & resettlement of 41 villages coming under submersion.

(ii) Construction of the in-take structures of foreshore lift irrigation schemes from Alamatti and Narayanapur reservoirs.

(iii) Creation of an irrigation potential of 1.71 lakh ha.

(iv) Construction of 689 KM length of ayacut roads.

(v) Extension of Indi Branch Canal from KM 64 to KM 175.

(vi) Construction of Jewargi Branch Canal from KM 0 to KM 85.26.

(vii) Construction of Alamatti Left Bank Canal from KM 0 to KM 77.64.
14.04 Later on, the Ministry of Environment and Forests, GOI accorded the necessary environmental clearance for UKP Stage-I Phase-III subject to certain conditions vide its letter No. J-12011/31/96-IA-1 dated 18.07.2000 (copy enclosed as Annexure-17).

15.0 Project Report of 1996, for UKP Stage-II Multi-purpose Project:-

15.01 In accordance with the observations / suggestions of CWC, the 2\textsuperscript{nd} Stage project was modified as a Multi-purpose Project and a detailed project report was prepared taking into consideration the earlier comments of CWC. The 2\textsuperscript{nd} Stage Multi-purpose Project estimated to cost Rs.2468.17 crores with a contemplated CCA of 1.97 lakh ha and a utilization of 54 TMC of water was discussed in the 11\textsuperscript{th} meeting of the Technical Advisory Committee held on 12.12.1995. In order to expedite submission of the project to CWC, the Committee cleared the project report subject to compliance to several observations.

15.02 After compliance to the observations of the Technical Advisory Committee, the estimate was modified to Rs.2786.17 crores. Out of this estimated cost, the amount apportioned for power component was Rs.771.53 crores.

15.03 The project proposals included both the irrigation component and the power component. Under the irrigation component, the following works were included:-

(i) Construction of Alamatti dam to its full height i.e., 528.25 m and the FRL contemplated was 524.256 m with 15.25 m height radial crest gates over the crest level of 509.016 m.

(ii) Construction of NRBC.

(iii) Mulwad lift canal from Alamatti reservoir.

(iv) ARBC lift canal from Alamatti reservoir.

(v) Rampur lift canal from Narayanapur reservoir.

(vi) Indi lift canal from NLBC.

(vii) Extension of ALBC.

15.04 As regards the power component, it was proposed to develop power generation in two phases. During the first phase, construction of power house at Alamatti with an installed capacity of 297 MW (4 units of 70 MW and one unit of 17 MW) was proposed to be taken up initially and 367 MW (5 units of 70 MW and one unit of 17 MW) ultimately. Under the 2\textsuperscript{nd} phase, it was proposed to develop a cascade of run-of-river plants on river Krishna between Narayanapur and Thamankal with an installed capacity of 960 MW.

15.05 It was indicated in the detailed project report that the FRL required at Alamatti to utilize 173 TMC under the project was 519.6 m (as per further studies done by IISc taking into consideration 50 years sedimentation) and that the storage between RL 519.6 m and RL 524.256 m would be used for power generation until such time surplus waters become available for irrigation under Scheme-B.

15.06 The project report was sent to CWC through GOK letter No.ID 55 WUD 93 dated 20.04.1996 for according necessary clearances.
16.0 **Dispute relating to Alamatti gate height:**

16.01 During the process of technical examination of the detailed project report by CWG, the height of crest gates of Alamatti dam as contemplated by GOK became an issue of major dispute with Andhra Pradesh. There were court cases in Andhra Pradesh High Court as well as in Supreme Court. Finally, the Supreme Court in its order of April 2000 permitted Karnataka Government to limit the FRL / gate level to 519.6 m only. More details on this issue are given in the chapter on “Dispute regarding height of Alamatti Dam”.

16.02 In the meanwhile, the estimate of the Stage-II project was up-dated to Rs.2,849.06 crores at 1998-99 level of rates.

17.0 **Clearances to the Stage-II Multi-purpose Project by GOI and finalisation of the DPR of the year 2000:**

17.01 Consequent to the Supreme Court order, the Project Report of Stage-II was discussed in the 73rd meeting of the Advisory Committee of Planning Commission held on 31.05.2000. After thorough discussions in the meeting, which was attended by the representatives of Maharashtra and Andhra Pradesh also, the Committee accepted the project limiting the FRL / gate level of Alamatti dam to 519.60 m subject to certain conditions.

17.02 Thereafter, the project was suitably modified taking into consideration the earlier comments of CWG and the conditions stipulated by the Advisory Committee at the time of accepting the project. The estimated cost of the 2nd Stage Multi-purpose Project (Irrigation component), as modified and finalized in September 2000, was Rs.2358.27 crores at 1998-99 level of rates. Consequently, the Planning Commission communicated its acceptance of the UKP Stage-II Multi-purpose Project (Irrigation portion) estimated to cost Rs.2,358.86 crores at 1998-99 level of rates subject to certain conditions vide Planning Commission's letter No.2(10)99/WR dated 13.12.2000 (copy enclosed as Annexure-18). Following are some of the important conditions stipulated by the Planning Commission:-

(i) The operation of the reservoir under all conditions should be such that there will not be any submergence in the territory of Maharashtra.

(ii) As per the verdict of the Supreme Court, the FRL will be restricted to 519.60 m and there would be no physical capacity to store more water above 519.60 m.

(iii) The utilization of the Krishna river water shall not exceed 173 TMC under Stage-I and Stage-II of UKP.

17.03 The important salient features of the project, as cleared by the Planning Commission, are as under:-

(i) Raising the FRL of Alamatti dam to 519.60 m from 512.2 m as approved under Stage-I.

(ii) ARBC lift canal to irrigate an area of 16,100 ha.

(iii) Rampur LI scheme from Narayanapur reservoir to irrigate an area of 20,235 ha.
(iv) NRBC to irrigate an area of 84,000 ha.
(v) Indi lift scheme from NLBC to irrigate an area of 41,900 ha.
(vi) Mulwad lift canal from Alamatti reservoir to irrigate an area of 30,850 ha.
(vii) Extension of ALBC to irrigate 4,035 ha.
(viii) Balance works of Alamatti dam.
(ix) Providing irrigation to a CCA of 1,97,120 ha under Stage-II, the intensity of irrigation and water utilization being 115% and 54 TMC respectively.

17.04 In the meanwhile, the Ministry of Environment and Forests, GOI communicated the environmental clearance to UKP Stage-II subject to certain conditions vide its letter No.J-12011/30/96-IA-1 dated 04.10.2000 (copy enclosed as Annexure-19).

17.05 In the DPR of September 2000, it is mentioned under "Power Component" that the power development in UKP is proposed to be taken up in 2 Phases. During the 1st Phase, construction of power house at Alamatti dam with an installed capacity of 297 MW (4 units of 70 MW and one unit of 17 MW) is proposed. In the 2nd Phase of the power project, it is proposed to develop a cascade of run-of-river plants on the Krishna between Narayanapur and Thamankal with an installed capacity of 960 MW and also increase the installed capacity of Alamatti power house to 367 MW (5 units of 70 MW and one unit of 17 MW). It is also mentioned in the report that, to facilitate viable power generation during the monsoon months, it has been proposed to keep the water level in Alamatti reservoir at FRL of 519.60 m limiting the actual irrigation water utilization to 173 TMC only during the year. It is further indicated in the project report that the power project report was being prepared and dealt with by KPCL separately.

18.0 Status of the Project as in August 2003:

18.01 As per the brochure prepared by KBJNL in the context of the visit of the Chairman of the Revenue Reforms Commission to the Project on 30.08.2003, following is the status of the Project:

(i) Narayanapur dam is completed in all respects.
(ii) Alamatti dam is completed in all respects.
(iii) Narayanapur Left Bank Canal (78 KM length) is completed.
(iv) Shahapur Branch Canal (76 KM length) is completed.
(v) Mudbal Branch Canal (50.8 KM length) is completed.
(vi) Indi Branch Canal (Length 172 KM) is completed. Water is allowed for irrigation upto KM 133 and trial run is being done from KM 133 to KM 172.
(vii) Jewargi Branch Canal (length 86 KM) has been completed from KM 0 to KM 70. Lining works from KM 71 to KM 86 are in progress and are expected to be completed shortly. Water has already been allowed in the canal for irrigation upto KM 70.
(viii) Alamatti Left Bank Canal (103 KM) is completed from KM 0 to KM 50 and works from KM 51 to KM 68 are in progress. From KM 68 to KM 80, tendering process is under way. Water has been allowed for irrigation upto KM 50.

(ix) Narayanapur Right Bank Canal (95 KM) has been completed. Water has been allowed for irrigation upto KM 70.

(x) Alamatti Right Bank Canal (length 67 KM) is nearing completion from KM 0 to KM 28 and works are in progress from KM 29 to KM 67.

(xi) Under Mulwad Lift Irrigation Scheme, the 1st Head work near Baluthi is completed and the 2nd Head work near Hanumapar is in progress. The works of the East Canal upto 17.5 KM and West Canal from KM 0 to KM 85 are in progress.

(xii) Under Rampur Lift Irrigation Scheme, the 1st Head work near Rampur (Navali) has been completed and the 2nd Head work near Anegosur is in progress. The lead off canal from the 1st Lift delivery chamber upto to the jackwell of the 2nd Lift is completed. Works in the East and West Canals for a length of 10 KM have been completed and the remaining works are in progress.

(xiii) The Head works of Indi Lift Irrigation Scheme and the works of the Canal from KM 0 to KM 96 are in progress.

18.02 Following Table gives a picture of the status of irrigation potential created and water utilization achieved upto end of March 2003:-

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Canal</th>
<th>Planned CCA in ha.</th>
<th>Irrigation potential created upto end of March 2003</th>
<th>Planned water utilization in TMC</th>
<th>Actually utilized upto end of March 2003</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>All the 173 TMC is actually utilized by adopting higher irrigation intensity, raising the summer crops and meeting the increased needs of drinking water due to drought situation.</td>
</tr>
<tr>
<td>Stage-I:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>NLBC</td>
<td>47,223</td>
<td>53,590</td>
<td>13.10</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>SBC</td>
<td>1,22,120</td>
<td>1,09,091</td>
<td>34.00</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Mudbal Branch Canal</td>
<td>51,000</td>
<td>45,015</td>
<td>14.10</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Indi Branch Canal</td>
<td>1,31,260</td>
<td>1,25,604</td>
<td>37.50</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Jewargi Branch Canal</td>
<td>57,100</td>
<td>44,467</td>
<td>15.80</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>ALBC</td>
<td>16,200</td>
<td>7,000</td>
<td>4.50</td>
<td></td>
</tr>
<tr>
<td>Sub-total for Stage-I:</td>
<td>4,24,903</td>
<td>3,84,767</td>
<td>119.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage-II:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>NRBC</td>
<td>84,000</td>
<td>44,690</td>
<td>22.40</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>ALBC extension</td>
<td>4,035</td>
<td>-</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>ARBC</td>
<td>16,100</td>
<td>-</td>
<td>4.50</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Mulwad LI Scheme</td>
<td>30,850</td>
<td>-</td>
<td>8.50</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Rampur LI Scheme</td>
<td>20,235</td>
<td>-</td>
<td>5.60</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Indi LI Scheme</td>
<td>41,900</td>
<td>-</td>
<td>11.90</td>
<td></td>
</tr>
<tr>
<td>Sub-total for Stage-II</td>
<td>1,97,120</td>
<td>44,690</td>
<td>54.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total for UKP Stage-I and Stage-II.</td>
<td>6,22,023</td>
<td>4,29,457</td>
<td>173.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18.03 The following Table gives a picture of the contemplated CCA and water utilizations under the various components of the project under Scheme 'B' (to utilise 129 TMC):-
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Component</th>
<th>Contemplated CCA in ha.</th>
<th>Contemplated water utilization in TMC.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ALBC (Chimmalgi Lift)</td>
<td>80,940</td>
<td>22.50</td>
</tr>
<tr>
<td>2.</td>
<td>NRBC (Extension)</td>
<td>72,000</td>
<td>22.50</td>
</tr>
<tr>
<td>3.</td>
<td>ARBC (Thimmapur Lift)</td>
<td>16,900</td>
<td>5.50</td>
</tr>
<tr>
<td>4.</td>
<td>Mulwad L.I.Scheme (Kudagi Lift and Mulwad Lift)</td>
<td>1,80,750</td>
<td>56.50</td>
</tr>
<tr>
<td>5.</td>
<td>Rampur L.I.Scheme (from Ane Hosur Lift)</td>
<td>12,800</td>
<td>4.00</td>
</tr>
<tr>
<td>6.</td>
<td>Indi L.I.Scheme</td>
<td>19,000</td>
<td>4.50</td>
</tr>
<tr>
<td>7.</td>
<td>Herkal L.I.Scheme</td>
<td>33,180</td>
<td>10.50</td>
</tr>
<tr>
<td>8.</td>
<td>To be adjusted / allocated</td>
<td>NA</td>
<td>3.00</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>4,15,570</strong></td>
<td><strong>129.00</strong></td>
</tr>
</tbody>
</table>

18.04 The total irrigation potential created under the project since inception upto end of October 2003 is 4,39,775 ha. The balance irrigation potential of 1,88,615 ha is proposed to be fully created by the end of 2004-2005.

18.05 The total expenditure on the project since inception upto end of October 2003 is Rs.11,780.32 crores which includes repayment of interest amounting to Rs.2680.25 crores on funds borrowed by KBJNL and repayment of principal amount of Rs.1703 crores.

18.06 The latest revised costs of UKP Stage-I and Stage-II are Rs.5613.83 crores and Rs.2954.58 crores respectively, at 2000-2001 level of rates. The Stage-I is expected to be completed by March 2004 and Stage-II by March 2005.
CHAPTER 3*

NARAYANAPUR AND ALAMATTI DAMS

1.0 **BACKGROUND:**

The first project report of Upper Krishna Project (UKP) was prepared and sent to the Central Water and Power Commission (CWPC) during the year 1960. It was proposed to irrigate an area of 12 lakh acres by utilizing 206 TMC of water. After further examination, the project was modified during the year 1963 envisaging construction of two dams, one at Alamatti and the other at Narayanapur and execution in three stages with an ultimate utilization of 340 TMC of water. The work relating to foundations of Alamatti dam and Narayanapur dam was taken up in 1963. The features of the locations of the dams, shifting of the sites and foundation problems encountered during execution, modifications effected to the flood hydrology & providing additional spillways to Narayanapur dam and changes in the design of Alamatti dam, are explained in the following paragraphs:

2.0 **NARAYANAPUR DAM:**

2.01 Original location near Narayanapur village:

(1) The Narayanapur dam site was proposed to be located between Narayanapur village of Shorapur taluk of Gulbarga district and Halbhavi village of Lingasugur taluk of Raichur district, at Latitude 16° 15' 0" N and Longitude 76° 25' 0" E.

(2) The river near the dam site runs through rocky bed and drops at Chaya falls by about 120 feet about a mile below Narayanapur dam site. The dam site was located across the main river and the Devargudda branch. The total length of the dam proposed was 13,900 feet, out of which 1,916 feet was to be the masonry spillway in the main river portion, the remaining portion being earthen dam.

(3) The alignment of the earthen dam on the left flank was to stretch towards the Nagabenal ridge, while on the right flank it was aligned along the ridge of the Devargudda island and crossing the Sunkal stream towards a ridge point. The site was approved by the competent authority.

2.02 Visit of the Union Minister for Irrigation & Power:

Dr. K.L. Rao, the then Hon'ble Union Minister for Irrigation and Power inspected the Alamatti and Narayanapur dam sites on 17th and 18th of April 1964 along with Sri. Veerendra Patil, Hon'ble Minister for PWD, Mysore State and officers of the Mysore Government and noted the following points.

"The Narayanapur dam site Left Bank has a crawling earthen bank for nearly 2 ½ miles. The alignment has been taken over the ridge but unfortunately the ridge is full of stone boulders and the removal of these to a satisfactory..."

(*) Source of this chapter:
(1) Note of Chief Engineer (O&M), Narayanapur.
(4) Documents / Records of UKP Dam Zone, Alamatti.
foundation would present considerable difficulties. Nearly 20 million cubic yards of work has to be done which needs to be reduced. I, therefore, feel that other alternative site at Siddapur, about 3 to 4 miles upstream must be investigated very quickly. By locating the dam there, there will be some loss in the reservoir capacity but this can be eliminated to the extent of increased storage that will be obtained in the Almatti dam. Also, the height of the Narayanapur dam may be increased by 10 feet which in turn may not affect the temple at the confluence. This has to be carefully ascertained further. Investigation of the new site must be carried out as expeditiously as possible. If preliminary investigations show reduction of work and not appreciable amount of loss in capacity, the new site should be adopted for construction. As soon as field data is obtained, C.W. & P.C. must be consulted and no time should be lost in finalizing the site."

2.03 Examination of alternative sites at Siddapur:

(1) The proposal of the then Union Minister for Irrigation & Power was accepted by the State Government in G.O. No. PWD 11 MUK 63 dated 17.09.1964 and the foundation work already taken up for Narayanapur dam was abandoned. Thereafter, two alternate sites were examined at Siddapur village. The geological conditions of the two proposed alternate alignments were as under:

(A) Alignment No.1:

Massive granites were exposed over a wide area along the alignment in the river bed with a few mounds of pink granites which were jointed and rendered bouldery. Massive pegmatites were found out-cropping over a wide area along the alignment. Black cotton soil of 10 feet to 15 feet was seen on the edges of the second Island and towards the edge of the river course on the Right Bank. The flanks were composed of red soil and weathered granite with gentle slope towards the river, suitable for good abutments.

(B) Alignment No.2:

(i) The river course was composed of pink granite floor with less of joint system. The granite was massive and continuous. The major portion of this alignment was devoid of bouldery formation, transported boulders and silt. Islands of bouldery granites and soil ridges along the alignment in the river bed were relatively less. The conditions of soils and the behaviour of flanks were very similar to those met with in alignment No.1. The depth of weathering on the flanks appeared to be less than in the flanks of other alignment. The extent of black cotton soil was very much less. The proportion of pegmatites found along the alignment was appreciably less. Major geological structural defects like faults, shear zones, etc., did not appear to be present.

(ii) The geological study indicated that suitable foundation conditions existed along both the alignments. Between these two, alignment No.2 merited consideration since continuous granite rock floor was exposed throughout the width of the river bed with incipient joint system, and was devoid of pegmatites, veins, bouldery outcrops of rocks and transported materials.

(iii) Based on the above conclusion, the alignment No.2 was selected. Even though this site was near Siddapur village, the dam was called by its earlier name viz 'Narayanapur dam'. 
In August 1967, with a view to providing a terminal reservoir on river Krishna within the State boundary and bringing in more area under irrigation by having a higher storage and also since it was submerging large extent of lands including the Sangama temple, the proposal to construct the lower dam at Siddapur was given up and it was decided to locate the lower dam at Narayanapur as originally planned vide G.O. No. PWD 11 MUK 63 dated 26.08.1967 (copy enclosed as Annexure-1).

However, consequent on further investigations conducted by the newly created Irrigation Projects Zone at Dharwad (created in August 1967), it was proposed in 1968 to have the lower dam at Siddapur itself, which was approved (as Upper Narayanapur site) by Government in May 1968. It is at this site the dam has now been constructed.

2.04 Dam site:-

(1) The Left Bank of Narayanapur dam is situated near Siddapur village of Muddebihal taluk, Bijapur district and the Right Bank near Javoor village of Lingsugur taluk of Raichur district. The site is situated at a Latitude of 16° 10' 0" N and Longitude of 76° 26' 0" E. The river near the dam site runs through rocky bed. The dam site is located across the main river and Mailgadda branch.

(2) The alignment of the dam is straight across the river and is turned upstream both on the left and right flanks so as to reduce the length of the dam. On the right, it is further aligned along the ridges between Mailgadda branch and Sunkal stream. Near Chitapur village, there is a low saddle in the ridge along the alignment.

(3) Geology & Foundations:-

(a) In the foundation the rock types in the dam site are gneisses and granites. All these are massive and hard rocks, but jointed. No major dykes were identified in the region of the dam. No major defective structures such as faults and shear zones were noticed within the area. The river bed proper was exposed with pink grossive and flanks were composed of soil sand and weathered granite with gentle slope towards the river.

(b) The general condition of foundation of Narayanapur dam for earth dam, spillway and non-overflow section was good and no serious foundation problems were encountered during execution.

(c) The seepage observed during the excavation of foundation for masonry non-overflow section and spillway portion was normal.

2.05 Problems in the Dyke portion:-

(1) Though the main Narayanapur dam was built without any problem, a major problem was faced in the construction of Dyke portion of the dam. The problem found was in the form of BC soil over-burden of about 6 meters over the murrum layer along the alignment of the dyke. Construction of dyke could not be started on the BC soil over-burden with only the base stripping as is usually done for an earthen dam. The characteristics of the over-burden were studied in detail. It came to the notice that as the construction of the dyke progresses, the process of consolidation and consequent settlement would be dangerous for the safety of the dyke as it would result in cracks in the embankment. The conventional approach in the case of such problems would be to
get the over-burden removed irrespective of the cost and construct the earthen dam on good foundations. Instead of adopting this conventional method, the authorities examined other alternatives which would not only be economical & effective but also ensure the safety of the structure. The alternative finally approved was the construction of vertical sand piles. It was considered that the sand piles would hasten the process of consolidation of the BC soil over-burden in such a way that, by the time the construction of the earth dam is completed, major process of consolidation would be over and that there will be no danger to the safety of the structure. A bold decision was taken to introduce vertical sand piles of 30 cm dia and 10.50 mt depth and placed at 2.5 mt center to center staggered in the entire base width of the earthen dam. The dyke of Narayanapur dam was constructed accordingly. The decision so taken resulted in considerable economy without affecting the safety of the structure as otherwise the removal of over-burden in the entire length and breadth of the earthen dam would have involved considerable cost and time.

(2)(a) The problems of dyke of Narayanapur dam did not end with the solution to the foundation problem and completion of construction. After the completion of construction and before the construction of the main Narayanapur dam was completed and water impounded, it was noticed that huge quantity of water had to be regularly pumped out of the drainage system. This problem was examined by the Expert Panel appointed by the Government of Karnataka at the instance of the World Bank. The Expert Panel, after a detailed examination of the site, suggested construction of a positive cut-off trench at a little distance on the upstream by using earth moving equipment. The strata at this location was so much saturated that the movement of earth moving equipment became impossible and attempts to excavate a trench had to be given up.

(b) The problem was placed before the Technical Committee which felt that a proper and appropriate remedy for the problem can be found only when the cause of the problem is identified. The problem was thereon referred to CWPRS, Pune, to identify the root cause of the problem. After extensive field and laboratory studies, the CWPRS identified the cause of the problem to the existence of a buried valley below the dyke, extending on the upstream direction and finally day lighting on the river Krishna. The depth at which the buried valley existed was also identified.

(c) Further investigation work was entrusted to M/s.Geo-Engineering Company, Bangalore. With the report of investigation of the problem, the matter was again placed before the Technical Committee for advice. After a detailed examination, the Committee suggested construction of a concrete cut-off wall, stating that the excavation of a trench in a strata fully saturated was almost impossible. A methodology for construction of the concrete cut-off wall involving a Bentonite slurry trench was also suggested. Accordingly, a protective impervious diaphragm wall with cement bentonite slurry was provided for 300 m length of the dyke portion upto rock level to overcome the seepage through the underlying pervious strata. It is more than 20 years since this has been implemented, and the Narayanapur dam in general and the dyke in particular has been functioning satisfactorily.
2.06 Review of flood intensity and providing additional spillways for Narayanapur Dam:

(1) According to the project report of December 1976 of UKP Stage-I, the technical features relating to the Design flood and spillways of Narayanapur & Alamatti Dams were as follows:

<table>
<thead>
<tr>
<th>Narayanapur Dam</th>
<th>Alamatt</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Crest level</td>
<td>480.252 m</td>
</tr>
<tr>
<td>(ii) FRL</td>
<td>492.252 m (1615 ft)</td>
</tr>
<tr>
<td>(iii) Top of dam</td>
<td>495.752 m</td>
</tr>
<tr>
<td>(iv) Designed flood intensity</td>
<td>31,160 cumecs (11 lakh cusecs)</td>
</tr>
<tr>
<td>(v) No. and size of crest gates</td>
<td>25 Nos. of 15m x 12m (Radial type)</td>
</tr>
</tbody>
</table>

(2) When the Phase I of UKP Stage-I was appraised by World Bank in 1977, both Narayanapur and Alamatti Dams were under construction. Whereas Narayanapur Dam was in an advanced stage of construction, Alamatti Dam was in its initial stage of construction.

(3) The World Bank Consultants reviewed the designs of both the dams in 1977 and furnished a report where upon a panel of the following experts was constituted to examine the detailed designs as well as the report of World Bank Consultants and to make suitable recommendations:

| (i) | Sri. Y.K. Murthy, Chairman, CWC, New Delhi |
| (ii) | Sri. I.M. Magdum, Retd Spl. Secretary, PWD, GOK, Bangalore |
| (iii) | Sri. P.M. Mane, Retd Member (Design & Research) CWPC, Bombay |
| (iv) | Sri. M.S. Balasundaram, Retd Directed General, GSI, Madras |
| (v) | Prof. R.K. Katti, Head of Civil Engg. Dept (soil Mechanics) IIT, Bombay |
| (vi) | Sri. A.S. Ramanathan, Director of Hydrometeorology, IMD, New Delhi |
| (vii) | Sri. G.S. Shivanna, Director, KERS, K.R. Sagar |
| (viii) | Sri. P.R. Bellubbi, CE, UKP, Alamatti |

(4) Regarding the design flood, the World Bank Consultants, who made studies in May 1977, had made the following recommendations on peak discharge values:
(i) Almatti 28,300 cusecs 40,100 cusecs
   (9.99 lakh cusecs) (14.15 lakh cusecs)
(ii) Narayanapur 34,000 cusecs 43,300 cusecs
      (10.95 lakh cusecs) (15.285 lakh cusecs)

Certain assumptions had been made by the World Bank Consultants in the studies. Against these values, the maximum flood adopted by the project authorities for spillway design at Almatti was 8.25 lakh cusecs and at Narayanapur it was 11 lakh cusecs.

(5) The Expert Panel constituted in 1977 to review the designs taking into consideration the report of the World Bank Consultants, after conducting detailed studies, gave its report in January – February 1978 on all the 10 issues referred to it (vide copy enclosed as Annexure-2). The recommendations of the Panel of Experts were accepted by Government of Karnataka, Government of India and the World Bank. Their observations / recommendations relating to the design flood were as under:

" (i) On the basis of extensive rational studies on design flood computations, the probable floods are estimated to be as below:-

   Almatti 9,45,000 cusecs
   Narayanapur 9,64,000 cusecs.

(ii) Frequency studies with limited data indicated the following value for a return period of 10,000 years with 95% upper confidence limit:-

   Almatti 10,95,000 cusecs
   Narayanapur 13,40,000 cusecs.

(iii) The I.B.R.D. design flood peaks are –

   Almatti  Narayanapur
   Indian Storm 9,98,920 cusecs 10,95,000 cusecs
   Mexican Storm 14,15,500 cusecs 15,28,500 cusecs

(iv) The panel of Experts are of the opinion that a design flood of 10,95,000 cusecs and 13,40,000 cusecs for the Almatti and Narayanapur Dams respectively are adequate on the basis of rational analysis and frequency studies for Indian conditions. It is recommended that the spillways be designed for these design floods with 10% of the gates non-operative. However, the surplussing capacity of the spillways are checked to be safe for the I.B.R.D. design floods of 14,15,000 cusecs for Almatti and 15,28,500 cusecs for Narayanapur with all the gates as operative. Encroachments on the free board are small and may be accepted for these design floods.

(v) Modifications in the spillway and the gates will be necessary for Almatti whereas additional spillway capacity at Narayanapur has to be provided."
Regarding the spillway capacity needed to pass the revised design flood, the panel of Experts made the following recommendations:

"Narayanapur Dam:"

(i) The spillway bays should be increased from the present 25 to 30. It is possible at the present stage of construction to provide these additional 5 spillway bays between Ch. 83 to 95. The encroachment on the free board will be about 0.6 m for 13.4 lakh cusecs and about 0.9 m for 15.28 lakh cusecs.

(ii) The free board provided on the Earthen Dam portion is not adequate and should be increased by 0.34 m.

(iii) The energy dissipating arrangements require modifications. Alternate studies may be conducted with three dimensional models before decision is taken on the modifications necessary.

(iv) An alternative of constructing a low subsidiary weir at a suitable distance on D/S to enable build-up of the required height of tail water to force the formation of hydraulic jump for energy dissipation is thought of.

(v) The site conditions were inspected to study the problem. Construction of a subsidiary weir is feasible at a reasonable cost. The tentative location and alignment of the subsidiary weir is shown in enclosed drawing No. 56.

(vi) The subsidiary weir will have sufficient openings located in the bed in portions where rock explosives are at the lowest level so that the pocket between main dam and subsidiary weir will get drained out.

(vii) The section of subsidiary weir should be flat top to serve as a broad crested weir with vertical U/S face and a suitable uniform slope on D/S required for stability under the worst hydraulic conditions.

(viii) The subsidiary weir of length 3280 ft (1000 m) is recommended to be located approximately at a distance of 450 ft. from the toe of the main dam.

(ix) In the main spillway from block No. 12 to 37, the excavation of rock below the flip portion as required by the original design has been carried out. This may be filled back with concrete of the same grade as the face of the spillway but finished flat to correspond to the level of the spillway bottom at the construction joint or to a suitable slope downwards thereafter to abut against the D/s end of the excavated rock.

(x) No training walls need be constructed beyond the toe of the dam against the block No. 37 and 52 and above at river sluices.

(xi) All the above recommendations are subject to the confirmation to 3 – D model studies.

"Alamatti Dam:"

(i) The crest of the spillway should be lowered by 2 m. and the gate height be correspondingly increased by 2 m. The encroachment on the free
board will be about 0.2 m for 10.95 lakh cusecs and 1.22 m for 14.15 lakh cusecs.

(ii) Further hydraulic model studies to determine the length of the stilling basin are required for dissipating the energy for the revised designed flood discharge indicated earlier. After the results become available necessary changes in the design should be effected.

(iii) The right side training wall may be extended beyond the end sill but splayed out at about 30° to center line of the river flow for a length of about 300 ft to 500 ft. The extensional training wall may be located along the exposures of well defined hard rock mound.

(iv) The tail channel of the power house can have a suitable bend beyond the end weir so as to follow the present deep channel. Thus, the chances of heavy debris getting deposited in the tail channel of the power house can be eliminated.

(v) The part of the excavated spoil dumped on the Left flank of the river may be utilized in the balance work of the Left Bank Earth Dam in the U/s and D/s shoulders of free draining material. The spoil so removed commencing from the left end which is more or less in line with left training wall will provide a lead channel for the spill from the left end block.

(vi) The pocket behind the left training wall has to be filled up to some height. The excavated spoil in continuation of the channel mentioned above can be used, thus helping automatically widen the channel.

(vii) There is need for training wall or a guide bund on the left in continuation of the left training wall to prevent formation of return flows. The spoil next to the channel, which contains a substantial portion of large size stones can be dumped as a guide splaying at about 20° to 30° and to a length of about 300 ft.

(viii) It is suggested that these layouts be tried as 3-D model. Such a model need not be very large as the results aimed at will be more of qualitative nature than quantitative ones like velocities etc."

(7) In accordance with the above recommendations of the Experts Panel, the design of both the dams was suitably modified. As for Alamatti Dam, there was no problem in straight away adopting the revised design flood as the dam was in its initial stage of construction. But for Narayanapur dam, as the dam was in an advanced stage of construction considering 25 spillway gates, 5 additional spillway gates had to be provided in the right flank of the dam to accommodate the revised design flood.

3.0 ALAMATTI DAM:-

3.01 Examination of alternative sites:-

(1) Three sites for the Alamatti dam were considered; site No.1 being the downstream most, site No.2 being about 500 feet upstream of site No.1 and site No.3 being about 1000 feet upstream of site No.1. Site No.3 appears to have been ruled out in view of locating hard granite in major portion of the river bed and also being the
lengthiest. However, it is not known whether the various sites were examined by the MIPC Board or the Technical Sub-Committee thereof at any time. It appears geological experts were also not consulted before selecting the site.

(2) In 1962, the then Senior Geologist inspected all the three sites and gave his report wherein he categorically indicated that the site No.3 was totally not satisfactory. He indicated existence of a highly weathered junction between granite and quartzite in the river bed itself near the right bank where quartzite was either eroded away or was in decayed condition. He advised for further probing of this junction with inclined bores. He also indicated that the site No.1 could be free from this defect and showed preference thereto.

(3) The above geological report seemed to have not been seriously considered and no further probings were done. But, the work of excavation for foundation was started in 1964 on the flanks along the site No.2. The estimates were also prepared based on site No.2.

(a) The excavation further revealed the following major defects:

(i) Existence of another highly weathered zone in the granite just near the left flank in Ch.19 to 20 and the weathering had penetrated to more than 120 feet below the river bed level.

(ii) The granite rock in ch. 10 to 12 suddenly dipped down practically vertical within the downstream heel.

(iii) The detailed probing done along and across the right side junction with quartzite and granite indicated 30 feet to 40 feet thickness of loose material and weathered quartzite. The granite rock within had a highly sloping profile along the dam cross section, sloping down at 1:1 towards upstream. The level of granite met with at the heel was 1482 feet or nearly 120 feet below the river bed level of 1600 feet.

(b) The existence of the two weathered zones both on the right and left meant a lot of expenditure to found the dam sections in these zones. In addition, it was not possible to locate both the spillway of about 1400 feet in length and the power dam of about 450 feet in length as well as the river sluice blocks of about 150 feet in length, within the river bed which was about 1500 feet long within the two deep pits. Therefore, it became obligatory to locate the power dam within the extreme left flank in ch. 15 to 19 requiring deep approach and exit channels.

(c) It also became obligatory to shift the dam alignment to the downstream by atleast 100 feet on the right side and about 30 feet on left side so as to avoid the precipices in the granite rock near the heel. This meant practically re-excavation of foundations in the flanks regardless of the work already done.

(4) In view of the above implications, it became desirable to consider the alternative of abandoning the site No.2 altogether and adopting the site No. 1 which would be free from all these major defects. Additional bores were taken along this line and the junction of quartzite and granite on the right side was explored. The junction happened to be beyond the river bed and quite tight. Also the quartzite layers were highly compact, massive and tight. The soft zone in the left flank was located to be firstly not so deep (only about 30 feet lower than the river bed) and located far away towards the flank i.e., in ch.14 to 15. As such, the entire river bed between ch.20 to 41
(2100 feet) was available for locating the spillway, the power dam and the independent river sluice blocks. No approach channels and tail channels needed to be provided since the river bed itself was available therefor. Further, the condition of the bed rock was also superior to site No.2 since the rock levels in the flanks were higher and the bed rock was free from horizontal fractures below the foundation levels.

(5) The length of the dam with top level at 1732 feet (for FRL 1720 feet) was assessed as 5158 feet along the site No. 1 and 5967 feet along the site No.2, thus saving a length of nearly 309 feet by adopting the site No.1.

(6) Comparative estimates prepared for both the alignments i.e., site Nos.1 and 2, also indicated considerable saving by adopting site No.1.

3.02 Opinion of the Geologist on the abandoned alignment No.2:-

(1) Consequent on the decision to abandon the site No.2 regardless of the excavation already done and to adopt the site No.1, the opinion of the Assistant Geologist in Narayanapur was obtained. He analysed the merits and demerits of the site No.2, as explained below:

" Merits:-

There are only two main rock types encountered in the dam, the underlying granite gneisses which form basement rock and bedded quartzites belonging to Kaladgi series dipping at 10° to 15° upstream. The length of the dam is about 5200 feet. Quartzites are found only in the abutments. The main portion of the dam will rest on the hard and compact granitic basement.

Demerits:-

One of the drawbacks along this alignment is the abnormal and anomalous conditions encountered in borehole No. 5 which has not revealed any hard rock although it has been drilled to a depth of 74 feet indicating therein the existence of a high weathered and sheared junction between granite and quartzite. There is existence of another highly weathered zone in the granite just near the left flank between ch. 19 to 20. The weathering has penetrated to more than 120 feet below the river bed level."

(2) The Geologist was of the opinion that the existence of the two weathered zones on the right and left flanks meant a lot of expenditure to found the dam section in these zones. He was also of the opinion that it was impossible to locate the spillway of about 1400 feet in length and the power dam of about 450 feet in length as well as the river sluice blocks of about 150 feet in length within the river bed which was only about 1500 feet long within the two deep pits. Concluding his opinion, the Geologist stated that, in view of the above implications, the site No.2 was altogether abandoned and site No.1 was adopted. It is at the site No.1 the dam has now been constructed.

3.03 Review of adequacy of investigations for foundations and the treatment thereon:-

(1) When the foundation work of the Dam was in progress, the panel of Experts that had been constituted in 1977 was also consulted about the adequacy of the investigations for foundations of the Dam and the treatment thereon. The issue referred to the Experts Panel for examination was:
Whether the foundations have been adequately investigated and grouted to ensure that no troublesome rock fissures exist which have not been adequately grouted or treated in this regard; they may also examine the fault zone in the right abutment of Alamatti Dam and recommend how it should be treated and what hazard or risks might remain. 

(2) The Experts Panel gave its report in January – February 1978. Regarding the issue in question, the observations and recommendations of the Experts were as stated below:

"(A) Alamatti Dam:

The rock types in the Dam site area are gneisses and granites in the bed, with quartzite (Lower Kaladgis – Upper Protetozoic) in the abutment. All these are massive and hard rocks but jointed.

The investigations were made chiefly to determine the extent of overburden and grade of acceptable foundation rock. Since the rock in the bed of the river was of similar nature, 64 bore holes with a total depth of 1136 meters are considered adequate to obtain the bed rock conditions. In the gneisses and granites except the dolerite dykes and joint patterns there were no other special features to be established. In the case of quartzite also the joint patterns were relevant.

The results of consolidation grouting done so far in the completed portion show consistently small intake (generally varying from 0.08 to 1.4 bags per Rmt). Even the inclined holes have not taken much grout. It is desirable that the grouting be done in other areas to suit the joints pattern rather than adhering to regular pattern, to be effective and economical.

In the Alamatti Dam curtain grouting has not yet been taken up in the masonry dam portion.

(B) Fault Zone in Block No.45:

The prevalent rocks are basement gneisses overlain un-conformably by the quartzite dipping 10° - 15° in the North Westerly direction. At Ch. 1353.6 M and elevation 478 m the granites are in justa position with quartzite on the right bank. The contact is a fault affecting the basement rock extending across the dam. On the upstream it is met at Ch. 1346 M and on the down stream it emerges at Ch. 1359 M with a trend of N 27° W – S27° E. The fault is clear cut and has a thin clay gauge of few inches and the badly affected portion on either side is half a Meter. Including the fracturing it has produced, the width involved in granite / quartzite (fresh) is 5 to 6 meters.

(C) Treatment for the Fault Zone:

The present excavation elevation in this fault zone is 478 m. It is 6 meter below the general foundation in block 45. It is suggested that the concrete be placed in the entire trench in the form of an arch for a thickness of 2 meters and a width of 8 meters to transfer the loads to the competent adjoining rocks.

The additional transverse gallery along the fault zone at an elevation of 486 m is recommended to facilitate special grouting by vertical / or angle holes
to cover the weathered area adjoining the fault, which should be done to sufficient depth besides consolidation grouting of the fractured granites and quartzites on either side of the fault.

Additional grouting in front of the fault (heel) will be done radially in all three directions for a depth of ten meters besides an excavated trench in the heel that will be back filled with impervious material of one meter thickness and extended as a blanket one meter thick for a distance of 40 meters and a width of 8 to 10 meters. This will ensure prevention of access of water to the fault plane.

By filling in the fault zone area of 2 m thick and 8 m wide with an arch and provision of transverse gallery for special grouting together with the deeper additional curtain grouting, the fault could be treated adequately and rendered safe.

For consolidation grouting of the faulted contact four rows of holes as described in the detailed report may be adopted. One series of holes will be on the Granite side and the other three series will be on the quartzite side. The spacing and depth of these holes may be as mentioned in the detailed report.

As seen in the exposive of quartzite there are soft fillings along the bedding and fractures. These may be removed wherever exposed and plugged by hand placed concrete.

The folded quartzites showing dry effects and fracturing both on the U/S heel and downstream toe at the end of excavation at the vertical cut in block No. 45 towards right abutment will have to be grouted.

By carrying out the above remedial treatment the fault plane will have rendered safe.”

(3) The report of the Panel of Experts was accepted by GOK, GOI as well as by the World Bank and its recommendations duly implemented.

3.04 Changes in the design of Alamatti Dam:

(1) As recommended by the Experts Panel, the crest level of the dam was lowered by 2 m (i.e., from 502 in to 500m) in the 1st Stage and the gate height was correspondingly increased by 2 m (i.e., from 10m to 12m). The project report of Stage–I was suitably modified and this modified (Revised) project was cleared by Planning Commission vide letter No. 11-26(6)/77 I & CAD dated 22.04.1978 and administratively approved for Rs. 283.65 Cr. in G.O. No. PWD 123 GUK 78 dated 07.12.1978. As per this project report, the proposal was to construct the dam to FRL 512 m (1680 feet) in the 1st Stage (i.e., crest level of 500 m + gates of 12 m ht). In the 2nd Stage of UKP, it was contemplated to dismantle the gates erected in the 1st Stage, raise the crest level to 512 m and re-erect the gates so that the FRL in the 2nd Stage would be 524 m.

(2) Considering the problems involved in the dismantling of crest gates erected in the 1st Stage and re-erecting them in the 2nd Stage after raising the crest level of the dam, the design of the dam was changed vide G.O. No. PWD 264 GUK 81 dated 19.04.1982 providing for construction of the dam up to a crest level of 512 m without gates in the 1st Stage itself. In the meanwhile, the project report of Stage-I was suitably modified and a comprehensive estimate including Stage-II was sent to CWC through GOK letter No. PWD 264 GUK 81(P) dated 04.02.1982. The World Bank, which was assisting the Phase-I of the project, communicated its 'no objection' to the proposed
modification subject to obtaining clearance of Government of India. The CWC while putting up the revised estimate of Stage I before the Advisory Committee of Planning Commission informed of its acceptance to the revised proposal vide CWC letter No.11/3/79-TE/3000 dated 30.04.1982. As tenders had already been invited for raising the dam from RL 493.9 m (1620 ft) to 500m (1640 ft) for full width of the section (considering a crest level of 512 m i.e., 1680 ft and FRL of 524 m i.e., 1720 ft with 12m high gates) instead of Truncated section (required for crest level 500m & FRL of 512 m).

The Advisory Committee of Planning Commission, which met on 10.05.1982, cleared the proposal of constructing the dam upto RL 500 m (1640 ft) for full width of the section for purpose of onward communication to World Bank (vide CWC letter No.11/3/79-TE/2793 dated 30.06.1982.

(3) When the Dam was under construction, the issue of submersion of Bagalkot Town came up for closer examination by Government. Due to construction of the Dam as an ungated spillway with a crest level of 512 m in the 1st Stage, a major portion of Bagalkot Town would have come under submersion in the 1st Stage itself. After examining this aspect carefully, it was decided in the meeting held under the Chairmanship of the Chairman, MIPC Board on 26.08.85, which was attended by the Director (Gates Design) of CWC and the CE, UKP Alamatti, that the crest level of the Dam may be kept at RL 509.016m (1670 ft) and that 15m x 15.24 m size gates may be provided. This change was accepted in G.O. No. PWD 56 WUD 83 dated 03.12.1985. In the same G.O. approval was also given to the revised estimate of UKP Stage-I amounting to Rs. 1071.10 crore and to limit the storage to FRL 512 m (1680 ft) in the 1st Stage. After protracted correspondence, the CWC considering the urgency of clearing the Phase–II of UKP Stage-I for obtaining World Bank Assistance, cleared the Phase–II project on 21.01.1987 envisaging construction of Alamatti Dam upto FRL 512.2 m (i.e., crest level of 509 m with 3 m ht gates) as contemplated in UKP Stage–I. The CWC also agreed for fixing the embedded parts required for radial gates of 15.2 m ht. as advance planning.

(4) The project report of UKP Stage- II amounting to Rs.1215.88 Cr was sent to CWC in November 1993. This proposal envisaged construction of the Dam to FRL 521 m (1709 ft) i.e., crest level of 509.16 m plus gates of 12 m ht. It was also indicated to CWC that a FRL of 518.7 m (1702 ft) was sufficient to utilize the water of 173 TMC allocated to the project under Scheme ‘A’ of the Tribunal award.

(5) Subsequently, since power generation had also been contemplated under the project, the 2nd Stage project report was modified converting the project as a Multi-purpose project. Accordingly, this 2nd Stage Multi-purpose project envisaging construction of the Dam to its final FRL of 524.256 m (including 15.2 m ht. Gates) was submitted to CWC on 30.04.1996. It was indicated to CWC that the storage upto FRL 519.6 m (as per studies done, this was the level required to utilize 173 TMC) would be used for irrigation and the storage above that level for power generation.

(6) The matter of constructing the Dam to its final height involving 15.2 m high gates ended up in litigation with cases filed in AP High Court and later on in the Supreme Court. The Supreme Court, after hearing the cases, passed its order on 25.04.2000 permitting storage / gate height to FRL 519.6 m.

(7) Finally the Planning Commission gave its clearance to the 2nd Stage Multi-purpose project allowing construction of the dam upto FRL 519.6 m as per the Supreme Court order. As the gates had, by that time, already been fabricated for 15.2 m ht
(corresponding to FRL 524.25 m), the skin plates were cut to an extent of about 4.65 m from the top in order to limit the FRL to 519.6 m.

3.05 Changes in the design of spillway bridge:-

(1) The spillway bridge had been designed as a RCC bridge with cast-in-situ girders and deck-slab. The work of raising the Dam along with piers (including fixing of embedded parts) and spillway bridge had been entrusted in August 1991 to an agency with the stipulated date of completion as May 1996. Due to various reasons, the construction of civil works was delayed. In order to complete the work expeditiously and not to lose further precious time, an alternate proposal of completing the spillway bridge work by adopting steel girders was examined during 1997. Another proposal of adopting pre-cast RCC girders was also thought of, but this proposal was given up as it was not possible to compress the programme to the required level.

(2) The proposal of adopting steel girders was discussed in the Technical Sub-Committee meetings of KBJNL and later on the matter was referred to Dr.Y.K.Murthy, Chairman of the DSRP for advice, who in turn referred it to Sri.G.N.Tandon a Member of the DSRP. Sri.Tandon, after examining the proposal in detail, offered his views through his letter dated 04.09.1997 stating that there was no special objection to use a composite bridge with the proposed steel girders. He had, however, suggested to raise the spillway piers by 0.75 m (from the original top level of 527.065 m) so as to retain the top of RCC deck slab at the originally contemplated level of 529.24 m. But on a detailed examination of the drawings, it was found that it was sufficient to raise the piers by only 0.55 m to accommodate the steel girders of depth 0.90 m and retain the top of RCC deck slab at RL 529.24 m.

(3) After getting the designs thoroughly checked and cleared by the Gates Experts Committee, the work was completed as a composite bridge with RCC deck slab cast over steel girders.

= = = = =
CHAPTER-4*

WORLD BANK ASSISTANCE

1.0 Introduction:-

1.01 Considering the magnitude of Upper Krishna Project and the funds required for its construction, the Government decided to pose the project for World Bank assistance in phases. Even though construction of the project was started in 1963, the pace of project was very slow due to meagre funds provided to the project. As such, it was decided in 1975-76 to pose the Karnataka Irrigation Project (as it was then called) for World Bank assistance and a project report was prepared in this regard and sent to Government of India. The project included irrigation infrastructure and land development in each of the ongoing Upper Krishna, Ghataprabha, Malaprabha and Tungabhadra schemes. In 1976, the project scope was changed, partly at the suggestion of Government of India and partly because of the already advanced stage of Ghataprabha and Malaprabha projects and the nature of the work at Tungabhadra. After considerable discussions, it was finally decided to include in the project to be posed for World Bank assistance several components of Upper Krishna Project and only Field Canals & on-farm development works in Ghataprabha and Malaprabha projects. Though this project was called the Karnataka Irrigation Project, it was usually referred as Upper Krishna Project Phase-I. This project with World Bank assistance was implemented from 1978 to 1986.

1.02 During the process of implementation of Upper Krishna Project Phase-I, another project report for Upper Krishna Project Phase-II was prepared in 1985-86 for obtaining World Bank assistance and, after discussions at various levels, the Identification Report for UKP Phase-II was sent to Government of India for posing for World Bank assistance. This project was subsequently implemented from 1989 to 1997 with World Bank assistance.

1.03 Important features of both the projects implemented with World Bank assistance viz. Upper Krishna Project Phase-I (Karnataka Irrigation Project) and Upper Krishna Project Phase-II are explained in the following paragraphs.

2.0 Upper Krishna Project Phase-I (Karnataka Irrigation Project - Credit No.788-IN):-

2.01 Project Appraisal and Agreements:-

(i) The project was appraised by the World Bank in September 1977 and the Staff Appraisal Report was prepared in March 1978. In the meantime, negotiations were held in Washington during February & March 1978 between the representatives of Government of India, Government of Karnataka and the Agricultural Re-finance & Development Corporation (ARDC) on the one hand and International Development Association (IDA) on the other. This was followed by signing of the Development credit agreement, Project agreement and ARDC agreement on 12.05.1978.

(*)Source of this chapter:- 1. Records furnished by the KBJNL Corporate Office, Almatti.
2. Documents of World Bank relating to:

UKP Phase-I:
(1) Staff Appraisal Report,
(2) Development Credit Agreement,
(3) Project Agreement and
(4) Project Completion Report.

UKP Phase-II:
(1) Staff Appraisal Report,
(2) Development Credit Agreement,
(3) Loan Agreement,
(4) Project Agreement and
(5) Implementation Completion Report.
(ii) Features of the project:-

(a) The project, as per the Development Credit Agreement, comprised the following components:-

Part-A: Within Upper Krishna Scheme

(1) Completion of Alamatti and Narayanapur dams.

(2) Completion of Narayanapur left bank canal from approximately km 36 to 78, including Rajankollur tunnel (3 km), Gundalgera tunnel (1 km); and construction of Shahapur branch canal (76 km).

(3) Construction of lined / stabilised irrigation distribution and drainage systems to serve an area of about 105,000 hectares.

(4) Construction of lined / stabilised field irrigation channels to individual farms serving an area of about 80,000 hectares.

(5) Rehabilitation and upgrading of about 70 km of existing village and link roads and the construction of about 530 km of new village and link roads.

(6) Construction of field drainage channels and on-farm works, including land shaping, farm irrigation and farm drainage ditches for about 25,000 hectares.

(7) Establishment of a Land Development Training Center to train staff on the design, execution and operation & management of land development works.

(8) Implementation of a program of monitoring the water use efficiencies and economic and social impact of the project.

(9) Resettlement of families displaced due to construction of dams under the project.

(10) Establishment of an agricultural development center, agricultural research stations and other facilities.

Part-B: Within Malaprabha Scheme

Construction of lined / stabilised field irrigation channels, field drainage channels, and on-farm works including land shaping, farm irrigation and farm drainage ditches, for about 26,000 hectares.

Part-C: Within Ghataprabha Scheme

Construction of lined / stabilised field irrigation channels, field drainage channels, and on-farm works including land shaping, farm irrigation and farm drainage ditches, for about 5,000 hectares.

(b) The Staff Appraisal Report (SAR) was a detailed project report and contained all the technical features of the project area and the actual project that was to be implemented with World Bank assistance, development of irrigation / drainage / road systems, rehabilitation & resettlement (R&R) of project affected families, procurement of civil works & machinery, implementation schedules, regular inspections of dams and spillways by State Engineers & CWC to ensure adequate dam safety, making arrangements for general supervision of quality control by CWC, required organisation and management, accounting & auditing, agriculture production, farm income, cost recovery, benefits, justification and risks, etc.

(iii) Cost estimates:-

The cost estimates of the project considered for assistance, as reflected in the SAR, were as under:-
### Sl. No. | Item | Estimated cost in million Rupees. | Estimated cost in million Dollars.
--- | --- | --- | ---
1. | Alamatti Dam (including Civil works, land acquisition & compensation and village centres). | 240.70 | 28.00
2. | Narayanapur Dam (including civil works, land acquisition & compensation and village centres). | 213.50 | 24.80
3. | Irrigation & Drainage systems (including NLBC, two tunnels, SBC, distribution system, drainage system and buildings). | 781.70 | 90.90
4. | Village roads. | 78.40 | 9.10
5. | Land development (i) UKP (including aerial photography & mapping, FICs, FDCs, land shaping & buildings). (ii) Malaprabha and Ghataprabha projects. | 116.00 | 13.60
6. | Equipment and Services | 36.50 | 4.20
7. | Project monitoring | 2.30 | 0.30
8. | Agricultural supporting services | 33.50 | 3.90
9. | Engineering, supervision and administration | 253.30 | 29.50
10. | Physical contingencies | 184.70 | 21.50
11. | Price escalation | 427.40 | 49.70
Total: | | **2445.40** | **284.40**

(iv) **Salient features:**

The salient features of Alamatti and Narayanapur dams, as indicated in the SAR, are shown in the statement enclosed as **Annexure-1**. As can be seen from the enclosed statement, Alamatti dam was proposed to be constructed upto a FRL of 512.06 m with crest level at 500.06 m and 26 Nos of spillway gates (radial type) of 15 m x 12 m size.

(v) **Schedules:**

The yearwise schedule of expenditures, yearwise schedule of disbursements and the yearwise implementation schedule, as projected in the SAR, are enclosed as **Annexures-2, 3 & 4** respectively.

(vi) **Credit assistance:**

The amount of credit assistance extended by the World Bank, as per the Development credit agreement, is as shown below:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Category</th>
<th>Amount of the Credit allocated (in million Dollars)</th>
<th>% of expenditures to be financed.</th>
</tr>
</thead>
</table>
| 1. | Equipment and vehicles: (a) Directly imported (b) Locally manufactured (c) Imported but procured locally | 5.10 | 100% of foreign expenditures 100% of local expenditures (ex-factory) 70%
| 2. | Civil works: (a) On-farm (b) Others | 7.00 108.00 | 55% of ARDC’s refinance 70%
| 3. | Unallocated | 5.90 | |
| **Total:** | | **126.00** | |

FN: The exchange rate considered at the time of agreement was Rs.8.60 per Dollar.
(vii) **Project completion date and credit closing date:**

As per the Development Credit Agreement, the project was expected to be completed by March 31, 1983 (i.e., in 5 years period from 1978 to 1983) and the credit closing date was 31.03.1984. However, the credit closing date was subsequently extended, during implementation of the project, up to 31.03.1986.

(viii) **Important covenants in the Development Credit Agreement:**

Following were some of the important Covenants in the Development Credit Agreement (DCA):

(a) The borrower (i.e., Government of India) shall pay to the IDA a service charge at the rate of ¾ percent per annum on the principal amount of credit withdrawn and outstanding from time to time.

(b) The service charges shall be payable semi-annually on March 1 and September 1 in each year.

(c) The borrower shall repay the principal amount of credit in semi-annual instalments payable on each March 1 and September 1 commencing from September 1, 1988 and ending March 1, 2028, each instalment to and including the instalment payable on March 1, 1998, to be ½ percent of such principal amount, and each instalment thereafter to be 1½ percent of such principal amount.

(d) The borrower shall make available out of the proceeds of the credit, funds equivalent to 119 million Dollars to Karnataka in accordance with the borrower’s standard arrangements for developmental assistance to the States of India and 7 million Dollars to ARDC under the financial arrangements to be entered into between the borrower and the ARDC.

(ix) **Features of Project Agreement:**

(a) The project agreement covered mainly the manner of implementation of the project like maintaining of audited accounts and financial statements, furnishing of periodical reports, preparation of water allocation plan based on cropping pattern, systematic assessment and collection of betterment levy, levying water charges, resettlement of families affected by submersion of reservoirs, procurement of contracts for civil works, etc.

(b) Following were the important covenants in the Project Agreement:

1. Karnataka should allocate to the extent possible, land suitable for cultivation to the farmers resettled from the Alamatti and Narayanapur reservoir areas.

2. Karnataka should make arrangements for a systematic assessment and collection of Betterment Levy in the area covered by the project.

2.02 **Project implementation and reasons for delay:**

(i) The SAR stated that about 64 million Dollars, or 48% of civil works, would be procured through ICB contracts. As against this, only about 25%, or 33 million Dollars were procured under ICB. The reason for this being -- (a) there were frequent changes in the configuration of Alamatti dam resulting in drastically reducing the value of work and (b) due to mis-procurement of the tunnel contracts, there was cancellation of
disbursement to the extent of 8.36 million Dollars. Apart from the above, 41 small contracts for works were procured under LCB.

(ii) Construction of civil works was considerably delayed soon after the start of the project due to countrywide shortage of cement and explosives which situation continued until 1983. Moreover, frequent power failures also contributed to the delays, especially in tunnel works.

(iii) Further, many disputes cropped up during the execution of civil contracts. There was an arbitration clause in the ICB & LCB contract documents and the contractors, availing the advantages flowing from this arbitration clause, referred their disputes to arbitration. Some even went to Law Courts. As a result, the works had almost come to a grinding halt inviting severe comments by World Bank. It took considerable time for the Government to settle all such disputes and see that the works were resumed in right earnestness. Several classic cases of such disputes are highlighted in the Chapter “Contract Management and Settlement of Disputes”.

(iv) Land acquisition delays also had a substantial effect on the progress of work. Even though compensation amounts were paid under the Land Acquisition Act, many land losers approached Law Courts claiming higher compensations. There were as many as 11,500 cases pending in Law Courts at one point of time. Much of the time and energy of officers were oriented in attending to Court cases. The land losers, after approaching Law Courts, cultivated the habit of obstructing the works. At the time of preparation of Project Completion Report by World Bank, about 5000 cases had been settled in favour of the land losers and the remaining were sub-judice. In most cases, land losers had to be coerced with the help of local leaders to part with their lands to ensure smooth progress of the work.

(v) Consequent on the aforesaid reasons for delay, the project could be implemented in a period of 8 years from 1978 to 1986 as against the originally contemplated period of 5 years from 1978 to 1983. The credit closing date, which was 31st March 1984 as per the Development Credit Agreement, had to be eventually extended by 2 years i.e., upto 31st March 1986.

2.03 Preparation of Project Completion Report (PCR) by World Bank:

The FAO / CP Mission that visited India in September / October 1986 prepared, in close collaboration with the World Bank staff, a draft PCR and copies of the same were sent by the World Bank to the borrower (GOI) and the GOK in September 1988. The draft was prepared taking into consideration the findings of the 11 full supervision Missions of World Bank that visited the project from 1978 to 1986. Comments of GOK on the findings of the PCR Mission were sent to World Bank on 14.10.1988. In turn, the GOI also sent its comments to World Bank on 30.11.1988. The World Bank, after reviewing the comments of GOK and GOI, finalised its PCR in December 1988 and sent copies of the same to GOK in January 1989.

2.04 Achievements, as reflected in the PCR:

Actual achievements under various components of the project, as analysed in the PCR, are highlighted in the following paragraphs.
(i) **Disbursements:**

(a) Though the credit assistance, as per the Development Credit Agreement (DCA), was 126 million Dollars, during the process of implementation a sum of 8.36 million Dollars was cancelled from the credit because of mis-procurement of the construction of two tunnels in NLBC. The reason is that after the ICB tenders were opened, GOK decided to ask for re-bids which was not acceptable to World Bank and thereupon the Bank cancelled the relevant disbursable portion from the credit.

(b) Credit allocation as per the DCA and the actual disbursements made are shown in the following statement:

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount of credit allocated</th>
<th>Actual disbursements made</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>As per DCA</td>
<td>Revised</td>
<td></td>
</tr>
<tr>
<td>Civil works:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) On-farm works</td>
<td>7.00</td>
<td>7.00</td>
<td>0.20</td>
</tr>
<tr>
<td>(ii) Other civil works</td>
<td>108.00</td>
<td>99.64</td>
<td>110.20</td>
</tr>
<tr>
<td>Equipment &amp; Vehicles</td>
<td>5.10</td>
<td>5.10</td>
<td>7.20</td>
</tr>
<tr>
<td>Unallocated</td>
<td>5.90</td>
<td>5.90</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>126.00</td>
<td>117.64</td>
<td>117.60</td>
</tr>
</tbody>
</table>

(ii) **Project Cost:**

The actual cost of the project increased substantially over the cost projected in the SAR. The following statement gives a comparison of appraisal estimate and actual project cost.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Estimated cost as per SAR of 1978</th>
<th>Actual cost as in March 1986</th>
<th>Balance cost for completion</th>
<th>Total project cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alamatti dam (including civil works, land acquisition &amp; compensation and village centres)</td>
<td>240.70</td>
<td>760.68</td>
<td>607.91</td>
<td>1368.59</td>
</tr>
<tr>
<td>2</td>
<td>Narayanapur dam (including civil works, land acquisition &amp; compensation and village centres)</td>
<td>213.50</td>
<td>418.02</td>
<td>-</td>
<td>418.02</td>
</tr>
<tr>
<td>3</td>
<td>Irrigation &amp; drainage systems (NLBC, two tunnels, SBC, distribution system, drainage system and buildings)</td>
<td>781.70</td>
<td>1586.34</td>
<td>195.10</td>
<td>1781.44</td>
</tr>
<tr>
<td>4</td>
<td>Village roads</td>
<td>78.40</td>
<td>139.67</td>
<td>24.64</td>
<td>164.31</td>
</tr>
<tr>
<td>5</td>
<td>Land development</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td>UKP (including aerial photography &amp; mapping, FICs, FDCs, land shaping &amp; buildings)</td>
<td>116.00</td>
<td>295.37</td>
<td>269.90</td>
<td>565.27</td>
</tr>
<tr>
<td>(ii)</td>
<td>Malaprabha &amp; Ghataprabha projects</td>
<td>77.40</td>
<td>68.14</td>
<td>-</td>
<td>68.14</td>
</tr>
<tr>
<td>6</td>
<td>Equipment &amp; services</td>
<td>36.50</td>
<td>172.45</td>
<td>33.93</td>
<td>206.38</td>
</tr>
<tr>
<td>7</td>
<td>Project monitoring</td>
<td>2.30</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Agricultural supporting services</td>
<td>33.50</td>
<td>20.24</td>
<td>-</td>
<td>20.24</td>
</tr>
<tr>
<td>9</td>
<td>Engineering supervision &amp; administration</td>
<td>253.30</td>
<td>292.52</td>
<td>16.21</td>
<td>308.73</td>
</tr>
<tr>
<td>10</td>
<td>Physical contingencies</td>
<td>184.70</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>Price escalation</td>
<td>427.40</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2445.40</td>
<td>3753.43</td>
<td>1147.69</td>
<td>4901.12</td>
</tr>
</tbody>
</table>

FN: Actual costs incurred on physical contingencies and price escalation are included in the actual costs of individual components.
(iii) **Area irrigated:**

(a) Even though the Upper Krishna Project Phase-I development area was projected as 1,05,000 ha. in the SAR, the area got reduced to 97,340 ha. as a result of detailed topographical survey conducted during the course of implementation.

(b) Following statement gives a picture of the Upper Krishna Project Phase-I area projected in the SAR and the area actually irrigated at the end of the project:

<table>
<thead>
<tr>
<th>Item</th>
<th>Appraisal</th>
<th>Actual (in 1986)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>As per SAR in 1978</td>
<td>Revised in 1981-82</td>
</tr>
<tr>
<td>Irrigation potential</td>
<td>1,05,000 ha.</td>
<td>97,340 ha.</td>
</tr>
<tr>
<td>Field channel potential (Irrigable area)</td>
<td>80,000 ha.</td>
<td>80,000 ha.</td>
</tr>
<tr>
<td>Seasonwise irrigated area:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kharif:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notified area</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rabi:</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

(iv) **Agriculture production:**

Agriculture production as per the projections at appraisal and the actual achievements under the project, are shown in the following statement:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Appraisal 1977 (Pre-project)</th>
<th>Future with project</th>
<th>Appraisal 1982 (pre-project)</th>
<th>Actual 1983</th>
<th>Actual 1984</th>
<th>Actual 1985</th>
<th>Actual 1986</th>
<th>(Figures are in Tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food-grains</td>
<td>18,500</td>
<td>21,530</td>
<td>24,300</td>
<td>39,200</td>
<td>45,800</td>
<td>61,600</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Cotton</td>
<td>6,800</td>
<td>37,800</td>
<td>6,000</td>
<td>7,100</td>
<td>4,700</td>
<td>4,300</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Oilseeds</td>
<td>3,700</td>
<td>30,900</td>
<td>9,700</td>
<td>15,000</td>
<td>16,600</td>
<td>34,700</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>2,500</td>
<td>7,000</td>
<td>7,000</td>
<td>9,800</td>
<td>8,100</td>
<td>8,700</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

(v) **Status of main components:**

The actual status of completion of main components when the credit closed in March 1986, is summarised as shown under:

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage completed (as in March 1986)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alamatti dam:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Civil works</td>
<td>70%</td>
<td>When the credit closed in March 1986, construction of civil works proposed at appraisal was approximately 82% complete.</td>
</tr>
<tr>
<td>(ii) Village centers</td>
<td>85%</td>
<td></td>
</tr>
<tr>
<td>Narayanapur dam:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Civil works</td>
<td>92%</td>
<td></td>
</tr>
<tr>
<td>(ii) Village centers</td>
<td>84%</td>
<td></td>
</tr>
<tr>
<td>Narayanapur Left Bank Canal</td>
<td>97%</td>
<td></td>
</tr>
<tr>
<td>Shahapur Branch Canal</td>
<td>86%</td>
<td></td>
</tr>
<tr>
<td>Distribution system</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>Drainage system</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Village Roads</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Field Irrigation Channels</td>
<td>64%</td>
<td></td>
</tr>
<tr>
<td>Field drainage</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Malaprabha &amp; Ghataprabha projects</td>
<td>58%</td>
<td></td>
</tr>
</tbody>
</table>
(vi) Progress of individual major components:-

Following statement gives a picture of the targets projected at appraisal and the progress actually achieved in respect of major components of civil works of Upper Krishna Project Phase-I:-

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Completion of Alamatti dam</td>
<td>FRL 512 m</td>
<td>500 m*</td>
</tr>
<tr>
<td>2.</td>
<td>Completion of Narayanapur dam (FRL 492.25 m)</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>3.</td>
<td>NLBC Main Canal</td>
<td>78 KM (including 0 to 36 KM of pre-Phase-I)</td>
<td>78 KM</td>
</tr>
<tr>
<td>4.</td>
<td>Distributaries &amp; laterals of NLBC</td>
<td>48,000 ha. (including 7,000 ha. of pre-Phase-I)</td>
<td>47,200 ha</td>
</tr>
<tr>
<td>5.</td>
<td>FICs of NLBC</td>
<td>48,000 ha. (including 7,000 ha. of pre-Phase-I)</td>
<td>47,220 ha</td>
</tr>
<tr>
<td>6.</td>
<td>OFD &amp; field drainage of NLBC</td>
<td>25,000 ha.</td>
<td>2,700 ha.</td>
</tr>
<tr>
<td>7.</td>
<td>Shahapur Branch Canal</td>
<td>76 KM</td>
<td>76 KM</td>
</tr>
<tr>
<td>8.</td>
<td>Distributaries &amp; laterals of SBC</td>
<td>64,000 ha.</td>
<td>58,170 ha.</td>
</tr>
<tr>
<td>9.</td>
<td>FICs of SBC</td>
<td>39,000 ha.</td>
<td>40,480 ha.</td>
</tr>
</tbody>
</table>

(*) At appraisal (in 1978) it was proposed to construct the Alamatti dam upto FRL 512 m. (i.e., crest level of 500 m plus 12 m height gates). During implementation of Phase-I project, the design of Alamatti dam was changed in 1982 contemplating a crest level of 512 m (without gates) under Upper Krishna Project Stage-I. The configuration of the dam was again changed in 1985 contemplating a permanent crest level of 509 m and erecting 15.2 m height gates in the First Stage itself. Due to these modifications, construction of the dam was restricted to a level of 500 m in Upper Krishna Project Phase-I.

(vii) Rehabilitation & Resettlement:-

(a) It was estimated at Appraisal that Alamatti & Narayanapur reservoirs under Phase-I would submerge about 41,000 ha. of cultivated lands and displace around 13,000 families. Provision had been made in the estimates for construction of 50 Resettlement Centres (25 each at Alamatti and Narayanapur). However, as per the R&R Plan prepared in July 1986, the number of villages submerged and the number of families affected were as under:-

<table>
<thead>
<tr>
<th>Narayanapur</th>
<th>Alamatti</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Number of villages submerged………………………</td>
<td>37</td>
</tr>
<tr>
<td>2. Farm land submerged of above villages…………….</td>
<td>36%</td>
</tr>
<tr>
<td>3. Number of villages whose agricultural Lands submerged……………………….</td>
<td>53</td>
</tr>
<tr>
<td>4. Farm land of above villages………………………..</td>
<td>15%</td>
</tr>
<tr>
<td>5. Number of families affected:</td>
<td></td>
</tr>
<tr>
<td>Losing land only……………………………………….</td>
<td>2897</td>
</tr>
<tr>
<td>Losing houses only……………………………………..</td>
<td>1933</td>
</tr>
<tr>
<td>Losing both land &amp; houses……………………………..</td>
<td>1605</td>
</tr>
<tr>
<td>Total: 6435</td>
<td>12957</td>
</tr>
</tbody>
</table>

(b) As against 50 Resettlement centres contemplated, 55 centres were taken up for construction considering the actual needs. 27 centres for Narayanapur were completed and the centres for Alamatti were in progress. Though compensation was paid to the displaced families as per the Land Acquisition Act, no rehabilitation measures to bring them to their pre-project standard of living, were taken.
(viii) Project financing:—

<table>
<thead>
<tr>
<th></th>
<th>Project cost(in mill. Dollars)</th>
<th>IDA financing(in mill.Dollars)</th>
<th>% financing</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>284.40 (As per SAR)</td>
<td>126.00 (As per SAR)</td>
<td>44.30%</td>
</tr>
<tr>
<td></td>
<td>(Rs.244.54 crores)</td>
<td>(Rs.108.36 crores)</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>284.40 (As per SAR)</td>
<td>117.64 (Revised)</td>
<td>41.36%</td>
</tr>
<tr>
<td></td>
<td>(Rs.244.54 crores)</td>
<td>(Rs.101.14 crores)</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>388.21 (At project closure)</td>
<td>117.60 (Actuals)</td>
<td>30.29%</td>
</tr>
<tr>
<td></td>
<td>(Rs.375.34 crores)</td>
<td>(Rs.119.00 crores)</td>
<td>(31.70%)</td>
</tr>
<tr>
<td>(d)</td>
<td>478.58 (Total for completion)</td>
<td>117.60 (Actuals)</td>
<td>24.57%</td>
</tr>
<tr>
<td></td>
<td>(Rs.490.11 crores)</td>
<td>(Rs.119.00 crores)</td>
<td>(24.28%)</td>
</tr>
</tbody>
</table>

(ix) Cost recovery:—

Even though it was stipulated in the Project Agreement that Karnataka should assess and recover the Betterment Levy from the beneficiaries, no such recoveries could be made due to the fact that, following litigation in Courts, the Betterment Levy was abolished in 1980 without IDA’s consent.

2.05 Institutional Performance, conclusions and lessons:—

The findings of the PCR Mission on the performance of various Institutions connected with the implementation of the project, its conclusions and lessons for further development of Upper Krishna Project, are enclosed as Annexure-5.

2.06 Evaluation summary of the project implementation:—

Summary of the evaluation of the project implementation, as recorded in the PCR, is reproduced below:—

“(i) Implementation experience:—

The main implementation problems faced by the project were as follows: (a) inadequate planning and procurement (far too many small contracts) practices; (b) management and staffing weaknesses characterized by lack of accountability and responsibility in managers and inadequately trained and insufficient staff; and (c) insufficient understanding of the magnitude and complexity of the resettlement and rehabilitation operations which resulted in this operation being poorly designed, funded and executed. In addition the construction of the Alamatti dam was premature as its need for irrigation requirements was not necessary in Phase-I. Consequently, even after 3 one year extensions of the Credit closing date the infrastructure was not completed and there were serious cost overruns. At Credit closure, actual expenditures incurred were more than 50% higher in rupee terms and more than 35% higher in US$ terms (due to the depreciation of the rupee). About 82 percent of the civil works proposed under the project had been completed and about 60 percent of the target had been reached in providing irrigation waters to farmers. Actual disbursement under the Credit totalled US $ 117.6 million and US $ 8.4 million was cancelled because of mis-procurement of the construction of two tunnels on the main irrigation system.

(ii) Project impact:—

At completion the project had already had a significant impact in the project area. Agricultural production has increased and with it, the incomes of directly benefitting farmers. Nutritional levels among the population is increasing as seen by an increase in quantity and variety of food in the local markets. This trend is expected to continue and expand. On the negative side, the most serious impact has been on the project’s displaced population. Available evidence suggests that most of the people affected by the project suffered a deterioration in their standard of living and in some cases in their social status. Landless laborers have been particularly hard hit as a result of the loss of productive land base and consequent lower demand for labor in an increasingly
(iii) **Sustainability:**

At completion there was reason to be confident that the project would be sustainable. Indeed, two years after credit closing the Phase I irrigation targets have been achieved. The introduction of suitable cultivation and water management practices in Phase I has laid the foundation for more efficient future development, soil conservation, and for an effective and equitable use of water resources. In addition, in the preparation and appraisal of a follow-up project, attention has been focused on improving the recovery of costs incurred during the operation and maintenance of the irrigation systems. Consequently, it is envisaged that, financially too, the project would become increasingly self-sustaining. Encouraging progress has also been made in the follow-up project in defining a more rational and detailed institutional and legal framework to implement a coherent resettlement and rehabilitation program. Consequently, there is reason to be confident that costs associated with population displacement would also be minimized in future efforts.

(iv) **Findings and Lessons:**

Several findings and lessons emerge from the project experience. On the irrigation side, a common denominator of many of the deficiencies encountered during implementation was the weak institutional base which was reflected in the lack of effective project management and lack of accountability at all levels. It is clear that design and construction must be improved and that staff turnover must be reduced by proper incentives and the provision of facilities. The harsher lessons were, however, learned in attempting to deal with the human displacement problem. Involuntary resettlement of populations affected by the submergence of their habitat for irrigation, power and other purposes is a consequence of the development of water resources to meet the needs of a growing population. However, it is clear that resettlement and rehabilitation of project-affected families should also be one of the major objectives of such a development process. The lessons learned under this project clearly indicate that a coherent, well-planned and designed resettlement plan should be formulated and implemented in projects of this nature. 

2.07 **Water utilisations:**

At the time of appraisal in 1978, the irrigation potential contemplated under Phase-I was 1,05,000 ha. To irrigate this area, water utilisation contemplated was about 30 TMC. As against this, the area actually irrigated, as assessed in the PCR, was 59,420 ha. The water utilisation actually achieved would work out to about 17 TMC. This analysis is made in proportion to the contemplated utilisation of 119 TMC to irrigate 4.25 lakh ha in Stage-I.

2.08 **Conclusion:**

As already stated in paragraph 2.03 above, before the PCR was finalised by the World Bank, the draft report prepared by the FAO / CP Mission had been sent to GOK / GOI by World Bank in September 1988 for comments. GOK sent its comments on all the important findings of the Mission to World Bank in Government letter No. PWD 193 WBM 88 dated 14.10.1988 (copy enclosed as **Annexure-6**) under intimation to Government of India. In turn, GOI also communicated its comments to World Bank...
through telex message on 30.11.1988 (copy enclosed as Annexure-7). But, as seen from the finalised PCR, the findings of the Mission have mostly remained unaltered. In spite of some harsh comments by World Bank about the deficiencies in implementation of the project, it must be appreciated that, as admitted by the World Bank itself [vide paragraph 2.06(ii) above], agriculture production increased upon completion of the Phase-I project and with it, the incomes of directly benefitting farmers also increased. Further, nutritional levels among the population was also increasing. These long term benefits by the project have to be recognised.

(ii) However, it may be pointed out that GOK, keeping in view the deficiencies in the implementation of Upper Krishna Project Phase-I as pointed out in the PCR, took many corrective measures while posing the repeater project viz. Upper Krishna Project Phase-II for World Bank assistance. These measures are broadly explained in the following paragraphs.

3.0 **Upper Krishna Project Phase-II (Loan No.3050-IN & Credit No.2010-IN):-**

3.01 Corrective measures taken to improve efficiency & quality based on lessons learned from Phase-I:-

Even before Upper Krishna Project Phase-I was completed with World Bank assistance in March 1986, a project report for the repeater project viz Upper Krishna Project Phase-II was prepared during 1985-86 for obtaining World Bank assistance. Several Missions of World Bank visited the State for assisting GOK in the preparation of the Identification Report. Learning lessons from the deficiencies pointed out by the World Bank supervision Missions of UKP Phase-I (as pointed out in the PCR) and also at the instance of the World Bank Preparation Missions, many corrective measures were taken by GOK towards improving the efficiency and quality not only in the preparation of the Project Report (Identification Report) but also in the implementation of UKP Phase-II. It is only after GOK took actions / initiated suitable measures / gave assurances in the above direction, the World Bank agreed for appraisal / negotiations of the Project. Following were the measures taken by GOK in this regard:-

(i) A Dam Safety Review Panel consisting of Experts was constituted for undertaking periodical inspections of the Dams and Spillways with the objective of ensuring proper safety of the structures.

(ii) A feasibility study for future development of Upper Krishna Project was got done by M/s. Consulting Engineering Studies, Delhi with the objective of assisting the project management in the planning of future development of the project and to determine viable options of development.

(iii) A Master Plan for operation and maintenance was got prepared by M/s. WAPCOS, Delhi with the objective of recommending -- (a) a suitable O&M policy; (b) water delivery schedules / methods; (c) an appropriate training for the staff; (d) an effective communication system; and (e) a suitable organisation for management of the project.

(iv) An integrated Reservoir Operation Study (RESOP study) was got done by the Indian Institute of Science, Bangalore, with the objective of determining viable options for the combined working of Alamatti and Narayanapur dams keeping in view the irrigation development and water utilisations.

(v) A plan for the command area development of the project was got prepared by the University of Agriculture Sciences, Dharwad, with the objective of minimising water logging and salinity (however, during implementation of Phase-II, a Master Drainage Plan was got prepared by M/s.CES, New Delhi).
A catchment area treatment plan was got prepared by ICSIM, Bangalore, with the objective of suggesting suitable afforestation and soil conservation measures in the catchment area of the project.

A study was got done by Professors of JCE, Mysore, for establishing a suitable Management Information System in Upper Krishna Project.

An Action Plan for R&R of project affected families based on socio-economic studies, was got prepared by MYRADA, Bangalore, with the main objective of proper rehabilitation of the families coming under submersion of the two reservoirs of the project.

In order to convince the World Bank, of the sincerity of Government of Karnataka in providing R&R benefits to the project affected families so as to bring them at least to their earlier standard of living, GOK in close collaboration with MYRADA, prepared a draft Bill for legislation in 1987. This Bill was called “The Karnataka Resettlement of Project Displaced Persons Bill, 1987”, which provided for acquisition of land in the command area for allotment to the displaced families. After the Bill was passed in both the Houses of Legislature, it was sent to Government of India for obtaining the assent of the President of India. (However, the fact remains that, due to delay in obtaining the assent of the President, it was decided not to notify Upper Krishna Project under this Act. President’s assent was received only in August 1994.)

Separate organisations for designs (including quality control) and for O&M were created under the project in order to (a) ensure uniformity in the design of structures and improving the quality of designs; (b) improve proper quality control standards during construction of civil works, independent of the construction organisations and (c) ensure proper operation & maintenance of completed civil works including water management, independent of the construction organisations.

A Water and Land Management Institute (WALMI) was created to train the Irrigation and Agriculture personnel in the field of water management.

A separate R&R and land acquisition wing was created to facilitate quick decisions on related matters and expediting the implementation of the R&R programme.

An exclusive post of Engineer-in-Chief cum Project Coordinator (ECPC) was created to oversee the overall project management.

As the quality of construction of civil works in the Phase-I had suffered mainly due to acute scarcity of water in the project area (the project is situated in a very remote and drought affected area where no proper basic amenities like approach roads, etc., were available in pre-phase-I period), it was decided to construct two water supply schemes for providing water supply required for the construction of the Indi Branch Canal and the Mudbal Branch Canal in the 2nd phase. Even though there was delay in the completion of these 2 water supply schemes, they have proved to be useful in the improvement of quality standards.

Assurances were given by Government of Karnataka that adequate funds for the project would be provided to ensure its successful completion.

3.02 Project Report preparation & clearances from Government of India:

The Project Report for Upper Krishna Project Phase-II prepared by GOK was suitably modified taking into consideration the comments of the visiting Preparation Missions of World Bank and the CWC and the modified Project Report, called as the Identification Report, was sent to Central Water Commission, GOI, New Delhi in Government letter No. PWD 118 WBM 86 dated 27.08.1986. The proposal of GOK as per the Identification Report was, in brief, as under:-
(a) **Construction of Alamatti dam (without crest gates):**

1. Raising of spillway crest from El.500 m to 509.016 m.
2. Construction of 15.2 m height piers (full height) with embedded parts for 15.2 m height radial gates.
3. Raising of non-overflow masonry & earthen sections in left flank, and spillway section, power blocks and non-overflow section in right flank to the final elevation of 528.756 m.
4. Construction of intake structures and installation of pen-stocks for 6 nos. of power units.

(b) **Fore-shore Lift Irrigation Schemes:**

1. Construction of head works of 6 nos. of fore-shore Lift Irrigation Schemes (5 from Alamatti reservoir and 1 from Narayanapur reservoir).

(c) **Canal net work:**

1. Construction of Mudbal Branch Canal for 49 KM length.
2. Construction of Indi Branch Canal for 62 KM length.
3. Construction of the remaining distributaries of Shahapur Branch Canal (first 9 distributaries had been constructed under Phase-I).
4. Development of a fresh irrigation area to an extent of 1,44,788 ha (cumulative area including the Phase-I area was indicated as 2,50,185 ha).

(ii) **Clearance from the Central Water Commission:**

Meanwhile, the Project Report for the revised Upper Krishna Project Stage-I, which had been sent through Government of Karnataka letter dated 15.11.1985, was also under examination by Central Water Commission (CWC). After holding series of discussions with the representatives of GOK and obtaining clarifications / compliance to various observations, the Central Water Commission finalised the cost of Phase-II as Rs.482.90 crores excluding CAD component and escalation. The cost of revised Stage-I was tentatively considered as Rs.1383.00 crores. Thereafter, the Central Water Commission recommended to the Ministry of Water Resources through its letter No.2/74/86/PPC(Vol.III)/129 dated 21.01.1987 stating that the Phase-II project had been found acceptable subject to the following conditions:

1. Radial gates of partial height (about 3 m height) shall be provided in the Revised Stage-I for utilisation of 119 TMC / 4.25 lakh ha irrigation as approved in Stage-I which would permit the storage upto 512.2m (1680 feet) with solid crest at El.509.016 m (1670 feet). The height of these radial gates could be increased later by additional arms and skin plates for utilisation of Krishna water allocated to the Project.

2. Additional cost of submergence and resettlement due to raising of the crest upto El.509 m with the backwater effect shall be included in the revised Stage-I project including the relocation costs for Bagalkot township.

3. Following investments for advance planning indicated by Government of Karnataka have been agreed to:

   (a) Cost of Alamatti dam works from El.523 to 527.25 m.

   (b) Embedded parts of radial crest gates for 15.2 m (50 feet) height.
(c) Head works from foundation level to El.512 m in case of 5 nos. of foreshore Lift Irrigation Schemes from Alamatti reservoir and 1 from Narayanapur reservoir.

(4) Clearance from the Department of Environment shall be obtained by the State Government for the revised Stage-I.

(iii) **Clearance from the Ministry of Water Resources:**

The Ministry of Water Resources (MOWR) through its O.M. No.11(12)/85-FA dated 05.02.1987 recommended the Phase-II project to the Department of Economic Affairs, Ministry of Finance for posing for World Bank assistance. The break up of expenditure and the components of Upper Krishna Project Phase-II cleared by MOWR were:

(a) **Break up of expenditure**

<table>
<thead>
<tr>
<th>Description</th>
<th>Rs. in million</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Dam and allied works including Bagalkot relocation</td>
<td>1824.83</td>
</tr>
<tr>
<td>(2) Distribution system, field channels and field drainage channels of Shahapur Branch Canal</td>
<td>1014.85</td>
</tr>
<tr>
<td>(3) Mudbal Branch Canal and Distributary system</td>
<td>567.64</td>
</tr>
<tr>
<td>(4) Indi Branch Canal and Distributary system</td>
<td>1120.10</td>
</tr>
<tr>
<td>(5) Institutional support</td>
<td>28.87</td>
</tr>
<tr>
<td>(6) Mapping</td>
<td>12.50</td>
</tr>
<tr>
<td>(7) Roads</td>
<td>400.63</td>
</tr>
<tr>
<td>(8) Engineering &amp; Administration, etc</td>
<td>569.72</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>5539.14</strong></td>
</tr>
<tr>
<td><strong>Say 5500.00</strong></td>
<td><strong>----------</strong></td>
</tr>
</tbody>
</table>

(b) **Components:**

**Alamatti dam:**

1. Spillway crest from 500 m to 509 m without gates.
2. Raising of piers to full height and installation of embedded parts for 15.2 m radial gates.
3. Non-overflow section and earthen section of the dam from El.515 m to El.527.25 m.
4. Power portion of the dam from El.496.5 m to El.527.25 m.
5. Intake structures and installation of pen stocks for 6 nos. of power units.
6. Head works for 6 nos. of fore-shore Lift Irrigation Schemes (5 nos. from Alamatti reservoir and 1 from Narayanapur reservoir).

**Canal net work:**

7. Mudbal and Indi Branch Canals and distribution system for Shahapur, Mudbal and Indi branches on an area of 1.45 lakh ha. and Field Irrigation Channels in 1.24 lakh ha.

(iv) **Clearance from the Advisory Committee, the Ministry of Environment & Forests and the Planning Commission:**

(a) The Ministry of Environment & Forests through its letter No.8-438/88-FC dated 22.02.1988 communicated to Government of Karnataka its approval for the release of 135 ha. of forest lands required for Stage-I project under the Forest (Conservation) Act, 1980, subject to certain conditions.
(b) The Advisory Committee of Planning Commission in its 42nd meeting held on 11.01.1989 recommended the Stage-I project estimated to cost Rs.1491.00 crores for approval by Planning Commission subject to clearance by the Department of Environment.

(c) The Ministry of Environment & Forests through its O.M.No.J-12011/41/86-IA dated 05.04.1989 gave environmental clearance for the Phase-II project subject to certain conditions.

(d) Finally, the Planning Commission gave its approval to the Stage-I project at an estimated cost of Rs.1214.97 crores subject to certain conditions, vide Planning Commission’s letter No.2(10)/88/I&CAD dated 24th September 1990.

3.03 Appraisal by World Bank, negotiations and agreements:

Following time table gives a picture of the dates of appraisal of the Phase-II project by World Bank, negotiations held at Washington, Board Presentation, signing of agreements and effectiveness of the agreements:

- Appraisal: February 1988
- Negotiations: 23rd November 1988
- Finalisation of SAR: 12th April 1989
- Board presentation: 4th May 1989
- Signing of Agreements: 16th June 1989

3.04 Description of the project, as per SAR:

The project, as per SAR of April 1989, was proposed to be completed in a period of 7 ½ years. The components included in the SAR were:

(a) Irrigation Component

(i) Civil works for Alamatti dam: raising of its overflow section to elevation 509 m, constructing piers and deck, and raising the right abutment to its final height;

(ii) Construction of distributary canals, laterals and field irrigation channels for some 148,000 ha;

(iii) Provision for on-farm development for about 116,000 ha. including land shaping, farm irrigation and farm drainage;

(iv) Construction of about 459 km of new roads, improvements to a further 138 km of existing roads and the reconstruction of about 76 km of existing roads;

(v) Establishment, maintenance and provision of equipment for a Water and Land Management Institute (WALMI) to train ID staff and agricultural officers in appropriate water management;

(vi) Provision for aerial photography and photogrammetric mapping of about 650,000 ha;

(vii) Construction of facilities and provision of material and equipment, for operation & maintenance of the irrigation project, for a Management Information System (MIS) and for the anti-malaria campaign; and

(viii) Technical assistance for: (1) a feasibility study of the future development of the UKP; (2) a master plan for the operation and maintenance of UKP and staff training in improved O&M; (3) operating WALMI; (4) monitoring water use
efficiencies and the agro-economic impact of the project; and (5) contract administration.

(b) **R&R Component:**

(i) The purchase of irrigable land by those farmers made landless or left with uneconomic-size holdings as a result of the project:

(ii) Income generating schemes for those with some land in order to restore and where possible improve productivity and income levels;

(iii) Provision of house plots (400 sq.m) and replacement village infrastructure including electricity, drinking water, wells, community halls, burial / cremation grounds, threshing grounds, fuel wood lots, schools and roads;

(iv) Provision of transport facilities for families and their livestock, salvaged house materials, and belongings to new village sites;

(v) Provision of food, fodder and fuel to PAFs during the transition period; and

(vi) Technical assistance for training of R&R staff and for ongoing monitoring and evaluation of the R&R process.

### 3.05 Agreements:

(i) The Development Credit Agreement (DCA) was between India and the International Development Association (IDA). The Loan Agreement was between India and the International Bank for Reconstruction and Development (IBRD) and the Project Agreement was between IDA & IBRD and Karnataka.

(ii) The project, as per the DCA, comprised two parts. Part ‘A’ was for Irrigation and Part ‘B’ was for R&R. Features of the project as described in Schedule-2 of the DCA are shown in Annexure-8. In a nut-shell, following were the more important features:

#### Part ‘A’ – Irrigation:

(a) Alamatti dam:

(1) Raising the spillway to El.509 m.
(2) Construction of piers to final El.528.76 m.
(3) Provision of anchors and embedded metal parts for the future installation of radial gates.
(4) Raising of left embankment to final El.528.76 m and partial completion of right embankment.
(5) Construction of a road bridge over spillway section.

(b) Irrigation Development:

(1) Construction of the distribution system of Shahapur Branch Canal.
(2) Construction of a major portion of Mudbal Branch Canal with distributaries.
(3) Construction of initial part of Indi Branch Canal together with distributaries.
(4) Construction of Field Irrigation Channels to serve about 1.50 lakh ha., including where Field Irrigation Channels had not been constructed in the developed areas of Phase-I.
(5) Improvement and construction of all-weather roads in Shahapur Branch Canal, Mudbal Branch Canal and Indi Branch Canal command areas.
(6) OFD works including land shaping, farm irrigation and farm drainage for about 1,16,000 ha. in Phase-I and Phase-II areas.
(c) **Strengthening of Training facilities:**

1. Establishment of WALMI to provide training mainly to staff of Irrigation Department and Agriculture Department.
2. Establishment and strengthening of Project Training Centres (PTC) for training canal operators and farmers.

(d) **Technical assistance:**

1. Photogrammetric mapping of the Irrigable land of the entire Upper Krishna Project (about 6,50,000 ha.).
3. Provision for training in WALMI and PTCs.
4. Provision for training in contract administration and supervision.
5. Establishment of a MIS system for the project.

**Part ‘B’ – Rehabilitation & Resettlement:**

1. Provision for allotment of irrigation land.
2. Provision for payment of ex-gratia.
3. Provision for a house plot free of cost.
4. Provision for adequate transportation free of cost, for the location of project affected families, their live stock, house materials and other belongings to new Resettlement Centres.

**3.06 Cost estimates:**

The cost estimates of the project considered for assistance, as reflected in the SAR, were as under:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Estimated cost (in million Rupees)</th>
<th>Estimated cost (in million Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A. Irrigation:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Alamatti dam</td>
<td>421.8</td>
<td>28.9</td>
</tr>
<tr>
<td>2</td>
<td>Shahapur Branch Canal</td>
<td>791.8</td>
<td>54.2</td>
</tr>
<tr>
<td>3</td>
<td>Mudbal Branch Canal</td>
<td>857.2</td>
<td>58.7</td>
</tr>
<tr>
<td>4</td>
<td>Indi Branch Canal</td>
<td>1389.6</td>
<td>95.2</td>
</tr>
<tr>
<td>5</td>
<td>Roads</td>
<td>456.5</td>
<td>31.3</td>
</tr>
<tr>
<td>6</td>
<td>Mapping</td>
<td>53.3</td>
<td>3.6</td>
</tr>
<tr>
<td>7</td>
<td>Studies</td>
<td>14.9</td>
<td>1.0</td>
</tr>
<tr>
<td>8</td>
<td>Anti-malaria campaign</td>
<td>47.0</td>
<td>3.2</td>
</tr>
<tr>
<td>9</td>
<td>WALMI</td>
<td>121.8</td>
<td>8.3</td>
</tr>
<tr>
<td>10</td>
<td>Establishment for O&amp;M</td>
<td>215.8</td>
<td>14.8</td>
</tr>
<tr>
<td></td>
<td><strong>Sub-Total:</strong></td>
<td><strong>4369.6</strong></td>
<td><strong>299.3</strong></td>
</tr>
<tr>
<td></td>
<td>B. R&amp;R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Total Base-line cost</td>
<td><strong>5249.3</strong></td>
<td><strong>359.5</strong></td>
</tr>
<tr>
<td>12</td>
<td>Add physical contingencies</td>
<td>533.1</td>
<td>36.5</td>
</tr>
<tr>
<td>13</td>
<td>Add price contingencies</td>
<td>2134.3</td>
<td>146.2</td>
</tr>
<tr>
<td></td>
<td><strong>Total project cost:</strong></td>
<td><strong>7916.7</strong></td>
<td><strong>542.2</strong></td>
</tr>
</tbody>
</table>

**3.07 Schedules:**

Yearwise schedule of expenditures on various components and yearwise schedule of disbursements, as projected in the SAR, are enclosed as **Annexures-9 & 10.**
3.08 Credit assistance & Loan assistance:-

(i) The total assistance extended to the project by World Bank was 325 million Dollars comprising 160 million Dollars (equivalent to 119 million SDR) in the form of credit from IDA and 165 million Dollars in the form of loan from IBRD.

(ii) The credit and loan assistance extended under different categories, as per the DCA, were as under:-

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Category</th>
<th>Amount of credit allocated (expressed in million SDR)</th>
<th>Amount of loan allocated (in million Dollars)</th>
<th>Percentage of expenditures to be financed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Civil works</td>
<td>110.00</td>
<td>157.00</td>
<td>85%</td>
</tr>
<tr>
<td>2.</td>
<td>Goods (except food)</td>
<td>2.00</td>
<td>3.00</td>
<td>100% of foreign expenditures, 100% of local expenditures (ex-factory cost) and 65% of local expenditures for other items procured locally.</td>
</tr>
<tr>
<td>3.</td>
<td>Consulting services</td>
<td>3.00</td>
<td>-</td>
<td>100%</td>
</tr>
<tr>
<td>4.</td>
<td>Unallocated</td>
<td>4.00</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong></td>
<td><strong>119.00</strong></td>
<td><strong>165.00</strong></td>
<td><strong>100%</strong></td>
</tr>
<tr>
<td></td>
<td>Equivalent</td>
<td><strong>119.00</strong></td>
<td><strong>160.00</strong></td>
<td><strong>165.00</strong></td>
</tr>
</tbody>
</table>

Total Assistance: 160 +165 =325 million Dollars

FN: The exchange rate considered at the time of appraisal / agreement was Rs.14.60 per Dollar.

3.09 Project completion date and credit / loan closing date:-

As per SAR, the project was to be completed in a period of 7½ years and as per the DCA, the completion date was 30th June 1996. The credit / loan closing date was stipulated in the DCA / loan agreement as 31st December 1996. However, the credit / loan closing date was subsequently extended upto 30.06.1997.

3.10 Important covenants in the Development Credit Agreement / Loan Agreement:-

(a) Development Credit Agreement:

(1) The borrower (GOI) shall pay to the Association a commitment charge on the principal amount of credit not withdrawn from time to time at a rate to be set by the Association as of June 30 of each year, but not to exceed the rate of ½ % per annum.

(2) The borrower shall pay to the Association a service charge at the rate of ¾ % per annum on the principal amount of the credit withdrawn and outstanding from time to time.

(3) Commitment charges and service charges shall be payable semi-annually on March 15 and September 15 in each year.

(4) The borrower shall repay the principal amount of the credit in semi-annual instalments payable on March 15 and September 15 commencing March 15, 1999 and ending September 15, 2023. Each instalment to and including the instalment payable on September 15, 2008 shall be 1¼ % of such principal amount, and each instalment thereafter shall be 2½ % of such principal amount.

(5) The borrower shall make the proceeds of the credit and the proceeds of the loan available, to Karnataka in accordance with the borrower’s standard arrangements for development assistance to States.
(b) Loan Agreement:

(1) The borrower shall pay to the Bank a commitment charge at the rate of \( \frac{3}{4} \% \) per annum on the principal amount of loan not withdrawn from time to time.

(2) The borrower shall pay interest on the principal amount of loan withdrawn and outstanding from time to time at a rate per annum for each interest period equal to \( \frac{1}{2} \% \) per annum above the cost of qualified borrowings for the last semester ending prior to the commencement of such interest period.

(i) “Interest period” means the six months period commencing on each date specified in (3) below, including the interest period in which this agreement is signed.

(ii) “Cost of qualified borrowings” means the cost of the outstanding borrowings of the Bank drawn down after June 30, 1982, expressed as a percentage per annum, as reasonably determined by the Bank.

(iii) “Semester” means the first six months or the second six months of a calendar year.

(3) Interest and other charges shall be payable semi-annually on March 15 and September 15 in each year.

3.11 Important features of project agreement:-

(i) One of the important covenants in the project agreement related to payment of service charges by the borrower. Following is the text of the covenant:-

"The borrower shall pay a service charge on the amount of the credit withdrawn and outstanding from time to time at the rate specified in the Development Credit Agreement. The borrower shall pay an additional service charge at the rate of \( \frac{1}{2} \% \) per annum on the principal amount outstanding from time to time of any special commitment entered into by the Association pursuant to the following Section:

Any action required or permitted to be taken and any document required or permitted to be executed, under this agreement on behalf of Karnataka may be taken or executed by a Secretary to Government of Karnataka or such other person or persons as Karnataka shall designate in writing, and Karnataka shall furnish to the Association sufficient evidence of the authority and the authenticated specimen signature of each person."

(ii) The Project Agreement also covered the manner of implementation of the project like designing the irrigation water demand, taking steps for the elimination of mosquito breeding in the project area, establishment of anti-malaria units, monitoring of ground water levels, monitoring of water quality of surface and sub-surface water, providing drainage to prevent water logging and salinity levels, establishment of Water User Groups in the command area, recovery of cost of O&M from water users, ensuring supply of water to irrigation areas by rotational water supply system, maintaining a Dam Safety Review Panel, establishment of a separate O&M unit, proper project management by the Engineer-in-Chief of the project, establishing of agricultural research facilities at Bheemarayanagudi and two research sub-stations in the project area, establishing a MIS Cell, training of project staff in contract administration, protection of water-shed of the reservoirs from risks of soil erosion, financing of OFD works, benefits to be extended to project displaced persons under the R&R programme, procurement of civil works / goods / consultancy service through ICB / LCB procedures etc.
3.12 Project implementation and reasons for delay:-

(i) As per the DCA, the project should have been completed by 30th June 1996 and the credit should have closed on 31st December 1996. But the project was actually completed by June 1997 and accordingly necessary extension was granted by the World Bank. Even though there was considerable progress in the irrigation sector, the progress in the R&R sector received a setback due to various reasons. The R&R package had to be revised / modified frequently taking into consideration the ground conditions, difficulties encountered during implementation and the recommendations / comments of the visiting World Bank Supervision Missions. As the raising of Alamatti dam was linked to the R&R progress, the civil works relating to raising of Alamatti dam had to be slowed down at times so as to be in tune with the progress of R&R. In fact, the World Bank suspended the aid on two occasions for reason of slow implementation of the R&R programme. Another reason that contributed to the slow progress of civil works was severe shortage of fuel (petrol / diesel) due to Gulf War in the initial years of implementation. Certain major disputes raised by contractors executing the civil works, the settlement of which took considerable time, also contributed to the delays.

(ii) By and large, the project was successfully implemented in the 8 years period from 1989 to 1997 as can be seen from the targets achieved which are highlighted in the paragraph 3.14 below. One important achievement was that GOK strongly advocated for the removal of arbitration clause from the ICB / LCB contract documents (for which the World Bank initially expressed strong resentments) and ultimately succeeded in persuading the World Bank.

3.13 Preparation of Implementation Completion Report by the World Bank:-

The Implementation Completion Report (ICR) was prepared by the World Bank Mission which visited India during September 1997 and reviewed by the South Asia Rural Development unit. Before finalising the ICR, the Mission also took note of the separate report prepared by GOK as well as the findings of the 24 Supervision Missions of World Bank that visited the project from 1989 to 1997. The Implementation Completion Report was finalised by World Bank in January 1998.

3.14 Achievements, as reflected in the ICR:-

Actual achievements under various components of the project, as analysed in the ICR, are highlighted in the following paragraphs:-

(i) Disbursements:-

Even though the total assistance extended by World Bank was 325 million Dollars (160 as credit and 165 as loan), following significant devaluation of Indian Rupee during implementation of the project and the amount left unutilised at project closure, an amount of 158.2 million Dollars was cancelled from the loan. The amount of loan utilised was therefore 6.8 million Dollars. Including the credit assistance of 160 million Dollars which was fully utilised, the total amount of disbursements made to the project by World Bank was 166.80 million Dollars.
(ii) Project cost:

The actual cost of the project increased substantially over the cost projected in the SAR. The following statement gives a comparison of the appraisal estimate and the actual project cost:

<table>
<thead>
<tr>
<th>Item</th>
<th>Appraisal Estimate</th>
<th>Actual Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rs. million</td>
<td>US $ million</td>
</tr>
<tr>
<td>Irrigation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alamatti dam</td>
<td>642.2</td>
<td>44.0</td>
</tr>
<tr>
<td>Canal &amp; Drainage works</td>
<td>4531.2</td>
<td>310.4</td>
</tr>
<tr>
<td>Roads</td>
<td>659.5</td>
<td>45.2</td>
</tr>
<tr>
<td>Buildings</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machinery &amp; Equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resettlement and Rehabilitation</td>
<td>1472.3</td>
<td>3100.8</td>
</tr>
<tr>
<td>Other Support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WALMI</td>
<td>175.9</td>
<td>12.0</td>
</tr>
<tr>
<td>Mapping</td>
<td>65.3</td>
<td>4.5</td>
</tr>
<tr>
<td>Studies</td>
<td>20.2</td>
<td>1.4</td>
</tr>
<tr>
<td>Anti-Malaria</td>
<td>64.9</td>
<td>4.4</td>
</tr>
<tr>
<td>Other CADA (training, OFD)</td>
<td>285.0</td>
<td>19.5</td>
</tr>
<tr>
<td>Establishment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O&amp;M</td>
<td>245.2</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7919.5</td>
<td>542.2</td>
</tr>
</tbody>
</table>

FN: 1. * This is including actual cost upto 30th June 1997 which was assessed as Rs.20,581 million and the balance amount required for completion of Phase-II works by 1999-2000 which was estimated as Rs.3589.5 million (Rs.210.6 million for Alamatti dam, Rs.441.9 million for canal works and Rs.2937 million for R&R).

2. WALMI building cost was under WALMI at appraisal but now included under ‘buildings’ as per actuals.

(iii) Project financing:

Following statement gives the percentage break up of project finances from various sources:

<table>
<thead>
<tr>
<th>Source</th>
<th>Appraisal estimate (in million Dollars)</th>
<th>Actual financing* (in million Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDA</td>
<td>160.0 (30%)</td>
<td>160.0 (21%)</td>
</tr>
<tr>
<td>IBRD</td>
<td>165.0 (30%)</td>
<td>6.8 (1%)</td>
</tr>
<tr>
<td>GOK/GOI</td>
<td>206.7 (38%)</td>
<td>589.1 (78%)</td>
</tr>
<tr>
<td>Farmers / nationalised banks</td>
<td>10.5 (2%)</td>
<td>Neg.</td>
</tr>
<tr>
<td>Total</td>
<td>542.2</td>
<td>755.9</td>
</tr>
</tbody>
</table>

(*) As per the Note of MD, KBJNL, Alamatti, the amount of actual reimbursement received from the WB Group is Rs.516.26 crores which works out to 21.35% of the actual project cost for completion (Rs.2417.06 crores).
Progress achieved under various components:-

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Unit</th>
<th>Estimate</th>
<th>Achievement as of June 30, 1997</th>
<th>% achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Alamatti dam:</td>
<td>(a) Concrete</td>
<td>T.Cum</td>
<td>275.74</td>
<td>224.36</td>
<td>81%</td>
</tr>
<tr>
<td></td>
<td>(b) Embedded parts for radial gates</td>
<td>No.</td>
<td>26</td>
<td>3</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>(c) River sluice gates</td>
<td>No.</td>
<td>6</td>
<td>-</td>
<td>0%</td>
</tr>
<tr>
<td>2. Shahapur Branch Canal</td>
<td>(a) Distributary</td>
<td>Km</td>
<td>597</td>
<td>597</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>(b) FICs</td>
<td>Km</td>
<td>2582</td>
<td>2582</td>
<td>100%</td>
</tr>
<tr>
<td>3. Mudbal Branch Canal</td>
<td>(a) Branch Canal</td>
<td>Km</td>
<td>50.8</td>
<td>46.16</td>
<td>91%</td>
</tr>
<tr>
<td></td>
<td>(b) Distributary</td>
<td>Km</td>
<td>179</td>
<td>156</td>
<td>87%</td>
</tr>
<tr>
<td></td>
<td>(c) FICs</td>
<td>Km</td>
<td>1539</td>
<td>1412</td>
<td>92%</td>
</tr>
<tr>
<td>4. Indi Branch Canal</td>
<td>(a) Branch Canal</td>
<td>Km</td>
<td>64</td>
<td>48.2+3(p)</td>
<td>78%</td>
</tr>
<tr>
<td></td>
<td>(b) Distributary</td>
<td>Km</td>
<td>621</td>
<td>450+25(p)</td>
<td>75%</td>
</tr>
<tr>
<td></td>
<td>(c) FICs</td>
<td>Km</td>
<td>2318</td>
<td>1962+30(p)</td>
<td>85%</td>
</tr>
<tr>
<td>5. Ayacut Roads</td>
<td></td>
<td>Km</td>
<td>627+290 (CADA)</td>
<td>617+18 (CADA)</td>
<td>98%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(69% including roads with CADA)</td>
</tr>
<tr>
<td>6. Buildings(Res.&amp;Non-Res)</td>
<td>(a) WALMI</td>
<td>No.</td>
<td>189R+5NR</td>
<td>All Buildings completed.</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>(b) Dam</td>
<td>No.</td>
<td>21R+1NR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) Canals</td>
<td>No.</td>
<td>165R+59NR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. OFD works</td>
<td>(a) Total land shaping (Land shaping in Phase-II area)</td>
<td>ha.</td>
<td>1,16,000 (1,14,000)</td>
<td>11,016 (8,800)</td>
<td>9.5%</td>
</tr>
<tr>
<td></td>
<td>(b) Drainage</td>
<td>ha.</td>
<td>30</td>
<td>10</td>
<td>33%</td>
</tr>
<tr>
<td>8. Studies</td>
<td>Rs. M.</td>
<td></td>
<td>48.5</td>
<td>36.0</td>
<td>74%</td>
</tr>
<tr>
<td>9. Mapping</td>
<td>Rs. M.</td>
<td></td>
<td>41.4</td>
<td>39.0</td>
<td>94%</td>
</tr>
<tr>
<td>10. Anti-Malaria</td>
<td>Rs. M.</td>
<td></td>
<td>64.9</td>
<td>11.09</td>
<td>17%</td>
</tr>
<tr>
<td>11. R&amp;R</td>
<td>Rs. M.</td>
<td></td>
<td>1,598.81</td>
<td>2,735.191</td>
<td>171%</td>
</tr>
<tr>
<td>12. R&amp;R (Physical)</td>
<td>(a) Area submerged by Alamatti dam with 509 m spillway crest.</td>
<td>Ha.</td>
<td>12,900</td>
<td>25,744</td>
<td>200%</td>
</tr>
<tr>
<td></td>
<td>(b) Families displaced under Phase-II</td>
<td>No.</td>
<td>40,000</td>
<td>44,148*</td>
<td>110%</td>
</tr>
<tr>
<td></td>
<td>(c) Income generating Schemes</td>
<td>No.</td>
<td>11,060</td>
<td>1,598</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>(d) Land allocated / Land Purchase grants</td>
<td>No.</td>
<td>5,864</td>
<td>638</td>
<td>11%</td>
</tr>
</tbody>
</table>

(*) Total number of families who will be displaced under Phase-II is 56,181 (excluding 1033 of Bagalkot) i.e., 140% of the SAR estimate.

(v) Number of villages & families affected, and construction of Resettlement Centres:

(a) At appraisal, it was estimated as follows:-
Number of villages submerged at Narayanapur: 37 fully
42 partly
Total: 79

Number of villages submerged at Alamatti: 54 fully
41 partly
Total: 95

Total number of Project Affected Families (PAFs) of Phase-II including the No. of families affected by submersion, displacement due to construction of Roads & Canals, missed PAFs and formation of new families: 40,000

Total number of families affected in Bagalkot: 530

Flood frequency considered for submersion and planning R&R in Phase-II: 1 in 10 years
(as against 1 in 10,000 years adopted in the revised Stage-I for designing the spillways)

Total number of resettlement centres: Narayanapur 33
Alamatti 68
Total: 101

(b) During the process of implementation of the project, the policy for R&R was changed several times based either on the recommendations / comments of World Bank or after giving due consideration to actual ground realities and difficulties experienced in the implementation. All such modifications / improvements were done through various Government Orders issued from time to time. The number of PDFs were assessed and identified under different categories through socio-economic surveys done from 1993 to 1996. According to the figures determined at project closure in June 1997, the total number of PDFs (including major children) was 57,214 (including 1,033 of Bagalkot).

(c) Apart from providing free house plots in the new resettlement centres and providing free transportation for moving the salvaged materials, several other R&R benefits were also extended in the form of land purchase grant, income generating schemes and house construction grant.

(d) Statements of progress achieved in land / structures acquisition, relocation of PDFs, rehabilitation entitlements, R&R expenditures and financial achievements, as at project closure (i.e. June 1997), are enclosed as Annexures-11, 12, 13, 14 & 15 respectively.

(vi) Agriculture production:

With the advent of irrigation under the Phase-II project, the crop yields have increased substantially. The statement (enclosed as Annexure-16) gives a picture of the crop yields before and after the project. While assessing the outcome of the project in its ICR, the World Bank has acknowledged the increased agriculture production with the advent of irrigation under the Phase-II project and has stated as follows:-

* xxx xxx The project has brought major agricultural benefits to an area that is agriculturally sub-marginal. Farmers with adequate land shaping and drainage are multiplying their net returns by nine times; even those who suffer from absence of land shaping and drainage are getting five times the returns they got without irrigation.
seed production has grown spectacularly while grain, fiber and even pulse has expanded giving full employment to families in the command, drawing labour into the command and causing significant increases in real wages. xxx xxx."

(vii) Water Users’ Associations:

49 Water Users’ Associations (WUA) were formed in 1990 & 1991, one in 1992 and none thereafter. These WUAs covered only 23,162 ha. of the command and are now moribund.

(viii) Modified indicators for future operation:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Estimated at closing date</th>
<th>Achieved by closing date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Land acquisition for Alamatti reservoir upto 515 m contour.</td>
<td>31,860 ha</td>
<td>18,060 ha</td>
</tr>
<tr>
<td>2.</td>
<td>Permanent replacement houses for rural PDFs of Alamatti reservoir by 1999.</td>
<td>48,338 Nos.</td>
<td>12,084 Nos.</td>
</tr>
<tr>
<td>3.</td>
<td>Area provided with field drains.</td>
<td>44,000 ha</td>
<td>20,297 ha</td>
</tr>
<tr>
<td>4.</td>
<td>Participatory irrigation management system to be introduced in Pilot distributaries.</td>
<td>5 Distry.</td>
<td>Not yet initiated</td>
</tr>
</tbody>
</table>

(ix) Key operating indicators in SAR:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Estimated</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Additional irrigated area</td>
<td>1,48,000 ha</td>
<td>93,513 ha</td>
</tr>
<tr>
<td>2.</td>
<td>Cropping intensity (of which irrigated)</td>
<td>145%</td>
<td>160%</td>
</tr>
<tr>
<td>3.</td>
<td>Number of affected families</td>
<td>40,000</td>
<td>57,214 (including 1033 of Bagalkot)</td>
</tr>
</tbody>
</table>

(x) Compliance with operation manual statements:

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Statement Number and Title</th>
<th>Comment on lack of compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>OMS 2.25 Cost Recovery Policy</td>
<td>GOK did not comply with this OMS which emphasises the importance of recovering the full cost of O&amp;M of Irrigation Schemes.</td>
</tr>
<tr>
<td>2.</td>
<td>OD 4.30 Involuntary resettlement</td>
<td>GOK has been assisting displaced persons in their move to new resettlement centres but has failed to provide them with adequate resources and Institutional support to restore their livelihoods.</td>
</tr>
<tr>
<td>3.</td>
<td>OP/BO 4.37 Safety of Dams</td>
<td>GOK has constituted a Dam Safety Review Panel but has not yet implemented its recommendations to repair the damaged stilling basin and carry out maintenance on the upstream face of the dam.</td>
</tr>
</tbody>
</table>

3.15 Water utilisations:

At the time of appraisal, the area contemplated for irrigation was assessed as 1,48,000 ha. This required a water utilisation of about 42 TMC. At the end of the project, the area actually irrigated was 93,513 ha requiring a water utilisation of about 27 TMC. This analysis is made in proportion to the contemplated utilisation of 119 TMC required for irrigating 4.25 lakh ha in Stage-I.
3.16 **Suspension of assistance during implementation:**

During implementation of the project, the World Bank suspended the aid on two occasions attributing the reason to poor implementation of the R&R programme. The first suspension was from November 1992 to February 1994 and the second one was from September 1995 to October 1996.

3.17 **Project implementation assessment:**

The World Bank in its ICR has made an overall assessment of the project implementation highlighting the project objectives, achievement of these objectives, major factors affecting the project, project sustainability, Bank performance, Borrower performance, assessment of outcome, future operation and key lessons learned. This report of assessment is enclosed as **Annexure-17**.

3.18 **Evaluation summary:**

The summary of the evaluation of the project completion made by World Bank in its ICR is reproduced below:

```
Implementation Experience and Results

5. The Borrower showed more enthusiasm for major civil works than for other aspects of the project. Only when R&R shortcomings became salient did the Borrower and the Bank concentrate on them. Minor civil works (FICs, FDs and land shaping), irrigation, O&M, agriculture, and malaria control were largely ignored by the project. In contrast, the Borrower pushed ahead with construction of major civil works not originally scheduled until after the completion of the project.

6. GOK followed a linear approach to R&R, first acquiring houses and agricultural land, then establishing the RC’s, then trying to relocate PDFs and, when all this is done, to offer PDFs their entitlements for economic rehabilitation. This fragmented approach slowed down the pace of resettlement and has left most of the income restoration work incomplete. The lack of project support, other than cash grants, for income restoration has contributed to weak performance of this sub-component. Outstripped by the pace of dam construction, contingency plans had to be implemented to undertake physical relocation on emergency bases. Although implemented smoothly, adoption of such emergency measures indicates the failure of planned resettlement measures.

7. Project impact: Agricultural production in properly irrigated areas surpassed appraisal expectations. However, incremental production and net value added were below expectations due to (a) lags in bringing new irrigation on-stream, and (b) absence of land shaping and drainage. The project displaced or otherwise adversely affected about 200,000 persons. The majority of these PAPs will not benefit from irrigation downstream. Although physical relocation of displaced persons to new Resettlement Centres (RC’s) is progressing well, due to the loss of productive land and the absence of alternate employment promotion schemes, the project has been unable to restore their livelihoods.

8. Project Sustainability: At present, both operation and maintenance are deficient and inadequately funded. Due to faulty canal operation, excessive water is being provided; farmers do not yet understand the cost of water logging and salinization and, consequently, have no incentive to save water. This situation is unsustainable. Similarly, without economic links between RC’s and the command area, or provision of alternate means of livelihood around the RC’s, resettlement benefits are not likely to be sustained.
```
9. **Actual Project Cost and Financing:** Original project costs, inclusive of physical and price contingencies, were estimated at US $ 542.2 million, of which 60% was by IBRD / IDA finance, 38% by GOK / GOI, and 2% by farmers and the nationalized banking system. Actually project expenditure up to June 30, 1997 was Rs.20,581 million and is expected to reach Rs.24,171 million by 2000 (US $ 643.6 million and $ 755.9 million respectively, at the weighted average exchange rate over the project period), when designated Phase-II investments are complete. The credit (US $ 160 million equivalent) was fully disbursed. US $ 6.8 million of the loan was disbursed and $ 158.2 million cancelled. Bank Group financing was thus 22% of the total; GOK / GOI financing was 78%; and farmer / nationalized bank financing negligible.

10. **Economic Rate of Return:** Given losses from truncated land shaping and drainage, Phase-II benefits provide a financial return of 0% and an economic return of 5%, compared to the 11% returns projected at appraisal, to the resources invested during the Phase-II period on works specified in the SAR, plus the remaining investments needed in 1997-2000 to complete them.

11. **Key Factors Relating to Achievement of Project Objectives:**

   GOK’s urgency to impound as much Krishna water as possible led to acceleration of work on Alamatti Dam and major canals, to the detriment of minor irrigation works, drainage, agricultural support and R&R. The Credit was suspended twice because R&R lagged behind dam construction leading to premature submergence of villages. R&R implementation improved somewhat as a result of the suspensions but R&R objectives could only be partially achieved. Implementation also suffered due to the absence of active NGOs who could have helped the project in R&R.

12. **Bank Performance:** Bank supervision first concentrated on major irrigation works, then, when it became salient, on R&R. Deficient R&R implementation led to intensive supervision of R&R and two suspensions. Nevertheless, the conditions for lifting suspension, particularly the second time, were unrelated to results on the ground and were unable to ensure that R&R objectives are met. Supervision of agriculture, drainage, and operation of the irrigation system was met. Due to the concentration of efforts on R&R and the construction program, supervision of several other major covenants such as the timing of Alamatti dam construction and attention to on-farm development, was deficient. Bank appraisal was, in retrospect, naïve in discounting the Borrower's determination to impound maximum of Krishna waters.

13. **Borrower Performance:** The Borrower made an immense financial effort to complete the physical works of the project but other components lagged significantly behind. Several parts of the project, including those covenanted, were not implemented. The most serious results of non-compliance and non-implementation is the loss of employment and consequently incomes for many PDFs, although physical relocation of PDFs accelerated significantly in the last 18 months of the project, unfortunately too late to change overall outcomes. A second deficiency is the serious water logging and salinization stemming from absence of drainage, lax operation of the canals, and lack of incentive for farmers to save water.

14. **Project Outcome:** Despite deficiencies noted above, the project has brought major agricultural benefits to an area that is agriculturally sub-marginal. Returns to individual farmers who have received water are several times their pre-irrigation incomes. Oilseed production has grown spectacularly, while grain, fiber and even pulse production have also grown significantly. Labour demand has expanded, giving full employment to families in the command, drawing labour into the command, and causing significant increases in real wages. But these benefits are much less than they might have been due principally to faulty canal operation, substantial absence of land-shaping and drainage, poor construction quality and maintenance, delays, and premature resettlement as a result of premature raising of Alamatti dam.
Summary of findings, Future Operations, and Key Lessons Learned

15. The project is rated unsatisfactory; its sustainability, uncertain at best. It is rated only partially successful in achievement of environmental, poverty-reduction, and institutional-development objectives. The Bank's identification and preparation assistance are rated satisfactory but its appraisal and supervision are rated deficient. The Borrower's preparation is rated satisfactory but its implementation, covenant compliance and operation are rated deficient.

16. **Future Operations:** The Borrower has provided an operational plan for completion of Phase-II investments and operation of the project. Branch canals and distributaries for the remaining 13,275 ha and remaining work on Alamatti dam should be completed within one year, FICs for the remaining 41,212 ha within three years. Physical resettlement is expected to be complete by December 1998. Economic rehabilitation is planned to be completed by March 1999, with the caveat that the project still lacks additional institutional capability to make these rehabilitation schemes viable. Ensuring satisfactory completion of economic rehabilitation should be a top priority for GOK. There are no plans to complete land levelling or the project's drainage component, or for initiating rotational water supply, for which the system was designed.

17. **Key Lessons Learned.** The salient lessons from UKP II are:

   (a) Economic rehabilitation plans – opportunities, skills needed, capital investments, input supply, market opportunities – should be taken into account when establishing Resettlement Centers. Lack of linkage between physical resettlement and economic rehabilitation has reduced the likelihood of restoring livelihoods of PDFs.

   (b) The time frame required for economic rehabilitation is much greater than that for physical resettlement. While physical resettlement can be completed parallel to infrastructure construction, the rehabilitation process will need support and careful monitoring until this is completed.

   (c) Resettlement cannot be implemented with a blueprint approach. Project design has to allow a flexible, process approach aimed at achieving resettlement objectives rather than delivering predetermined inputs.

   (d) The costs of not leveling irrigated land as planned and of not building the drains where needed will be very high compared to the modest costs avoided.

   (e) Leaving the canals open and allowing over-irrigation when there is surplus water during the initial construction period encourages high-water consuming crops and risks water logging and salinization. In this instance, a combination of (i) failure to construct drains, (ii) failure to operate the canals as designed, and (iii) farmers' lack of incentive to conserve water, have combined with the presence of soluble salts in the bedrock to produce crop-killing salinization in only five years after initiation of irrigation.

   (f) The absence, then, of sector work and formulation of a coherent irrigation sector strategy left the project conceptualization vulnerable despite intensive preparation and appraisal.

3.19 **Conclusion**:

   (i) When UKP Phase-I was completed with World Bank assistance in 1986, the draft PCR prepared by World Bank had been sent to GOK / GOI for comments. But no such procedure appears to have been followed in the case of UKP Phase-II which was completed in June 1997. The World Bank has finalised its ICR after obtaining a Borrower’s report from GOK, so much so no opportunity was given to GOK to offer its remarks / retaliate on the harsh comments made by World Bank in the ICR on the performance of the Borrower.
(ii) It must be admitted that, in spite of many odds GOK had to face during implementation (as explained in paragraph 3.12 above), the project could be successfully completed in a period of 8 years (from June 1989 to June 1997) as against the period of 7 ½ years stipulated in the SAR.

(iii) As admitted by the World Bank itself [as mentioned in paragraph 3.14(vi) above], there has been spectacular increase in agriculture production with the advent of irrigation under Phase-II and large indirect benefits like bringing in more and more employment opportunities in the project area. All these long term benefits have to be duly recognised.

(iv) Regarding UKP Phase-I, the IDA financing at appraisal was 44.30% of the estimated project cost. But as the project cost increased during implementation, the percentage of actual IDA financing (amounting to 117.60 million Dollars or Rs.119 crores) compared to the actual cost of completion (i.e., Rs.490.11 crores including cost of balance works) came down to 24.28%, which means GOK had to bear 75.72% of the actual project cost.

(v) Regarding UKP Phase-II, the percentage of World Bank financing was 60% of the estimated project cost at appraisal. The actual financing from WB Group (amounting to 166.80 million Dollars or Rs.516.26 crores) when compared to the actual cost of completion (Rs.2417.06 crores including cost of balance works) came down to 21.35% (this is assessed as 22% in the ICR), which means GOK had to bear 78.65% of the actual project cost.

(vi) The following Table gives a clear picture of the estimated costs projected, costs as per actuals, World Bank assistance contemplated and the World Bank assistance finally achieved, for Phase-I and Phase-II projects.

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Project period</th>
<th>Estimated cost at Appraisal, (in Rs. crores)</th>
<th>Actual cost for completion (in Rs. crores)</th>
<th>World Bank assistance contemplated as per Agreement. (in Rs. crores)</th>
<th>World Bank assistance actually received. (in Rs. crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase-I</td>
<td>1978 to 1986</td>
<td>244.54</td>
<td>490.11</td>
<td>108.36 (44.30% of estimated cost)</td>
<td>119.00 (24.28% of actual cost for completion)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>119.00</td>
<td></td>
</tr>
<tr>
<td>Phase-II</td>
<td>1989 to 1997</td>
<td>791.95 (791.67 as per SAR)</td>
<td>2417.06</td>
<td>475.50 (60% of estimated cost)</td>
<td>516.26 (22% of actual cost for completion)</td>
</tr>
</tbody>
</table>

(vii) Considering the fact that the project cost increased substantially due to -- (a) adoption of World Bank norms, (b) implementing the World Bank conditions (especially for the R&R package), and (c) the relatively small percentage of World Bank assistance, it may be worth evaluating the merits and demerits of going for World Bank assistance in future.

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CHAPTER-5*

RESTORATION OF THE DISTRESSED DON AQUEDUCT
IN NARAYANAPUR LEFT BANK CANAL (NLBC)

1.0 Introduction:-

1.01 Don aqueduct is situated at 23rd KM of NLBC across the river Don. This is a major CD work located in the Head reach of the main canal beyond which lies almost the entire atchkat of NLBC barring a relatively small portion of the atchkat coming under the distributaries upto 23rd KM (the total atchkat area under NLBC is about 4.09 lakh ha. in the I Stage of Upper Krishna Project). Construction of this work was started in 1976 and completed in 1982.

2.0 Salient Features:-

2.01 Don river:-

(i) Catchment area of Don river at the crossing point .. 3200 Sq.KM
(ii) Designed discharge of Don river .. 4433 cumecs

2.02 Aqueduct:-

(i) Designed discharge of the aqueduct .. 280.02 cumecs (9889 cusecs)
(ii) Length of the aqueduct .. 529 m.
(iii) Type of aqueduct .. RCC Trapezoidal trough supported by buttresses at intervals of 3.3 m and founded on rocky strata.
(iv) Levels:-

(a) Deepest foundation level .. RL 471.876 m. (1548.15 ft.)
(b) Canal bed level at entrance .. RL 478.478 m. (1569.81 ft.)
(c) FSL .. RL 484.288 m. (1588.87 ft.)
(d) Aqueduct top level .. RL 485.251 m. (1592.03 ft.)
(v) Buttresses .. 154 Nos. of cement concrete buttresses reinforced upto canal bed level and above that plain concrete.
(vi) Arches .. 42 Nos. of 9 m. span RCC arches in the central portion of the aqueduct.

(*)Sources of this chapter:- 1. Reports got up by TORSTEEL in January 1995 and February 1996.
   2. Notes got up by CE(O&M), UKP Narayanapur and placed before the 1st meeting of TAC on 10.05.1995.
   4. Proceedings of 8th meeting of TSC of KBJNL held on 27.05.1996.
Concrete

- M-15 grade for buttresses and M-20 grade for Trough portion.

Thickness of Buttress walls

- 0.45 m.

Thickness of Trough slab (designed as a continuous slab)

- 15 cm at top and 30 cm at bottom.

Construction period & cost

(a) 1976 to 1982
(b) Rs.21 lakhs.

Water allowed in the system

- During 1983-84.

3.0 Distress features and reference to M/s. Torsteel Research Foundation:

Distress features were observed in 1986 in several buttresses (Nos.1 to 12 and 140 to 154) at both ends of the structure and these were in the form of cracks in the buttresses. The cracks were progressive in width and number causing anxiety about the safety of the structure. Thereafter the project authorities made a reference to M/s. Torsteel Research Foundation in India, Bangalore to investigate the causes for distress and to evaluate the structural soundness of the aqueduct.

4.0 Observations made by M/s. Torsteel during 1988 & 1989 and interim report:

4.01 The experts of M/s. Torsteel conducted detailed investigations in May 1988 and submitted an interim report in June 1988 suggesting emergency restoration measures. The structure was monitored by M/s. Torsteel for a further period of one year during which period cracks were observed in all the buttresses supporting the approach and exit transitions. The cracks were distinct and horizontal, located along the interface of successive concrete lifts. They were in multiple numbers in some of the buttresses. All the observed cracks were above the canal bed level. It was also observed that the cracks were progressive in width and numbers. In addition to horizontal cracks, several inclined cracks were observed in a few of the buttresses. Based on the above observations, M/s. Torsteel submitted a detailed report in July 1989 suggesting detailed restoration measures.

4.02 The project authorities however carried out during 1988 only the emergency restoration measures recommended by M/s. Torsteel in its interim report i.e., strengthening of buttresses 3, 4 & 153 and interconnecting of the first two buttresses 1 & 2 in the approach transition by means of steel struts. The detailed restoration measures suggested in the report of July 1989 by M/s. Torsteel were not implemented. The project authorities, after a lapse of 5 years (i.e., in August 1994) requested M/s. Torsteel to re-inspect the aqueduct for assessing the present status and to suggest modifications to the original recommendations, if required.

5.0 Re-inspection by M/s. Torsteel in 1994 and physical observations:

5.01 The experts of M/s. Torsteel inspected the structure on 20th September 1994 and made the following physical observations:
(a) Cracks had developed in the 2nd buttress at the level of struts and the strut members had buckled.

(b) There were additional cracks in most of the buttresses and the earlier cracks had widened. However, buttresses 13 to 139 supporting the flume region did not exhibit any cracks.

(c) In all the buttresses of the approach and exit transitions, the interfaces between successive concrete lifts were found to be defective. Smooth laitance on top of lower lifts and honey comb concrete at bottom of upper lifts in all interfaces, pierced with short reinforcing bars meant for supporting the shutters, were observed.

(d) In some of the buttresses in both the transitions, non-verticality in alignment was observed. In some cases, the non-verticality was to an extent of 150 mm.

(e) In the first four spans from either end, the outer surface of the trough was found to be severely honeycombed. It was evident from the site observations that these spans were cast directly on made up ground without any form work. The reinforcing bars were found to be exposed and corroded in some regions. In these spans the bearing regions were found to be defective. Leakage of water in the water-bar region was profuse in some locations.

(f) The central flume region was observed to be, by and large, free from defects and distress.

5.02 In addition to the above, M/s.Torsteel made the following observations on the design features:-

(a) The trough is of conventional design based on standard norms.

(b) The buttresses are of plain concrete provided with nominal reinforcement only upto canal bed level, which is not in conformity with standard norms of design.

(c) Friction-free supports have not been provided, which is not in conformity with standard norms.

6.0 **Tests conducted by M/s.Torsteel:-**

6.01 Non-destructive tests such as rebound hammer test, profo-meter test, ultra-sonic pulse velocity test and semi-destructive tests such as core test, were conducted to ascertain the following:-

(a) How good is the *in-situ* concrete in buttresses?

(b) How integral is the interfaces between successive concrete lifts in buttresses? and

(c) Whether the disposition of reinforcement is in conformity with structural drawings?

6.02 Rebound hammer and core tests were carried out to ascertain the quality of in-situ concrete in buttresses while ultra-sonic pulse velocity test was carried out to ascertain the integrity / monolithicity of concrete at interfaces.

6.03 A profo-meter was deployed to map the reinforcement in the buttresses.

6.04 The tests were restricted to buttresses in the transition regions since the distress that had occurred was significant in buttresses of this region.
7.0  **Results of Tests:-**

7.01  **Rebound hammer tests:-**

These tests were carried out on buttresses 1 to 6 and 148 to 154 only at locations that were easily accessible. Patched up and cracked regions were avoided during tests. A close analysis of the test results indicated that the concrete in the buttresses was satisfactory with a minimum strength of 25 N / Sq.mm. However, the limitation of this test is that it cannot throw any light on the integrity of interface concrete since it is essentially a surface hardness test.

7.02  **Concrete core tests:-**

Concrete cores of 75 mm dia were extracted at two random locations in the buttresses. The test was intended mainly to study the strength and texture of in-situ concrete in the buttresses. These two cores were tested in the laboratory as per guidelines of ISI. The results indicated that the _in-situ_ concrete strength was about 18 N / Sq.mm. A physical examination of concrete in the tested cores indicated that the concrete was considerably dense and homogenous.

7.03  **Ultra-sonic Pulse Test:-**

The purpose of this test was to ascertain the integrity of concrete at the interfaces between successive concrete lifts. Ultra-sonic pulses were passed at random locations at interfaces in various buttresses. Interfaces with wide cracks were avoided. In most of the locations, the pulse did not pass through the interfaces indicating clear discontinuity of concrete over the full thickness of the buttresses.

7.04  **Profo-meter test:-**

This test was carried out at random areas in a few buttresses to map the reinforcements. The mapping of existing reinforcement as depicted by profo-meter was compared with that in structural drawings. They were found to compare well. It was confirmed that the reinforcing bars are provided in the buttresses only upto canal bed level.

8.0  **Reasons for distress as identified by M/s.Torsteel:-**

8.01  From the physical observations, results of the probing tests, information collected during one year of monitoring period and study of the structural drawings, the distress was attributed to the following specific causes:-

(a) The buttresses are thin, large in area and significant in height. They are the main load bearing systems. Such buttresses in this structure are out of plain concrete above the canal bed level and provided with only nominal reinforcement below the canal bed level. It has not been possible to visualise any justification for not providing any reinforcement in these either in design or construction, above the canal bed level.

(b) The interfaces between successive concrete lifts in transition buttresses are defective due to the modus of construction adopted. There is evidence of smooth laitance on top of lower lifts and honeycomb concrete at the bottom of upper lifts in the interfaces. This has resulted in lack of integrity / monolithicity of concrete in many interfaces. The interfaces have further weakened due to the presence of
short reinforcing bars at close intervals along them, which had been perhaps provided for supporting the shutters. From this, buttresses in the present structure above the canal bed level can be visualised to have been made up of plain concrete lifts kept one above the other without adequate continuity. The continuity which could have been established either by reinforcement and/or by good construction practice is absent here.

(c) Although the probing tests have revealed that concrete in various lifts is good enough, the same is not the case at the interfaces. This has resulted in weak planes along the full length of the buttresses between successive concrete lifts.

(d) In essence, the following six causes are of importance in the present case concerning the cracking of buttresses. These causes would not have posed any major problem if only the buttresses had been reinforced adequately throughout and good construction practice had been adopted.

They are:
1. Unsymmetrical loading due to differential earth pressure on transition buttresses.
2. Disturbance of buttresses during construction of trough
3. Non-verticality of buttresses
4. Temperature effects
5. Drag/thrust on side walls of trough and
6. Plate column effect in buttresses.

8.02 Differential earth pressure:

In the transition spans (particularly in the first four spans from either end), the trough has been cast on made up ground in between buttresses. In the process of removal of earth (for de-shuttering), there is evidence to indicate that the earth was being removed from one span keeping the earth in the adjacent span intact. This has resulted in development of differential earth pressure on the corresponding buttresses. This earth pressure resulted in development of horizontal cracks on faces away from the earth. Obviously the cracks have developed in the interfaces which have meagre flexural strength. This reasoning is further strengthened by the fact that, while removing earth from the second span in the entrance transition, during monitoring period, additional cracks developed in the adjacent buttress. It can be again emphasised here that these cracks developed only because of the absence of reinforcement and lack of integrity of concrete at the interfaces.

8.03 Disturbance of buttresses during the construction of trough:

The sequence of construction necessitated the completion of buttresses to their full height before the form work for the trough could be in position; this means construction of concrete buttresses of almost 15 m height with a nominal thickness of 45 cm. It can be visualised that, here also just as it can happen in other similar constructions, horizontal disturbances could have occurred during the casting of trough concrete. Such disturbances have obviously resulted in the initiation of cracks at least in some interfaces of some buttresses. However, such cracks have widened in course of time due to various other causes.

8.04 Non-verticality of buttresses:

At site, the thin concrete buttresses have not been cast truly vertical. The misalignment in many cases is much larger than the permissible values. Since the buttresses are of plain concrete, it is not necessary to over emphasise the necessity for rigorous control in construction to cast it truly vertical. In many designs, the tolerance
permitted is as low as 10 mm, whereas in the present case in some regions non-verticality is to the extent of 150 mm. This has induced additional moments in the buttresses not accounted for in the structural designs. Again, it can be visualised that these moments have induced hair cracks in some interfaces in some of the buttresses.

8.05 **Temperature effects:**

In the structural designs, movement joints are envisaged on alternate supports in the trough. Water bars have been indicated in such joints. However, in the drawings, friction free buttress supports have not been provided for. In addition, construction of such movement joints at site has not been satisfactory. This has resulted in a structure with concrete troughs partially restrained at buttress supports. It can be visualised that due to the large variation of temperature during the year at site, thermal stresses developed in the trough have been exerting significant horizontal outward forces on the buttresses particularly nearer the embankments. This visualisation is justifiable in view of the fact that the cracks are significant in buttresses nearer to embankment and the cracks are on the river face of the buttresses.

8.06 **Drag / thrust on side walls of the trough:**

The configuration of the trough in the transition is such that it results in thrust on buttresses in approach transition and drag on buttresses in exit transition. As the joints between the buttresses and the trough are not fully friction free, it can be expected that the drag / thrust is fully transmitted on to the corresponding buttresses. From the nature of cracks observed, its effect can be visualised to have been more predominant on the exit transition buttresses.

8.07 **Plate column effect:**

The buttresses are considerably thin compared with width and height. The same has to be theoretically designed as plate column with inplane loading. The development of secondary moments is an important factor to be considered in the design, more so in case of plain concrete buttresses. This fact has not been considered and provided for in the design. Increased thickness or provision of adequate reinforcement would have taken care of these secondary moments.

8.08 **Seismic effects on the structure:**

One another deficiency in the structural designs of the aqueduct is non-provision for seismic effects. This is considered to be a very important factor in recent times. Aftereffects of tremors in Koyna and Idikki regions have further highlighted the importance of this. The safe provision to take care of this effect is converting plain concrete buttresses to reinforced buttresses.

8.09 In any affected buttress, it is difficult to identify any particular cause from the above as solely responsible for the distress. In all probability, combination of two or more of the above causes must have resulted in the development of cracks.

8.10 The buckling of struts between buttresses No.1 and 2, provided during emergency restoration measures, indicate that the buttress No.1 is incapable of resisting earth pressure and this earth pressure in turn is being transmitted to the buttress No.2 through these struts. Not designing these struts for such large earth pressure has led to their buckling. This also resulted in further development of cracks in buttress No.2. This calls for strengthening the buttresses No.1 & 2 and 153 & 154 to resist the earth pressure.
9.0  **Recommendations made by M/s.Torsteel for restoration of the aqueduct**:

9.01  While summing up the findings that the structure as it stood was structurally unsafe and needed immediate restoration measures to make it safe again, M/s.Torsteel in its report of January 1995 made the following recommendations for restoration of the aqueduct, mainly aimed at strengthening of initial buttresses to resist the earth pressure, restoring the other cracked buttresses and sealing of the leaky spots and joints:

(i)  Shotcreting of trough
(ii) Encasement of buttresses 3 to 12 and 140 to 152
(iii) Strengthening of buttresses 1 & 2 and 153 & 154
(iv) Providing RCC stiffners connecting buttresses 1 to 12 and 140 to 154
(v)  Sealing of construction joints

10.0  **Sequence of operations of restoration measures**:

10.01  M/s.Torsteel recommended the following sequence of operation in respect of each of the above said restoration measures:

(1)  Shotcreting of trough shall be taken up first followed by encasement of buttresses 3 to 12 and 140 to 152. Further, buttresses 1, 2 and 153 & 154 shall be strengthened. Sealing of construction joints of the trough and grouting of seeping regions shall be taken up at the end.

(2)  **Shotcreting of trough**:

(i)  In the first and last 5 spans of both the transitions, the outer surface of the trough shall be sand blasted followed by thorough cleaning by water jet.
(ii) Exposed reinforcing bars shall be coated with anti-corrosive chemical to specification.
(iii) Shear connectors shall be fixed at specified locations as per specification and drawings.
(iv) Weld mesh to specification shall be fixed in position by tack welding to shear connectors.
(v)  Shotcreting shall be carried out to specifications and thickness shall be made up in two to three layers.

(3)  **Encasement of buttresses 3 to 12 and 140 to 152**:

(i)  Soil boulder fill shall be removed upto foundation bed level.
(ii) The surface to be encased shall be sand blasted followed by cleaning with water jet.
(iii) Shear connectors shall be fixed at specified locations as per specification and drawings.
(iv) Proposed reinforcement shall be placed in position and tack welded to the shear connectors.
(v)  Encasement shall be carried out as per specification and drawings.
(vi) Finally, the top one meter of the buttress shall be shotcreted as per specification and drawings.

(4)  **Strengthening of buttresses 1 & 2 and 153 & 154**:

(i)  (a) Tubular supports shall be inserted at predetermined intervals between buttresses 2 to 5 and 140 to 153 as detailed in drawings.
(b) The soil boulder filling in between buttresses shall be removed in stages followed by inserting tubular supports. This sequence shall be carried out upto canal bed level.
(ii) For providing piles, drilling shall be carried out through a compressor operated drill up to the existing foundation level.

(iii) RC piles shall be cast as per details in the drawings.

(iv) The strengthening of the buttresses 1, 2, 153 and 154 shall be carried out as per specifications and drawings.

(v) Finally, the top 300 mm of buttress shall be shotcreted as per specification and drawings.

(5) **Providing RC stiffeners connecting buttresses 1 to 12 and 140 to 154:**

(i) The proposed reinforcements shall be fabricated and properly connected to buttress reinforcements.

(ii) Slurry tight form work shall be provided and M-20 grade concrete shall be poured into the form to specification.

(6) **Sealing of construction joints:**

(i) ‘V’ groove shall be made along the profile of construction joint and thoroughly cleaned with water jet.

(ii) Groove shall be thoroughly filled with polysulphide sealents as per manufacturer’s specification.

11.0 **Alternative proposal and estimates:**

11.01 The Chief Engineer, O & M Zone, Narayanapur, prepared an estimate for restoration of the aqueduct based on the above recommendations of M/s.Torsteel. The estimated cost was reported as Rs.211 lakhs.

11.02 While placing the proposal before the first meeting of the Technical Advisory Committee, Irrigation Projects on 10.05.1995, the Chief Engineer also placed an alternative proposal of filling up the first and last five vents with UCR masonry in CM 1:4 making the entire portion monolithic for sustaining the lateral earth pressure and thrust at bearing regions and buckling effect of buttresses and also to keep the abutment side distressed buttress intact. The UCR masonry was proposed to be constructed up to the height of the canal trough bottom at the 5th span and tapered off to maximum height of the canal at the junction. At the exit side, same type of treatment was proposed between span 149 to end of aqueduct. By adopting this proposal, according to the Chief Engineer, the design objective would be met with and it was easy for construction purposes also. As regards the rest of the restoration measures, the proposal of the Chief Engineer was to retain the measures suggested by M/s.Torsteel.

11.03 The estimated cost of the alternative proposal as worked out by the Chief Engineer was Rs.163 lakhs.

11.04 As per the comparative statement prepared by the Chief Engineer excluding the cost of Work Charged Establishment and Contingencies, the alternative proposal of the Chief Engineer was cheaper by Rs.46 lakhs.
12.0 **Deliberations of the Technical Advisory Committee in its 1st meeting held on 10.05.1995**:

12.01 The measures recommended by M/s. Torsteel and the alternative proposal got up by the Chief Engineer, O & M were discussed in the first meeting of TAC held on 10.05.1995. The urgency for finding a solution with a view to allow water by 15th June was recognised and the Committee decided to take up the restoration measures in two phases, viz.:-

(a) to take care of the immediate need to ensure safety of the structure, and

(b) identify measures for strengthening the other portions considering seismic and other forces in due course but essential.

12.02 In the first phase, it was decided to strengthen the first 5 and last 5 bays by providing mass concrete M100 with plums after providing dowel bars in the rock foundation as well as at the existing buttresses by welding them to integrate the mass concrete and buttresses so as to take care of the seismic forces and also act as a monolithic mass.

12.03 It was decided to discuss the second phase measures after inspection of the site by the Committee and collection of the required data by the Chief Engineer.

13.0 **Discussions in the 2nd meeting of TAC held on 26.05.1995**:

13.01 The project authorities were directed to consult Dr. Vishwanath of Torsteel urgently, as a precautionary measure, regarding the sequence of excavation in order to ensure that the equilibrium of the buttresses is not disturbed in any way.

14.0 **Inspection of the aqueduct by TAC on 26.06.1995**:

14.01 At the time of inspection by the TAC on 26.06.1995, the work of mass concreting in the first 5 and last 5 spans was in progress. The suggestion of the Chief Engineer (O&M) to raise the level of concreting of abutments in spans 1, 2 & 3 and 153, 152 & 151 upto the top of aqueduct and in the remaining 1 ½ spans upto 3.6 m above the trough bed level was agreed to. The other suggestion of the Chief Engineer to interconnect the buttresses 6 to 12 on the approach side and 140 to 149 on the exit side by introducing struts (stiffeners) of RCC was decided to be discussed in the meeting of TAC.

15.0 **Discussions in the 3rd meeting of TAC held on 26.06.1995 and 27.06.1995**:

15.01 Immediately after inspections, the TAC held its 3rd meeting on 26th and 27th June 1995 at Kembhavi and Bheemarayanagudi and discussed the proposal of the Chief Engineer (O&M).

15.02 After discussions, the Committee took the following decision:-

(a) Concreting of abutments in spans 1, 2 & 3 and 153, 152 & 151 should be raised to the top of aqueduct. For the remaining 1 ½ spans on either side, concreting may be raised upto 3.65 m above trough bed level;

(b) Shotcreting of trough in spans 4 & 5 and 149 & 150 may be done;
Under the second phase of restoration work, buttresses 6 to 12 on the approach side and 140 to 149 on the exit side may be interconnected by introducing struts (stiffners) of RCC as proposed by the Chief Engineer (O&M). By providing these struts at two positions as interconnection of buttresses, the long column effect would be eliminated. However, its efficacy for withstanding seismic forces has to be worked out before taking up this work.

15.03 The second phase restoration work as recommended above was subject to the following conditions:

(a) Detailed design calculations are to be done considering the seismic forces;

(b) The columns have to be taken upto rock level;

(c) Struts (stiffners) have to be suitably connected on to the buttresses by providing grip rods.

15.04 The Chief Engineer (O&M) informed that the hydraulics, consequent upon the filling up of end spans with concrete, have been checked and found satisfactory.

15.05 For the remaining buttresses of the structure, no corrective action was found necessary, which was concurred by Dr. Vishwanath (of Torsteel) also.

16.0 Inspection of the aqueduct by TAC on 07.08.1995:

16.01 On the day of inspection by TAC on 07.08.1995, the first phase restoration work had already been completed and water had also been let into the canal for irrigation. The project authorities were directed to take core samples of the concrete and evaluate the strengths by adopting standard procedures in order to satisfy quality control stipulations.

17.0 Discussions in the 8th meeting of Technical Sub-Committee of KBJNL held on 27.05.1996:

17.01 The report of M/s. Torsteel on the second phase restoration measures, as got up in February 1996, was discussed in the meeting of TSC on 27.05.1996.

17.02 M/s. Torsteel, referring to its earlier comprehensive report submitted in January 1995, furnished revised final drawings for restoration of the remaining buttresses viz., 6 to 12 and 140 to 149 as well as for the trough, under the second phase, along with the necessary specifications.

17.03 The total estimate cost of the second phase restoration work based on the recommendations of M/s. Torsteel was worked out by the Chief Engineer (O&M) as Rs.95 lakhs. After discussions, the TSC took the following decisions:

(a) In the unloaded condition of the aqueduct i.e., during the period of closure, the following sequence of restoration shall be adopted.

(i) All the expansion joints (vertical) in the trough shall be totally sealed first as per the report of the Consultants.

(ii) The shotcreting of the under-surface of the trough wherever necessary, shall be done as per the report of the Consultants.
At least bottom one meter of the buttresses 6 to 12 and 140 to 149 starting from the foundation shall be encased as per the report of the Consultants.

All the shear connectors over the whole surface of the buttresses 6 to 12 and 140 to 149 shall be completed as per the report of the Consultants.

(b) In essence, water can be released in the aqueduct only after the above four items are completed in all respects.

(c) The encasement of the remaining portion and shotcreting of the top reaches of the buttresses can follow later. However, during this stage of encasement, at appropriate intervals, PVC tubes shall be inserted in the encasement in the regions of horizontal cracks to take up pressure grouting, if required later.

(d) The proposed treatment of horizontal joints in the trough need not be taken up now. The trough concrete should not be disturbed by drilling holes at close intervals to facilitate cement injection grouting as suggested by one of the prospective tenders viz., M/s. REPCON.

(e) The contemplated application of Epoxy Bonding Coat on old concrete surface prior to encasement need not be taken up. Bond coat is superfluous in the present approach followed by the Consultants for the design of restoration work.

18.0 Inspection of the aqueduct by TAC on 5th and 6th October 1996:

18.01 On the day of inspection, the second phase restoration work was going on. As there was standing water in the trough, dewatering work was in progress. The leakages through horizontal joints in the trough portion were being plugged as per technical requirements.

19.0 Completion of restoration work:

19.01 The restoration work based on the recommendations of -- (i) M/s. Torsteel Research Foundation India, Bangalore, (ii) Technical Advisory Committee, Irrigation Projects, and (iii) Technical Sub-Committee of KBJNL, was completed in all respects in October 1996; the actual cost of completion of restoration work (both phases) being Rs.263 lakhs.

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1.0 The Karnataka Resettlement of Project Displaced Persons Act, 1987, (Karnataka Act No.24 of 1994):

1.01 Background:

It had been estimated at appraisal of UKP Phase-I by World Bank during 1977-78 that Alamatti and Narayanapur reservoirs under Phase-I would submerge about 41,000 ha. of cultivated lands and displace around 13,000 families. Provision had been made in the appraisal estimate for acquisition of lands and structures that would come under the submergence under two reservoirs, payment of necessary compensation under the Land Acquisition Act and construction of 50 resettlement centres (25 each at Alamatti and Narayanapur). The policy of GOK at that time was to resettle the displaced families in the new resettlement centres by providing them house plots free of cost and providing free transport for the salvaged materials. Construction of public buildings like Community Centres, Health Centres, Schools, etc. was also being provided in the new Resettlement Centres at Government cost. When the agreements were signed with World Bank in 1978 for financing the project, it was stipulated in the Project Agreement that Karnataka should allocate to the extent possible, land suitable for cultivation to the farmers resettled from the two reservoirs. Though in several other projects Government had provided the oustees with cultivable forest land, no such facility could be provided in the UKP Phase-I due to the fact that the Forest Conservation Act came into existence in 1980 according to which no forest lands could be acquired and allotted without obtaining the required clearance from Government of India. As a result, no rehabilitation benefits could be extended to the project affected families of Alamatti and Narayanapur reservoirs under Phase-I. But the World Bank insisted upon extending the required facilities to the displaced persons so as to bring them to the pre-project standard of living. Even as the Phase-I project was under implementation from 1978 to 1986, GOK had started preparing another project report during 1985-86, which was called as UKP Phase-II, for obtaining World Bank assistance. The World Bank Missions were closely associated with the preparation of the Project Report for Phase-II. The issue of extending benefits to the displaced families (it was estimated in 1988 that about 40,000 families would be displaced in Phase-II) so as to bring them to their original standard of living assumed great importance. Considering the fact that a substantial portion of budgetary support for the project would have to be spent only on the R&R programme, GOK initially resisted such proposals of World Bank even though ultimately it had to yield only in the interest of obtaining assistance from the World Bank. One of the strong reasons for the resentment of GOK was that, if such liberal R&R benefits were to be extended for the UKP oustees, the same yardstick might have to be followed in other projects also, consequent upon which the State’s finances would be largely affected.

1.02 Legislation:

In order to adopt a uniform policy for R&R for all the projects and eliminate any discrimination, GOK in consultation with MYRADA, a local NGO, prepared in 1987 a policy paper for R&R of project affected families and decided to bring out the same in the form of legislation. The main objective of the policy was to provide lands to the displaced families in the benefitted zone (command area). Accordingly, a draft Bill called “The Karnataka Resettlement of Project Displaced Persons Bill, 1987” was drafted and approved by GOK. The World Bank was kept informed of the intentions of GOK and a copy of this Bill was also made available to the Bank. This Bill was passed in both the
Houses of Legislature in 1987 and sent to Government of India for obtaining the assent of the President of India. As there was delay in obtaining the assent of the President of India and as UKP Phase-II project had to be appraised and negotiated without further delay (the project was appraised by World Bank in February 1988 and negotiations with World Bank were held in November 1988), it was decided by GOK not to apply the provisions of this Bill to UKP Phase-II. Various connected Departments / Ministries of Government of India raised many points of doubt on the referred Bill and necessary clarifications / compliances were promptly furnished by GOK. Finally, approval from the President of India was received in August 1994. Subsequently, the Act was published by GOK as “Karnataka Resettlement of Project Displaced Persons Act, 1987” (Karnataka Act No.24 of 1994). A copy of the said Act is enclosed as Annexure-1.

1.03 Provisions in the Act:-

(a) The Act provides mainly for the following:-

1. Restrictions on transfer, sub-division or partition of land in the benefitted zone

2. Assessment of extent of land from which persons are likely to be displaced and census of displaced persons

3. Preferring appeals

4. Assessment of land available for resettlement

5. Provisional declaration of affected zone and benefitted zone

6. Final declaration of affected zone and benefitted zone and power to make changes in such zones

7. Power to acquire land for the purposes of this Act

8. Appropriation of compensation payable to displaced persons under the Land Acquisition Act

9. Resettlement of displaced persons

10. Extent of land to be granted to displaced persons

11. Occupancy price

12. Public notice calling upon the displaced persons to state if they want lands for the resettlement

13. Resettlement officer to prepare draft scheme of resettlement

14. Publication of scheme and sanctioning of scheme

15. Entrustment of execution of layout to the local authority

16. Transfer of encumbrances

17. Implementation of the Resettlement Scheme

18. Penalty for false declaration

19. Power of officers of Government and local authorities to assist

20. Officers and servants appointed under this Act to be public servants

21. Bar of jurisdiction

22. Protection of action taken under this Act
(b) The schedules attached to the Act specify the following:-

1. Extent of acquisition of land in a Gramathana of the village falling in the affected zone

2. Scale of acquisition of irrigable land for allotment to displaced persons in the benefitted zone or outside the benefitted zone

3. Scale of acquisition of non-irrigable land for allotment to displaced persons outside the benefitted zone

4. Scale of allotment of agricultural land / non-agricultural land / house sites to the displaced persons

5. Scale of allotment of non-irrigable agricultural land to the displaced persons

6. Scale of allotment of non-irrigable, non-agricultural land to the displaced persons

7. Scale of allotment of house sites in Gramathana to the displaced persons

1.04 Implementation of the Act:-

(i) It has been stipulated under Section-1(3) of the Act that the Act shall come into force on such date as the State Government may, by notification in the official Gazette, appoint. It is understood that though the Act is published, it has not yet been given effect to for enforcement.

(ii) It is also stipulated under Section-9 of the Act that, if the State Government is of the opinion that it is necessary or expedient in the public interest so to do for the resettlement of displaced persons, it may by notification in the official Gazette, declare that the provisions of this Act shall apply in relation to the project specified in the notification, and thereupon, the provisions of this Act shall apply to such project.

(iii) It is therefore necessary that the Act shall have to be first notified by the Government for giving effect to. If the intention is to apply this Act to a specific project, it is also necessary to issue another notification declaring that the provisions of this Act shall be applicable to the project notified.

1.05 Conclusion:-

(i) It may be worth making an assessment / in-depth study of the cost of various benefits actually extended under the R&R programme to the project displaced / affected families of UKP Phase-II with World Bank assistance through various Government Orders and compare it with the cost of R&R benefits that could have otherwise been extended under the above R&R Act. This will serve as a pointer to providing R&R facilities to the project affected families of projects in future. Thereupon the Government can decide whether the Act could be enforced on future projects.

(ii) It is worth noting the observations made by the World Bank in its Implementation Completion Report (dated: January 12, 1998) of UKP Phase-II, which are reproduced below:-

"xxx xxx A Government Order issued prior to appraisal established the legal frame work for R&R, while an Act already approved by the State Legislature was pending approval by the President of India. The project had expected to benefit from this legislation. The Karnataka Resettlement of Project Displaced Persons Act, 1987, (henceforth called the Resettlement Act) received Presidential approval on August 8, 1994. This Act provides a legal basis for acquiring a proportion of land from the benefitted zone owned by farmers in..."
proportion to the size of their holding for allocation to persons displaced from the affected zone of that project. The cost of this acquisition was to be met from the compensation provided to the project displaced families. *Unfortunately, the Resettlement Act was never notified and applied to the project.* This is a missed opportunity. Average dry land holdings tend to be considerably larger than irrigated holdings. Irrigation requires more intensive work, often results in sale of ‘surplus land’. The prime beneficiaries of the project are the farmers in the command area. The prime losers are the persons displaced in the submerging zone. *Making the beneficiaries contribute towards rehabilitation of the losers would have been the most efficient and cost-effective way of achieving the R&R objectives.* Unfortunately, this was not to be.

2.0 **The Karnataka Krishna Basin Development Authority Act, 1992 (Karnataka Act No.12 of 1996):**

2.01 **Background:**

(a) Under Scheme-A of the Krishna Water Disputes Tribunal Award (of 1976) Karnataka was entitled to utilise 734 TMC of Krishna waters (at 75% dependability and including return flows). This was en-bloc allocation and not project specific. This en-bloc allocation was broadly categorised by GOK as under:

1. For Projects in operation................. 398.04 TMC
2. For on-going projects.................. 248.54 TMC
3. For new projects......................... 87.42 TMC

Total: 734.00 TMC

(b) The GOK prepared a Master Plan in 1987 for utilisation of Krishna waters under Scheme-A of the Award and in this Master Plan, UKP was allocated 173 TMC (119 TMC for Stage-I under the category “on-going projects” and 54 TMC for Stage-II under the category “new projects”). The allocation made in this Master Plan under different categories was as under:

1. For projects in operation ............... 382.34 TMC
2. For on-going projects .......... 241.14 TMC (including 119 for UKP Stage-I)
3. For new projects ..................... 110.52 TMC (including 54 for UKP Stage-II)

Total: 734.00 TMC

(c) As can be seen from the above, a total of 351.66 TMC of water was allocated under the two categories viz. “on-going” and “new” projects. Out of this allocation, UKP (173 TMC), Ghataprabha Stage-III (45.15 TMC) and Malaprabha (44 TMC) projects accounted for 262.15 TMC constituting nearly 75% of the total allocation under the said two categories.

(d) In the meanwhile, the UKP Phase-I project had been implemented with World Bank assistance (from 1978 to 1986) and UKP Phase-II project, for which the project report had been prepared in 1985-86, had been taken up for implementation with World Bank assistance (started in 1989 with a project period of 7½ years). Under the UKP Phase-I project, the actual area brought under irrigation at project closure (i.e., 1986) was only 59,420 ha. The quantum of water actually utilised by this irrigated area can be assessed as about 17 TMC (as analysed in the Chapter “World Bank Assistance”). According to the final order of the Tribunal, the Award could come up for review any time after May 2000. It was therefore necessary for Karnataka to utilise its share of Krishna waters under Scheme-A before the year 2000, which meant that all the projects included under the above said two categories viz. “on-going” and “new” should be brought, by the year 2000, to such a stage as to ensure utilisation of 351.66 TMC.
As already stated earlier, UKP, Ghataprabha Stage-III and Malaprabha projects accounted for nearly 75% of the water allocation made under the above two categories. When UKP Phase-II was posed for World Bank assistance in 1987-88, categorical assurances were given by GOK to World Bank that adequate funds would be provided for the project from the State budget. In spite of such assurances, GOK was finding it hard to meet the requirement of funds not only for UKP but also for other projects in the Krishna basin. The World Bank was also strongly urging GOK to allocate the required funds for UKP. It was in Karnataka’s own interest to provide adequate funds so as to accelerate the Krishna Basin projects for ensuring full utilisation of Krishna waters under Scheme-A of the Award before the year 2000. When UKP Phase-II was under implementation with World Bank assistance, Ghataprabha Stage-III and Malaprabha projects were in an advanced stage of construction. As such, utmost attention had to be paid for accelerating the works of UKP requiring huge funds.

Apart from financial constraints, there were other problems hindering the progress of UKP and other projects in Krishna basin. Decisions at Government level on various issues connected with the execution of the projects were being delayed due to numerous procedures to be followed like obtaining the concurrence of Planning Department / Finance Department / other connected departments / Cabinet approval, etc. Minimising the procedural delays was also important more so in the context of settlement of disputes arising not only from contracts for civil works but also from land acquisition, irrigation management, etc.

Considering the above factors, GOK decided in 1992 to find a suitable solution for overcoming the funding constraints, for minimising the procedural delays and for delivering quick settlement of disputes. With this in view, it was decided by the Government to form an Authority for development of Krishna basin projects. In this direction, a Bill called “The Karnataka Krishna Basin Development Authority Bill, 1992” was prepared and approved by the Government. The Bill was passed in both the Houses of Legislature and sent to GOI for obtaining the assent of the President of India. President’s approval was received in 1996 and thereafter the Act was published by the Government as “The Karnataka Krishna Basin Development Authority Act, 1992” (Karnataka Act No.12 of 1996). A copy of the same is enclosed as Annexure-2.

(a) The Act provides mainly for the following:

1. Constitution of the Authority
2. Meetings of the Authority
3. Functions of the Authority
4. General powers of the Authority
5. Rates for supply of water for irrigation, industrial and domestic purposes
6. Supply of water where supply has been stopped or reduced
7. Directions by the Authority
8. Power to delegate
9. Exercise of the powers under the Command Areas Development Act, 1980
10. Appointment of the Chief Executive
11. Powers and duties of the Chief Executive
12. Conditions of service of officers and servants of the Authority
13. Powers of appointment etc., of officers and servants of the Authority
14. Vesting of property in the Authority
15. Fund of the Authority
16. Application of fund
(17) Power to borrow
(18) Accounts and Audit
(19) Report
(20) Budget of the Authority
(21) Land Acquisition
(22) Amount payable
(23) Application of Land Acquisition Act, 1894
(24) Compulsory acquisition of land for the Authority
(25) Exercise of power under the Land Acquisition Act
(26) Authority to have power to acquire land by agreement
(27) Constitution of Special Courts
(28) Jurisdiction of Special Courts
(29) Procedure and powers of Special Courts
(30) Revision
(31) Bar of jurisdiction
(32) Appointment of Special Government Pleader-cum-Public Prosecutor
(33) Officers and servants of the Authority to be public servants
(34) Protection of action taken under this Act
(35) Overriding effect of the Act
(36) Bar of suits etc.
(37) Power to make rules
(38) Powers of Authority to make regulations
(39) Power of entry
(40) Removal of difficulties
(41) Power to transfer cases to regular Courts
(42) Amendment of Karnataka Act 34 of 1987

(b) The Schedules attached to the Act specify the following:-

(1) Disputes between the Authority and contractors or third parties.
(2) References received under section 27 of the Act read with section 18 and section 30 of the Land Acquisition Act, 1894.
(3) Claims for recovery of rates, taxes, penalty and disputes arising therefrom.
(4) Offences punishable under Chapter IX of the Karnataka Irrigation Act, 1965.
(5) Offences punishable under Chapter IX of the Karnataka Command Areas Development Authority Act, 1980.
(6) Offences against the public tranquillity punishable under sections 143 to 145, 147, 149, 150 to 160 of Indian Penal Code.
(7) Personating of public servant punishable under section 170 of Indian Penal Code.
(8) Offences amounting to contempt of lawful authority of public servants punishable under sections 172 to 190 of Indian Penal Code.
(9) Offences against public justice punishable under section 193 (second part), section 196 to 200, 201 (third part), 202 to 210, 211 (third part), 212 (third part), 213 (third part), 214 (third part), 215, 216 (third part), 221 (third part); 223 to 225, 225A, 225B and 228 of Indian Penal Code.
(10) Offences against public health and safety punishable under sections 277, 278 and 290 of Indian Penal Code.
(11) Offences against property punishable under sections 426 to 428, 430 to 432, 434 and 447 of Indian Penal Code.
(12) Criminal conspiracy punishable under section 120B of Indian Penal Code.
(13) Abetment of or attempts to commit any of the offences above.
2.04 **Implementation of the Act**:-

It has been stipulated under Section-1(2) of the Act that the Act shall come into force on such date as the State Government may, by notification in the official Gazette, appoint. It is understood that though the Act is published, it has not yet been given effect to for enforcement.

2.05 **Conclusion**:-

Though the Bill was passed by both the Houses of Legislature in 1992 and sent to GOI for obtaining the President’s approval, approval was received only in 1996. Perhaps considering this delay, the GOK went ahead in 1994 with the formation of a Company called as “The Krishna Bhagya Jala Nigam Limited” (KBJNL) under the Company’s Act, for expediting the works of UKP. As can be seen from the enclosed Act for the formation of an Authority, the Authority has vast powers including the constitution of Special Courts for settlement of all types of disputes. Moreover, the Authority has jurisdiction over all the projects in the entire Krishna basin whereas the jurisdiction of KBJNL is limited only to UKP though some projects in Bhima Sub-Basin were subsequently brought under the fold of KBJNL. Considering the vast advantages flowing out of the formation of Karnataka Krishna Basin Development Authority in the longer run, implementation of this Act may have to be examined by the Government.
CHAPTER-7*

MAJOR POLICY DECISIONS TAKEN
FOR ACCELERATING THE PROGRESS.

1.0 Status of the project in 1976:-

1.01 Even though work on the project commenced in 1963-64 not much progress could be achieved till 1976 due to various reasons like -- (a) initial teething problems; (b) shifting of site and foundation problems; (c) Frequent changes in the planning / water allocation / designs; (d) water disputes, etc. Against the contemplated 10.10 lakh acres of irrigation in First Stage as per the 1970 project report (ultimate irrigable area was 20.84 lakh acres), no appreciable progress had been achieved by 1975-76. Compared to the project cost of Rs.283.65 crores (as per the project report of 1976 cleared by Planning Commission in 1978), an expenditure of only Rs.22.14 crores had been incurred by the end of 1975-76. It was only after the publication of the final Award of the Krishna Water Disputes Tribunal (KWDT) in 1976, the project started to receive greater attention.

2.0 Major policy decisions taken to accelerate the progress:-

2.01 The Tribunal while determining the Karnataka's share of Krishna waters under Scheme-A, had considered a utilisation of 155 TMC under Upper Krishna Project. However, as the Tribunal in its final order had made only en-bloc allocations giving liberty to the States to make project-specific allocations, GOK subsequently increased the allocation for Upper Krishna Project under Scheme-A to 173 TMC. From Karnataka's view point, it was necessary to utilise its share of waters before May 2000 due to the fact that the allocations could come up for review at any time after this date according to the Tribunal's order. In order to achieve this objective, various major policy decisions, which proved to be eventful and had a great & positive impact on the progress, were taken by the Government from time to time for accelerating the works. These measures included -- (i) obtaining World Bank assistance for the project from 1978 to 1997; (ii) shifting of Bagalkot town and formation of Bagalkot Town Development Authority (BTDA); (iii) providing crest gates of full height for Alamatti dam in the first Stage itself; (iv) formation of a Company called "The Krishna Bhagya Jala Nigam Limited" for raising resources and executing the project; (v) Development of Kudala Sangama Kshethra and formation of Kudala Sangama Development Board; (vi) Important Legislations made for Rehabilitation & Resettlement of Project Affected Families and for development of Krishna Basin Projects; (vii) Starting of Narayanapur Right Bank Canal; (viii) direct entrustment of canal works; (ix) Obtaining assistance from GOI; (x) Entrustment of Survey work and preparation of Drawings & Estimates to private consultants; (xi) Amendments to Contract Document; and (xii) Introduction of E-tendering System. Measures taken in this direction are summarised in the following paragraphs.

3.0 Obtaining World Bank Assistance:-

3.01 Since as per the Tribunal Award, the allocations were to come up for review any time after May 2000, it became necessary to speed up the project works. In this direction, it was decided to obtain World Bank assistance for the project to make up for
the funds required to accelerate the works. In this regard, the project report prepared for Phase-I project for posing for World Bank assistance was appraised by the World Bank in September 1977 and the agreements were signed with World Bank in 1978. Accordingly, Phase-I of the project was implemented with World Bank assistance from 1978 to 1986. Thereafter, a repeater project called as Phase-II of the project was posed for World Bank assistance for which the project report was sent to GOI in August 1986. The agreements with World Bank were signed in 1989 and the project was implemented with World Bank assistance from 1989 to 1997. The total amount of assistance received from World Bank amounted to 284.40 million Dollars (117.60 for Phase-I and 166.80 for Phase-II). The targets and achievements under Phase-I and Phase-II are explained in greater detail in the chapter “World Bank Assistance”. As a result, by the end of 1996-97, an expenditure of Rs.2444.23 crores had been incurred on the project and an irrigation potential of 2,33,855 ha (5.776 lakh acres) had been created.

4.0 Shifting of Bagalkot town and formation of Bagalkot Town Development Authority (BTDA):

4.01 Due to construction of Alamatti dam upto crest level of 1680 feet (512.2 m) without gates in the 1st Stage as modified in 1982, a major part of Bagalkot town would have come under submersion by the Alamatti reservoir in the 1st Stage itself. One section of the people of Bagalkot town was urging for protection of the town from Alamatti reservoir whereas another section was pressing for shifting of the town to a higher location. This had become a big controversy resulting in an almost stalemate regarding the height of Alamatti dam. The Expert Committee under the chairmanship of Sri. S.G. Balekundry, Retd. Spl. Secretary (Irrigation), constituted to examine this issue with reference to the height of Alamatti dam, had given its report recommending to protect the town from getting submerged by Alamatti reservoir. All the connected issues in this regard were discussed in a meeting taken by the Hon'ble Chief Minister on 17.06.1983 which was attended by Legislators as well as the representatives of various sections of Bagalkot town. After discussions, it was unanimously decided to shift the town in the larger interest of the population of the town itself.

4.02 Thereafter, orders were issued in G.O. No. PWD 120 GUK 81 dated 24.08.1983 giving approval for shifting the affected portion of the Bagalkot town to a higher location. Approval was also given in this G.O. to constitute a Bagalkot Town Development Authority. In Government Order No. PWD 95 WBM 85 dated 21.06.1985, approval was accorded for a site of 2500 acres area for locating the new Bagalkot township. However, the area of the new township was increased to 4500 acres in Government Order No. PWD 160 WBM 85 dated 11.10.1985. In the same G.O., approval was accorded for entrusting -- (a) the work of preparing the layout plan of new Bagalkot township to M/s Correa Consultants, Bombay; (b) the housing studies to Indian Institute of Management, Bangalore; and (c) the sociological studies to Institute for Social & Economic Change, Bangalore.

4.03 More details on this issue are given in the Chapter “Relocation of Bagalkot Town and Development of Kudala Sangama Complex”.

5.0 Providing crest gates of full height for Alamatti dam in the 1st Stage itself:

5.01 As already stated above, the design of Alamatti dam was changed in 1982 contemplating construction of the dam upto a crest level of 1680 feet (512.2 m) without crest gates in the 1st Stage of UKP. Consequent on this modification, a major portion of Bagalkot town would have come under submersion in the 1st Stage itself. Though a
decision was taken in 1983 to shift the affected portion of the town to a higher location, huge investments had to be made considering the large number of structures / lands / population affected due to construction of an un-gated spillway in the 1st Stage. In order to minimise the cost of submersion and consequential re-location, various alternatives were examined and ultimately it was decided in 1985 to lower the crest level of the dam to RL 1670 feet (509.016 m) and erect crest gates of 50 feet height (15.24 m) in the 1st Stage itself. Approval to this effect was given in G.O. No. PWD 56 WUD 83 dated 03.12.1985 limiting the storage to 1680 feet (512.2 m) in the 1st Stage. It was contemplated to increase the storage level to 1720 feet (524.25 m) in the 2nd Stage. However, following a Supreme Court order, the gate height had to be later on limited to 519.6 m. More details on this issue are given in the Chapter “Dispute regarding the height of Alamatti dam”.

6.0  **Formation of Krishna Bhagya Jala Nigam Limited:**

6.01 During the course of implementation of the second phase project (implemented between 1989 and 1997), it was observed in one of the reviews that, in spite of obtaining World Bank assistance and speeding up the project, there was still a lot more to be achieved by the year 2000.

6.02 One of the reasons for not achieving the desired results was the persisting inadequate budgetary support. With this in view, a company called “The Krishna Bhagya Jala Nigam Limited” (KBJNL) with an authorised share capital of Rs.3000 crores, was formed through G.O. No. ID 25 WBM 92(P) dated 06.05.1994, under the Indian Company’s Act with the sole objective of not only supplementing the funds required for accelerating the work of the project but also executing the project. The objectives, functions and responsibilities of the Company are explained in greater detail in the Chapter “The Krishna Bhagya Jala Nigam Limited”.

7.0  **Development of Kudala Sangama Kshethra and formation of Kudala Sangama Development Board:**

7.01 The famous religious shrines of Sri Sangameshwara Temple and the Aikya Mantapa, situated at the confluence of Krishna and Malaprabha rivers, were coming under submersion by the backwaters of Narayanapur reservoir (also called as “Basava Sagara”). Several protective measures were thought of ever since work on UKP started in 1963. The issue whether to relocate the temple or to strengthen it was constantly under debate. This had become a sensitive matter due to religious sentiments attached to this temple. Finally, a decision was taken in the meeting held on 01.08.1987 under the chairmanship of Chief Minister to constitute a Committee under the chairmanship of Shri.B.D.Jatti, former Vice President of India to examine the issue. Accordingly, orders were issued in G.O. No.PWD 48 WUD 87 dated 09.12.1987. Consequent the resignation of Shri.B.D.Jatti, Sri Vishwanatha Reddy Mudnal, MLA, was appointed as the Chairman of the Committee vide G.O. No. PWD 48 WUD 87 dated 12.04.1988. The Mudnal Committee submitted its report to Government on 07.06.1988. The recommendations of the Mudnal Committee were in 4 parts. The 1st part pertained to protection of Sri Sangameshwara temple at its existing place itself and other temples, the 2nd part pertained to the development of the proposed new Kudala Sangama Kshethra and the 3rd & 4th parts pertained to formation of a Trust and a Monitoring Committee respectively.

7.02 The recommendations of the Mudnal Committee were accepted in G.O. No. PWD 73 WUD 88 dated 22.09.1988. The recommendations of the Committee were also
discussed in a meeting taken by the Chief Secretary on 12.09.1989 and the various departments responsible for the implementation of various components of these recommendations were identified.

7.03 Subsequently, the Government decided to form a Board for the development and management of Kudala Sangama Kshethra vide Government Notification No. LAW 64 LGN 94 dated 06.10.1994. The Board became effective from 01.08.1995 as per the subsequent Government Notification No. RD 8 REH 92 dated 18.07.1995.

7.04 More details on this issue are given in the chapter “Relocation of Bagalkot town and development of Kudala Sangama Complex”.

8.0 Important Legislations made for Rehabilitation & Resettlement of Project Affected Families and development of Krishna Basin projects:-

8.01 In order to comply with the conditions of World Bank for providing proper R&R facilities to the project affected families of UKP Phase-II, the Government decided in 1987 to bring out a suitable legislation in this regard. The intention was to adopt a uniform R&R policy for all projects. Accordingly, a Bill called “The Karnataka Resettlement of Project Displaced Persons Bill, 1987” was prepared in 1987 and passed in both the Houses of Legislature. Approval of the President of India was received for the Bill in 1994. Though the Act was published as “The Karnataka Resettlement of Project Displaced Persons Act, 1987” (Karnataka Act No.24 of 1994), it has not yet been given effect to for implementation.

8.02 Again, considering the various factors affecting the progress of UKP and other projects in Krishna Basin, the Government decided in 1992 to form an Authority for development of Krishna Basin projects with the main objective of utilising the State’s share of Krishna waters under Scheme ‘A’ of the Award before the year 2000. Accordingly, a Bill called “The Karnataka Krishna Basin Development Authority Bill, 1992” was approved and passed in both the Houses of Legislature in 1992. Approval of the President of India was received in 1996. Though the Act was published as “The Karnataka Krishna Basin Development Authority Act, 1992” (Karnataka Act No.12 of 1996), it has not yet been given effect to for implementation.

8.03 More details about these two Acts are given in the chapter “Important Legislations made, but not yet implemented”.

9.0 Starting of Narayanapur Right Bank Canal (NRBC):-

9.01 NRBC was earlier contemplated to be taken up in UKP 2nd Stage though the Head works for the canal were constructed along with other components of Narayanapur dam, in the 1st Stage itself (the dam was completed in 1982). NRBC was envisaged to run for a length of about 95 KM with a discharging capacity of 3,650 cusecs and irrigate about 84,000 ha. Simultaneously, the Karnataka Power Corporation Limited (KPCL) had also contemplated a power project in NRBC at a place called Thamankal. The KPCL proposed to have the NRBC with a discharging capacity of 30,000 cusecs terminating at 27th KM into a fore-bay balancing reservoir near Thamankal. No final decision about this project had been taken for a long time. Considering the fact that the State’s share of Krishna waters had to be used before the year 2000, Government sanctioned an estimate amounting to Rs.32.45 crores for construction of Narayanapur Right Bank Baby Canal in G.O. No. PWD 63 WUD 94
dated 13.12.1993. The Baby Canal was actually the first distributary of NRBC envisaged to run for a length of 48 KM and irrigate 12,000 ha.

9.02 In the meanwhile, an estimate amounting to Rs.480.00 crores for NRBC (95 KM length and irrigating 84,000 ha, by utilising 23.33 TMC of water) had been got up. In order to step up the utilisation of Krishna waters under Scheme ‘A’, a quick decision, as to whether NRBC should be designed purely as an irrigation canal or as a combined canal to carry additional discharge for power generation also, had to be taken. In the meeting held on 30.06.1995 under the chairmanship of the Chief Minister, it was decided to -- (a) dispense with the Thamankal Power Project due to the fact that there was another power project called as “Narayanapur Cascades Power Project” in the anvil; (b) implement the NRBC purely as an irrigation canal; and (c) withdraw the G.O. sanctioning the Baby canal. Subsequently, orders were issued in G.O. No. ID 39 WUD 94 dated 16.10.1995 (copy enclosed as **Annexure-1**) giving administrative approval to the estimate amounting to Rs.480.00 crores for NRBC. In the same G.O. approval was also given to take up the work subject to certain conditions and for cancellation of the earlier approval given for the Baby canal.

**10.0 Direct entrustment of canal works in 1995 and 1996:-**

**10.01 Status of the project as reviewed in December 1994:-**

The following gives a clear picture of the status of the project as it stood in December 1994:

**Financial progress:-**

(i) Expenditure since inception .. Rs.1290 crores

(ii) Expenditure during
(a) 1993-94 .. Rs.243 crores
(b) 1994-95 (upto Dec.1994) .. Rs.180 crores

(iii) Balance cost of the project (to be spent in 5 years from 1995 to 2000) .. Rs.6070 crores

**Water allocation and utilisation:-**

(iv) Allocation of water to the project under the Scheme-A of the Tribunal Award (to be utilised before May 2000) .. 173 TMC

(v) Water actually utilised upto December 1994 .. 49 TMC

(vi) Balance quantity of water to be utilised by 2000 AD (in five years period from 1995 to 2000) .. 124 TMC

**Physical progress:-**

(vii) Total irrigable area contemplated under the project .. 6.22 lakh hectares

(viii) Area actually irrigated upto Dec.1994 .. 1.31 lakh hectares

(ix) Balance area to be irrigated by 2000 AD (in five years period from 1995 to 2000) .. 4.91 lakh hectares
Rehabilitation & resettlement of affected villages:-

(x) Total number of villages coming under submersion at Alamatti in Phase-II of UKP Stage-I with World Bank Assistance 

.. 95

(xi) Number of villages for which Resettlement Centres were ready by December 1994 

.. 6

(xii) Balance number of villages for which Resettlement Centres had to be developed in Stage-I Phase-II by 2000 AD (in 5 years period from 1995 to 2000) 

.. 89

(xiii) Additional villages requiring resettlement in Phase-III of Stage-I and in Stage-II (to be resettled in the remaining period of five years from 1995 to 2000) 

.. 63

10.02 Identification of areas for acceleration:-

Considering the fact that the project had been under implementation for more than 30 years in which period the above progress had been achieved, a more determined Will was necessary to take all possible steps to accelerate the progress of the project keeping in view the target date of May 2000 for utilisation of Krishna waters under Scheme-A of the Award. Keen study revealed that drastic action was necessary to expedite the activities in many areas of the project, viz., -- (i) Raising of resources; (ii) Solving Land Acquisition problems and Rehabilitation & resettlement of project affected people; (iii) Expediting the work of Alamatti Dam crest gates; (iv) Expediting the works of foreshore Lift Irrigation Schemes especially Mulwad Scheme; (v) Expediting the canal works and starting the works of Narayanapur Right Bank Canal (NRBC); etc.

10.03 Follow up action taken:-

(i) Raising of resources:-

(a) The KBJNL had been formed as a public limited Company in 1994 with the main objectives of -- (i) finding resources for funding the project (the budgetary support was inadequate) and (ii) accelerating the progress by ensuring quick decisions on all the matters concerning the project. Immediate attention was given to activate KBJNL as a result of which the Company could mobilise its own resources as shown below:-

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Year</th>
<th>Amount mobilised (in Rs. crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1995-96</td>
<td>180.00</td>
</tr>
<tr>
<td>2.</td>
<td>1996-97</td>
<td>567.30</td>
</tr>
<tr>
<td>3.</td>
<td>1997-98</td>
<td>1009.58</td>
</tr>
<tr>
<td>4.</td>
<td>1998-99</td>
<td>646.61</td>
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<tr>
<td>5.</td>
<td>1999-2000</td>
<td>535.71</td>
</tr>
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<td>6.</td>
<td>2000-2001</td>
<td>1301.68</td>
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<tr>
<td>7.</td>
<td>2001-2002</td>
<td>838.73</td>
</tr>
<tr>
<td>8.</td>
<td>2002-2003</td>
<td>1209.01</td>
</tr>
<tr>
<td>9.</td>
<td>2003-2004</td>
<td>430.50</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td>6719.12</td>
</tr>
</tbody>
</table>
(b) More details on this issue are given in the chapter "Krishna Bhagya Jala Nigam Limited".

(ii) Solving land acquisition problems and R&R of project affected families:

(a) In spite of forming separate land acquisition and Rehabilitation & Resettlement wings at project level, the progress of civil works and acquisition of lands / structures continued to be affected due to procedural delays. It was therefore decided to create a post of Commissioner for Rehabilitation & Resettlement at project level with adequate powers in order to expedite the decisions. Accordingly, necessary orders creating the post were issued in Government Order No. RD 174 REH 95 dated 16.10.1995 (copy enclosed as Annexure-2). The Commissioner (R&R) was also given full powers for approving land acquisition awards.

(b) More details on these issues are given in the chapter "Land Acquisition and R&R of project affected families".

(iii) Expediting the work of Alamatti dam crest gates:

(a) To expedite decisions on designing, fabrication, erection and commissioning of radial crest gates of Alamatti dam, an Expert Committee under the chairmanship of Sri.D.N.Desai, Retd. Secretary, PWD was constituted by the Government in 1995. This Committee did a commendable job in ensuring that the gates were in position to enable timely storage in Alamatti reservoir.

(b) The objectives of this Committee and the achievements are highlighted in greater detail in the chapter “Design, fabrication, transportation and erection of crest gates of Alamatti Dam”.

(iv) Expediting the works of foreshore Lift Irrigation Schemes especially Mulwad Scheme:

(a) Considering the fact that very big L.I. schemes had been contemplated under UKP, it was necessary to give greater attention to all aspects like designing -- (1) the structures for head works; (2) the pumpsets and motors; (3) the transformer substations; etc. Keeping this in view, a Pumps Committee under the chairmanship of Sri.B.G.Rudrappa, Former Chairman, KEB, consisting of experts in the field, was constituted in 1997 for advising the project authorities on all matters connected with the subject. This Committee has done a commendable job as a result of which the contemplated head works of all the four foreshore L.I. schemes (three from Alamatti reservoir and one from Narayanapur reservoir) are almost completed and pumps & motors installed.

(b) The objectives and achievements of the Pumps Committee are explained in greater detail in the chapter “Lift Irrigation Schemes”.

(v) Acceleration of works:

Keeping in view the magnitude of huge balance works (especially canal works) to be taken up and completed in the remaining period of 5 years and the tremendous effort required to achieve the targets (173 TMC of water allocated to the project under Scheme-A of the Award had to be utilised before May 2000), the Hon'ble Chief Minister made an announcement on the floor of the Legislative Assembly on 19.04.1995 about
the determination of the Government to accelerate the Upper Krishna Project works and stated that an Action Plan for spending Rs.1000.00 crores during the year 1995-96 would be prepared immediately in this direction.

10.04 **Formulation of Action Plan:-**

(i) Accordingly, the Technical Advisory Committee for Irrigation Projects (TAC) was requested to prepare the required Action Plan in consultation with the project authorities immediately and the Committee, after holding detailed discussions and field visits, submitted on 28.06.1995 an Action Plan for spending Rs.1000 crores on the project during 1995-96 and Rs.1437 crores during 1996-97. Some of the important recommendations made by the Committee were – (a) to constitute a Land Purchase Committee to expedite acquisition of lands required for works; (b) to fix the size of each slice of Main Canals at Rs.10 crores for tendering; (c) to pre-qualify the contractors; etc. A copy of the said Action Plan is enclosed as Annexure-3.

(ii) It is an established fact that to pass an Award as per the Land Acquisition Act, it would take more than 2 years. Even after the Awards were passed, many land owners used to approach Courts of Law for enhancement of the compensation amount. In UKP alone, there were thousands of such cases in Law Courts. Another peculiar phenomenon that was prevailing in UKP was that the land owners, even after the Awards were passed, had a tendency to obstruct the execution of works pending settlement of their cases in Law Courts. It is common in PWD and ID that the completion of works gets considerably delayed due to above said land acquisition problems apart from leading to claims amounting to huge sums by the civil contractors. It is with this background the TAC had recommended for constitution of a Land Purchase Committee.

(iii) After more than a month of preparing the above said Action Plan, the Engineer-in-Chief-cum-Special Secretary (ECSS), UKP, Alamatti informed the Government on 01.08.1995 that the criteria fixed by the TAC in its Action Plan for tendering of works had been modified at project level. The TAC in its meeting held on 02.08.1995 and 03.08.1995 discussed the modified criteria of ECSS and reiterated its earlier recommendations and also took note of the delay & inaction of the project authorities in implementing its suggestions.

(iv) The Major Irrigation Projects Control Board (MIPC Board) in its meeting held under the Chairmanship of the Hon'ble Chief Minister on 26.08.1995 approved the above Action Plan for two years viz. 1995-96 and 1996-97. The Board also took serious note of the shortfall in progress of the project and of the inaction of the controlling authorities in solving the field problems at appropriate time.

10.05 **Revision of the Action Plan:-**

Considering the shortfall in progress upto July 1995 and the initial problems relating to mobilisation of resources through Bonds, the Action Plan for 1995-96 was revised on 26.08.1995 by the TAC from Rs.1000 crores to Rs.645 crores. The earlier recommendation of the Committee to constitute a Land Purchase Committee was reiterated in the modified Action Plan also. A copy of the modified Action Plan is enclosed as Annexure-4.
Measures taken for Entrustment of works in November 1995:-

(i) During the review of progress in November 1995, it was observed that the progress was not commensurate with the expectations (progress upto end of October 1995 being only Rs.147 crores) due to persisting land acquisition and other related procedural problems. As the proposal of constituting a Land Purchase Committee, as recommended by TAC, did not come through and as the procedural wrangles could not be allowed to dominate the State interests, the situation warranted to think of practicable and emergent measures for accelerating the works.

(ii) The NRBC which is a flow canal and for which the Head Regulator had been constructed in 1982 itself, had to be taken up urgently without further delay. Even though the foundation stone for NRBC had been laid during 1992-93 itself, works had not yet commenced. This situation had led to agitation from the farmers of Raichur districts.

(iii) Keeping in view the need for speedy implementation of the project by overcoming land acquisition delays and related problems, the Cabinet in its meeting held on 08.11.1995 approved the Policy of direct entrustment of works in reaches where land was not available. The works so approved for direct entrustment were -- (a) NRBC from KM 0 to KM 40; (b) JBC from KM 18 to KM 50; and (c) IBC from KM 64 to KM 120. Formal Government Order in this regard was issued on 13.11.1995 (copy enclosed as Annexure-5).

(iv) Important conditions stipulated in the aforesaid Government Order were -- (a) direct entrustment of works should be made in PWG Form-65 only where land was not available and only those agencies who had the required machinery & resources and capable of obtaining the consent of land owners should be entrusted with such works; (b) where land was available, works should be taken up through tenders; and (c) total cost of works to be entrusted to a contractor should not exceed Rs.5 crores.

(v) A separate Entrustment Committee comprising -- (a) Sri.K.C.Reddy, Chairman, TAC; (b) Irrigation Secretary; (c) Secretary (Project Finance), Finance Department; and (d) Managing Director of Krishna Bhagya Jala Nigam Limited (MD of KBJNL), was also constituted in the above said Government Order to identify suitable contractors and entrust the works in accordance with the above conditions.

(vi) Immediately after the Cabinet decision on 08.11.1995, in order to be in readiness for taking quick actions, the MD of KBJNL, who is responsible for implementation of UKP, issued Notification on 10.11.1995 inviting applications from interested Class-I contractors for taking up of above works on direct entrustment basis. In response, 213 applications were received and all the applicants attended the interview with the MD, KBJNL, on 20 & 21.11.1995 at Alamatti. After assessment of the applicants with reference to their capabilities to execute the contemplated works, annual turn-over, machinery owned by them, capability to obtain consent of land owners, willingness to take up the works at CSR or lesser rates, acceptance to complete the works without putting forth any claims etc, the MD prepared a select list (eligibility list) of 120 contractors. He also prepared another list of 37 local contractors for consideration of entrustment of distributary works / lateral works. The MD, while furnishing the lists to the Entrustment Committee, also furnished statements showing the details like estimated costs, sanctioning number and dates of the estimates of each Kilometer of the reaches in question, etc.
(vii) The Entrustment Committee in its meeting held on 24.11.1995, after considering the eligibility lists (select lists) and the details of sanctioned estimated costs furnished by the MD, recommended allotment of 65 works in the Main Canals at one work per contractor at SR of 1995-96 minus 6% for earth work and at SR for CD works, the cost of each work to be entrusted being not more than Rs.2.50 crores. The Entrustment Committee also recommended for allotment of 37 works in Distributary Nos.14 & 15 of IBC to local contractors at not more than one work each, the cost of allotment of each work being upto Rs.25 lakhs and the rates payable being SR of 1995-96 minus 2% for earth work and SR for CD works. It was also recommended that the rates should remain firm for the completion period and that the period of completion should be specified as 9 months. Those contractors who figured in the eligibility lists but could not be allotted works were kept in the reserve list for consideration at the time of future allotments. After getting approval of the Chairman, KBJNL i.e., the Chief Minister, to the above recommendations of the Entrustment Committee, the MD, KBJNL issued the necessary entrustment orders.

(viii) The KBJNL Board in its meeting held on 24.01.1996 ratified the action taken by the MD in entrusting the works to contractors in terms of the recommendations of the Entrustment Committee.

(ix) The Technical Sub-Committee (TSC) of KBJNL inspected the UKP works on 14th, 15th and 16th Feb. 1996 and reviewed the progress of the newly entrusted works in NRBC, JBC and IBC. The Committee commended the progress of works and expressed its deep appreciation for all those who were responsible for the excellent progress.

10.07 Measures taken for Entrustment of works in May 1996:-

(i) Encouraged by the excellent result out of the direct entrustments made in November 1995, the KBJNL Board in its meeting held on 28.03.1996 resolved to continue the measure of direct entrustment in the further reaches of IBC, JBC and NRBC and directed the TSC to examine the issue in totality.

(ii) The TSC of KBJNL in its meeting held on 08.05.1996 examined in detail the proposal of direct entrustment of further works in -- (a) NRBC from KM 41 to KM 70, (b) IBC from KM 121 to KM 150 and (c) JBC from KM 51 to KM 70, and recommended for taking up these works where land was not available or likely to be not available shortly, on direct entrustment basis. The Committee also made similar recommendation in respect of about 8 KM length of canal from KM 23 to KM 35 of NRBC which was not coming in the forest area due to re-alignment of the canal. The Committee, while making the above recommendations, also stressed the need to expedite the design and execution of major CD works already entrusted to ensure contiguous and uninterrupted flow of water and preparation of a Bar Chart of all activities including CD works to be regularly monitored by the concerned Engineer-in-Chief / Chief Engineer.

(iii) The Cabinet in its meeting held on 20.05.1996 accepted the above proposal of direct entrustment of further reaches and accordingly necessary Government Order was issued on 24.05.1996 (copy enclosed as Annexure-6). Some of the important approvals / conditions contained in the said Order were as under:

(1) Direct entrustment of works shall be in -- (a) IBC from KM 121 to KM 150 (except 4 KM length on tender basis), (b) JBC from KM 51 to KM 70, (c) NRBC from KM 41 to KM 70, (d) NRBC from KM 23 to KM 25 as per modified alignment, and (e) distributaries coming in the above reaches.
(2) Only one work costing not more than Rs.2.5 crores shall be entrusted to an agency by operating the reserve list already prepared.

(3) One or more works at a total cost not exceeding Rs.5 crores can be entrusted to an agency who has given very good performance.

(4) Canal works should be taken up only after the designs for canals and CD works are finalised.

(5) Distributary works should be taken up only after 'C' Planning is done, and

(6) The same Entrustment Committee shall identify the agencies and entrust the works directly.

(iv) The Managing Director, KBJNL furnished to the Entrustment Committee a list of 84 contractors who had given outstanding performance in the works directly entrusted to them earlier. He also furnished statements showing the details of estimated costs of all the concerned reaches, which included the cost of structures also. The Entrustment Committee in its meeting held on 28.05.1996, after considering the reserve list already prepared, the list of contractors who had given outstanding performance and the details of estimated costs furnished by the Managing Director, recommended allotment of 117 works in the Main Canals (including CD works) at not more than one work to an agency. The recommended rates of entrustment were at SR of 1996-97 minus 10% for earth work and at SR for CD works. Several Kilometers were split into two parts viz., Part-A and Part-B for purposes of entrustment to separate contractors wherever required. The Committee, while making the allotments, specifically indicated that the detailed estimates should be technically sanctioned by the competent authority before commencement of work and also that the CD works along with Canals should be designed immediately. As regards the distributary works, the Committee recommended for tackling the distributary net work separately by the Managing Director as was done in the previous occasion so as to be in terms of Government Order dated 24.05.1996. The period of completion of works was stipulated as 15 months. After allotment of these 117 works, a reserve list of 31 contractors was also finalised by the Entrustment Committee.

(v) The KBJNL Board in its meeting held on 29.05.1996 approved the comprehensive recommendations of the Entrustment Committee in totality for entrusting works at a total cost of Rs.200 crores to 117 contractors on direct entrustment basis. The MD has thereafter taken action to issue Entrustment Order individually to all the contractors.

10.08 Results-

(i) Consequent on the creation of the post of the Commissioner for Rehabilitation & Resettlement, there was a significant improvement in the progress of land acquisition and Rehabilitation & Resettlement sectors. The World Bank has duly recognised the achievement of Government in this field by communicating its appreciation in its following message:-

"In accordance with the Bank suspension Telex to GOK, the Government took number of actions which led to a considerable improvement in the quality of R&R programme. In particular, the GOK has posted a dynamic R&R Commissioner with the requisite administrative and financial powers to head the UKP R&R Wing and has been provided adequate staff and funds to carry out large R&R programme. As a result of this participative and consultative measures, the implementation of R&R has considerably improved. "
(ii) As a result of the above decisions regarding direct entrustment of works in both instances, the progress of UKP works not only increased substantially during 1995-96 and 1996-97 as shown below, but also laid firm foundation / basis for further accelerating the physical and financial achievements beyond 1996-97 up-to-date:-

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount of CLA received under AIBP from GOI (in Rs. crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994-95</td>
<td>Rs.251.56 crores</td>
</tr>
<tr>
<td>1995-96</td>
<td>Rs.388.05 crores (increase is 54.25%)</td>
</tr>
<tr>
<td>1996-97</td>
<td>Rs.714.28 crores (increase is 84.01%)</td>
</tr>
</tbody>
</table>

11.0 Obtaining assistance from Government of India:

11.01 The GOI introduced a new programme called “Accelerated Irrigation Benefit Programme” (AIBP) during the year 1996-97 meant for extending financial assistance to State Governments for completing major and medium irrigation projects whose completion was lingering for paucity of funds. The qualifying conditions for assistance (Central Loan Assistance or CLA) under this programme were that – (i) the project should be in an advanced stage of completion; (ii) the components eligible for CLA should not have availed assistance from any other agency; (iii) 50% of the estimated cost should have already been spent; (iv) Budget provision to an extent of atleast one and a half times the CLA should have been provided; and (v) only such of the projects having got the investment clearance by the Planning Commission only are eligible. Under the above said AIBP, the amount of CLA received from GOI for UKP Stage-I Phase-III is sizeable, as shown below:-

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount of CLA received under AIBP from GOI (in Rs. crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996-97</td>
<td>57.00</td>
</tr>
<tr>
<td>1997-98</td>
<td>50.00</td>
</tr>
<tr>
<td>1998-99</td>
<td>50.00</td>
</tr>
<tr>
<td>1999-2000</td>
<td>100.00</td>
</tr>
<tr>
<td>2000-2001</td>
<td>100.00</td>
</tr>
<tr>
<td>2001-2002</td>
<td>450.00</td>
</tr>
<tr>
<td>2002-2003</td>
<td>456.05</td>
</tr>
<tr>
<td>Total:</td>
<td>1263.05</td>
</tr>
</tbody>
</table>

12.0 Entrustment of survey work, preparation of drawings & estimates, to private consultants:

12.01 When the KBJNL came into existence in 1994-95, the works of UKP Stage-I were in progress. Only the Head works of L.I. schemes viz Mulwad, ALBC, ARBC and Rampur (a portion of the ALBC Canal was also included in the 1st Stage) were included in the 1st Stage. The Indi L.I. scheme and the Canal systems of all these L.I. schemes were contemplated in the 2nd Stage of UKP.

12.02 The allocation of 173 TMC of water made to UKP (119 TMC under Stage-I and 54 TMC under Stage-II) had to be utilised before May 2000, the date after which the allocations made by the Tribunal to the three Party-States could come up for review. As such, it became necessary to start the works of UKP 2nd Stage also without further delay. Though the work of NRBC, a gravity flow canal which was included in the 2nd Stage, had been taken up during 1995-96, the canal works under the various L.I. schemes had remained un-tackled as only their Head works were taken up in the 1st Stage and which were yet to be completed.
12.03 Considering the urgency of starting all the works of Stage-II and the acute dearth of technical staff at lower levels (like Assistant Engineers and Junior Engineers) it was decided in the 4th meeting of TSC of KBJNL held on 23.01.96 that consultancy services can be obtained for design of canals structures in special cases selectively depending on the necessity and urgency subject to certain conditions. Accordingly, design of 21 structures like CTCs, Regulators, Aqueducts, MCPCs etc., in NRBC / IBC / JBC was entrusted to private consultants in February–March 1996.

12.04 Again in the early 2000, it was decided to entrust the work of surveys, preparation of drawings and estimates of the Canal systems of the L.I. schemes to private consultants.

12.05 In the above direction, the work of surveys and preparation of drawings & estimates in respect of the ALBC and ARBC were entrusted to M/s. RITES, New Delhi. However, as the consultants, could not fulfill the obligations, the work was withdrawn from them and entrusted to M/s. Siecon Surveys Private Limited, Bangalore.

12.06 As regards, the work of surveys and preparation of drawings & estimates in respect of canals under Mulwad L.I. scheme and Indi L.I. scheme, and Chief Engineer, Dam zone, Alamatti, after inviting offers from various consultancy firms, short listed 21 firms who were invited for a pre-bid conference on 10.04.2000. After deciding the scope of work in the pre-bid conference, the firms submitted their financial bids which were opened by the MD, KBJNL on 03.05.2000. Further, negotiations were conducted by the MD with four firms on 25.05.2000 in order to get the offers reduced to the extent possible. After negotiations, the offers were finalised and the work was distributed among the said four firms with the condition that the work should be completed by the end of December 2000 and in any case not later than February 2001. The reaches entrusted to the consultancy firms were as below:

(a) M/s. TATA Consulting Engineers Ltd., Bombay... Mulwad LIS West Canal from KM 0 to KM 50.
(b) M/s. Vision labs, Hyderabad... Mulwad LIS West Canal from KM 51 to KM 85.
(c) M/s. Siecon Survey Ltd., Bangalore... Indi LIS canal from KM 11 to KM 60.
(d) M/s. STUP Consultants Ltd., Bangalore... Indi LIS Canal from KM 61 to KM 95.

12.07 The work has been completed successfully by the consultants and has contributed substantially for accelerating the progress.

13.0 Amendments to Contract Document:-

13.01 During the implementation of Phase-I and Phase-II projects with World Bank Assistance during the period 1978 to 1997, there was shortfall in progress for various reasons. The slow progress was mainly due to land acquisition problems. Even in cases where land had been acquired as per law, the land owners resorted to litigations claiming higher compensation amounts than what were awarded and started obstructing the works. There were as many as 11,500 court cases at one point of time relating to land acquisition cases.

13.02 Considering the seriousness of the problems arising out of land acquisition delays and the need for accelerating the works, it was decided in 1995 to entrust the works only to those agencies who were capable of obtaining the consent of land owners
at no extra cost to KBJNL. A specific clause was introduced in the tender document to the effect that it was the responsibility of the contractors to take possession of the lands required for the work by obtaining suitable undertakings from the land owners before commencement of works at no extra cost to KBJNL and that the contractors would not be eligible for any sort of compensation on account of non-availability of lands required for the works. Even after this modification, the land acquisition proceedings would continue and awards passed as per the Land Acquisition Act. Introduction of the said clause has paved the way for smooth and unobstructed execution of works almost free from land acquisition problems.

13.03 Due to many technical specifications in the tender documents not being clear or not properly worded, the implementing officers experienced a state of confusion. Even the rules relating to the tendering procedures needed refinement / improvement to ensure smooth conduct of tender operations right from the NIT stage upto the evaluation / acceptance of tenders. In this direction, a Committee was constituted by KBJNL in 2002 to examine the tender document / Technical specifications and suggest suitable modifications. This Committee comprising -- (a) Sri. H.S. Chiniwal, Retd. Engineer-in-Chief; (b) The Chief Engineer, UKP, Dam Zone, Almatti; and (c) The Executive Director (Finance), KBJNL, gave its report suggesting suitable modifications / amendments wherever necessary. These modifications were discussed by TSC in its 83rd meeting held on 29.07.2002 and 84th meeting held on 26.08.2002. After detailed examination of all issues, the TSC finalised the Tender document incorporating the modifications / amendments wherever required. Two of the important changes / modifications made in the tender document are as briefed below:-

(i) **Modifications to Clause-13(b):**

<table>
<thead>
<tr>
<th>Clause No.</th>
<th>As existing in the tender document</th>
<th>As modified</th>
</tr>
</thead>
<tbody>
<tr>
<td>13(b)</td>
<td>The Additional quantity which exceeds 125 percent of the tendered quantity shall be paid at the rates entered in or derived from the Schedule of Rates prevalent at the time of executing additional and alterations plus or minus the overall percentage of the original tendered rates over the current Schedule of Rates of the year in which the tender is accepted (as per the comparative statement prepared at the time of acceptance of the tender).</td>
<td>The Additional quantity which exceeds 125 percent of the tendered quantity shall be paid at the rates entered in or derived from the Schedule of Rates prevalent at the time of occurrence of additional and alterations plus or minus the overall percentage of the original tendered rates over the current Schedule of Rates of the year in which the tender is accepted (as per the comparative statement prepared at the time of acceptance of the tender) or the rates entered in the agreement, whichever is lower.</td>
</tr>
</tbody>
</table>

(ii) **Modifications to Clause-29:**

<table>
<thead>
<tr>
<th>Clause No.</th>
<th>As existing in the tender document</th>
<th>Additional condition introduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>Not existing in the tender document.</td>
<td>It is clearly understood and agreed upon by both the parties that no part of the above clause 29 shall be construed to be an Arbitration Clause under the Arbitration and Conciliation Act 1996 or any other Act. In the event of any dispute or difference arising between the parties to this contract; upon exhausting the remedies available under clauses 29(a) to (g); the only final remedy available shall be to approach the jurisdictional Civil Court agreed to under clause 29(e) of this contract by filing a suit in accordance with law.</td>
</tr>
</tbody>
</table>
14.0  **Introduction of Internet based tendering (E-tendering) System:**

14.01  Even after following the prescribed rules and procedures for tendering, there were several complaints that some bidders were being physically prevented from purchasing the tender documents and putting their tenders in the designated boxes in time, by vested interests. There were also allegations that the bidders were forming a ring before offering their bids. Due to this unhealthy practice, the sanctity of resorting to open tenders was being lost. There are several instances where, on receipt of such complaints and allegations, the tenders were cancelled and works put to re-tendering. This resulted in wastage of precious time and delay in taking up the works for execution. Such delays obviously resulted in escalation in prices. It therefore became necessary to find out an alternative system which would be fool-proof, cost effective and time saving.

14.02  It was thus decided in January 2002, to introduce E-tendering system along with manual tendering, to eliminate the hastles of traditional tendering process and bring transparency. The objective was to prevent / minimise the formation of ring by intending bidders and provide full liberty to them to take part in the tendering process, free of any foul play, thus encouraging a healthy competition.

14.03  In this direction, M/s. KEONICS, a GOK undertaking, were engaged as consultants by KBJNL, who, in collaboration with M/s. Antares Systems Limited, submitted a proposal on 28.01.2002 on internet-based tendering system. The proposal involved design, development customization, implementation and providing internet based B2G service for a time bound period, to KBJNL. After finalising the scope of work, the different activities under this system were decided to be as under:-

(a)  **Procurement activity:**

1. Creation of web tenders notification with easy data duplication facility and uploading of tender document.
2. Authorise the procurement notifications and post to the vendors on the selection criteria from vendor database.
3. Float corrigendum and electronically transfer corrigendum to public notification and all the vendors.
4. Allow buyer to verify and scrutiny the applicants’ request and send the tender form.
5. Allow vendor to fill in the form online and submit by authenticated electronic signature or download / print the form, fill-in and submit the form in manual tender box.
6. Allow vendor to upload necessary documents to the tender offer.
7. Creation and announcement of corrigendum, if any with authorizations.
8. Maintain the security of tender box till the opening date and time.
9. Communicate and get the approval of vendors in case of postponement of tender opening date.
10. Allow buyer to open the tenders, in stages like technical, commercial and cost on the opening date and time.
12. Allow vendor to view the comparative statement once the buyer makes it public.
15. Publication of tender notification.
16. Publication of corrigendum.
17. Auto matching and e-transmission of tender notifications and corrigendum to vendors.
18. Receive request and send bid docs to vendors.
19. One vendor one bid submission per tender.
20. Receive bids to tender box / open bids in stages and evaluation of responses / scrutiny.
21. Integration of manual tender bids with electronic bids and provide a consolidated comparative statement.
22. Publication of comparative statement and tender award details on the net.
23. Complete audit tracking of tendering process.
24. Decision support (completed, in-progress, tendering, future contracts).
(b) **Procurement operation management**:

   (1) Completed Tender details.

(c) **Procurement related finance transaction tracking**:

   (1) Multiple electronic payment gateways with PKI integration for real time highly scalable and reliable payment platform if payments to be made by vendors (optional).
   (2) Support tender fee and EMD submissions.
   (3) Report generation & auditing of financial transactions.

(d) **Security**:

   (1) User ID and Access.
   (2) Hierarchy set up with pre-defined access levels.
   (3) Data encryption (SSL enabled).
   (4) Audit tracking.
   (5) E-payment with PKI support.
   (6) Support of advanced bio-metric technology for security and authentication of electronic documentation to establish unique identity with electronic signature.
   (7) Cross verification of signatures.

(e) **Workflow-tender-wizard**:

   **Registration**:

   (1) Creation of registration and pre-qualification notification.
   (2) Make the notification public through authorisation.
   (3) Allow vendors to request for registration form on line.

14.04 After examining the proposal of the consultants M/s. KEONICS and holding discussions with them, following decisions were taken by KBJNL:

(1) **Implementation**:

   Initially implementation will be done at the office of the Managing Director, KBJNL, Bangalore.

(2) **Inviting tenders**:

   As a pilot study, one / two short term tenders related to Distributory or Main Canal works will be invited through the internet and in the same time manual process will also be gone through simultaneously.

(3) **Training**:

   Training should be provided by M/s. Keonics through M/s. Antares System Limited, Bangalore to KBJNL staff and to the KBJNL enrolled contractors of Cat-I, II, and III in Bangalore.

(4) **E-signature**:

   Initially only the scanned signatures will be considered; later on digital signature will be introduced, as each of the contractor is required to have digital signature device and they should be trained.
(5) **E-payment**:  

KBJNL to discuss with the banks to provide E-Payment gateway service (Nationalised bank, ICICI, HDFC, Citibank) for EMD, form fee etc.

14.05 Accordingly the first E-tendering was done for 2 works under NRBC during March-April 2002 simultaneously along with manual tendering. This is the first time where “E-tendering” system was adopted in the procurement activity in the entire country.

14.06 It has been recently decided by Government vide Government Circular No. WRD 78 MBI 2003 dated 22.09.2003 (vide copy enclosed as **Annexure-7**) that, with a view to enhancing transparency in the tendering process, in respect of works costing more than Rs.50 lakhs, the tendering process shall be only by “E-tendering”.

= = =
CHAPTER-8*

LAND ACQUISITION AND REHABILITATION & RESETTLEMENT OF PROJECT AFFECTED FAMILIES.

1.0 Background:-

1.01 The Project Report for 2nd Phase of Upper Krishna Project Stage-I for posing for World Bank assistance was prepared during 1985-86. The Pre-appraisal Mission of World Bank assisted the project authorities in the preparation of the project report as per the norms and guidelines of World Bank. Certain conditions were put forth by the World Bank before the project could be appraised. Some of the important conditions stipulated by World Bank were that -- (i) adequate measures should be taken to rehabilitate and resettlement the project affected families of both phase-1 and phase-2 to bring them to their original standard of living, (ii) a suitable R & R plan should be prepared based on acceptable R & R policies and (iii) a separate organisation should be created for implementation of the R&R plan.

2.0 Administrative set up:-

2.01 To meet the requirement of World Bank, the Administrator, UKP, CADA, was entrusted with the responsibility of land acquisition and R&R of people affected in UKP vide G.O. No. PWD 17 GUK 85 dated 5.12.1985. Consequent on this order, additional posts under the Administrator were sanctioned in various Government Orders for R&R purposes.

2.02 In G.O. No. PWD 461 AQJ 85 dated 19.02.1986, the Land Acquisition Wing, comprising the Special Deputy Commissioner, UKP, Alamatti and his organization, was brought under the administrative control of the Administrator, UKP, CADA.

2.03 In G.O. No. PWD 20 WBM 89 dated 03.03.1989, while approving the policies for R&R, the responsibility of land acquisition and R&R at project level was transferred to the ECPC, UKP, Alamatti who was re-designated as the ECPC and Ex-officio Joint Director for R&R. He was to report on R&R matters to the Additional Chief Secretary to Government who had been designated as the Ex-officio Director for R&R of UKP. In the same G.O., both the Land Acquisition Wing and the R&R Wing were brought under the administrative control of the ECPC and ex-officio Joint Director for R&R.

2.04 In G.O. No. PWD 274 WBM 89 dated 02.03.1990, the responsibility of land acquisition and R&R was shifted back, at the instance of World Bank, to the Administrator, UKP, CADA who was designated as the Ex-officio Joint Director for R&R. Consequently, both the Land Acquisition Wing and the R&R Wing were shifted to the administrative control of the Administrator, UKP, CADA and Ex-officio Joint Director for R&R. He was required to report to the Additional Chief Secretary and Ex-officio Director for R&R through the Irrigation Department at Government level.

(*) Source of this chapter:- (1) 1982 Project report of revised UKP Stage-I, (2) PCR of UKP Phase-I prepared by World Bank, (3) ICR of UKP Phase-II prepared by World Bank, (4) Project report of 2000 of UKP Stage-II Multi-purpose project, (5) Notes & details made available by the Land Acquisition and R&R Wing of UKP.
2.05 In G.O. No. RD 45 REH 92 dated 07.07.1992, some more posts were created under the R&R Wing including the post of General Manager of IAS cadre (senior scale), at the suggestion of World Bank.

2.06 During the course of implementation of UKP 2nd Phase Project with World Bank assistance (project was implemented from 1989 to 1996), the progress in the R&R sector was slow drawing the attention of World Bank. In order to ensure concentrated attention to the implementation of the R&R plan, the Government decided in 1995 to create a post of Commissioner for Land Acquisition and R&R. Accordingly, orders were issued in G.O. No. RD 174 REH 95 dated 16.10.1995 (copy enclosed as Annexure-1) creating the post of Commissioner for Land Acquisition and R&R and Ex-officio Additional Secretary to Government, giving him full powers to approve the awards in land acquisition cases of UKP.

2.07 With the creation of a separate organisation for land acquisition and R&R headed by a Commissioner as explained above, the process of land acquisition and implementation of the R&R programme gained momentum.

3.0 **Land acquisition**:–

3.01 Norms of Central Water Commission (CWC):–

The norms of acquisition of lands and structures coming under submersion by major and medium irrigation projects, laid down by CWC and communicated in GOI letter No. 20(10)/72 – policy dated 10.06.1972, are as under:-

" Structures along with their lands should be acquired upto the designed M.W.L. plus wave height plus 1 foot vertical or 300 feet horizontal from M.W.L. line whichever is less.  
(The M.W.L. Line should take into account the backwater curve). No building should in future be allowed to be constructed in this zone.  

With regard to land it should be acquired upto F.R.L. plus the wave height in case of gated spillway.  In the case of un-gated spillway acquisition of land should extend to areas coming under submergence of 10 years flood plus wave height.  "

3.02 Submergence at FRL of Narayanapur Dam:–

(1) As per the project report of 1963, the Narayanapur Dam was to be constructed to FRL 1607.50 feet. Consequent on shifting the site to Siddapur about 5 to 6 miles upstream, the project was conceived for execution in 2 phases. In the 1st phase, the Narayanapur Dam (at Siddapur) was to be constructed to FRL 1577.50 feet for irrigating 2.30 lakh acres under the Left Bank Canal. In the 2nd phase, it was proposed to increase the FRL to 1607.50 feet and irrigate 3.70 lakh acres of lands under the Right Bank Canal.

(2) The project was further modified in 1968 with a view to increasing the scope and according to this modified proposal approved by Government in G.O. No. PWD 11 MUK 63 dated 22.05.1968, the dam was to be constructed to FRL 1615 feet (492.252 m) and the present dam has been constructed accordingly.

(3) As per the salient features enclosed to the project report of 2000 for UKP Stage-II Multipurpose project, the total area of submergence under Narayanapur Reservoir is 13,206 ha (32,632 acres) and the total number of villages affected due to
Submersion is 41. However, the total extent of lands actually acquired for submersion is 37,000 acres.

3.03 **Submergence at FRL of Alamatti Dam:-**

(1) As already explained elsewhere in the report (under the chapter "Narayanapur and Alamatti Dams") the design of Alamatti dam has undergone many changes relating to the section of the dam, crest level, height of gates, FRL and flood intensity before finalizing the permanent crest level as RL 509.016 m (1670 feet) during 1985. Though the gate height was decided as 15.24 m to correspond to FRL of 524.256 m (1720 feet), the FRL as well as the gate height had to be restricted, as per orders of Supreme Court passed in April 2000, to RL 519.6 m.

(2) The total area of submergence under Alamatti reservoir, as per the salient features enclosed to the project report of 2000 for UKP Stage II Multipurpose project, is 24,230 ha under Stage-I (FRL 512.2 m) and 47,787 ha under Stage-II (FRL of 519.6 m and including Stage-I submergence). 136 villages have come under submersion in Stage-I (no additional villages were coming under submersion in Stage-II) the population so affected being approximately 1,30,000. However, the total extent of land actually acquired for submersion in phases is as under:-

| (i) | Upto FRL 512 m | ... | 68,080 acres |
| (ii) | From RL 512 to RL 515 m | ... | 34,829 acres |
| (iii) | From RL 515 to FRL 519.6 m | ... | 30,500 acres |

**Total:** 1,33,409 acres

3.04 **Lok Adalats and fixing rates for lands for acquisition:-**

(1) The progress of the World Bank assisted projects (Phase-I & II) had slowed down for various reasons. One of the main reasons for the slow progress was the problems related to land acquisition. Even though the lands had been acquired as per the Land Acquisition Act, the land owners used to approach the Law Courts claiming higher compensation amounts and at the same time resorted to create obstructions for the execution of works. According to the Special Deputy Commissioner's report dated 12.11.1992, there were 9,323 cases pending before the Civil Courts. As per the project completion report of phase-I prepared by World Bank, there were 11,500 court cases related to land acquisition at one point of time. Considering such large number of court cases, the World Bank suggested constitution of Lok Adalats for settling the court cases under Section-18 of the Land Acquisition Act.

(2) After careful examination of the issues, the Government issued orders in G.O. No. RD 501 AQW 1991 dated 13.11.1992 (copy enclosed as Annexeure-2) directing that the land acquisition cases pending in courts for enhancement of compensation be settled through negotiations with land owners by organizing Lok Adalats under the Karnataka Legal Aid Board. In the same G.O., a Committee was also constituted under the chairmanship of the Jurisdictional Deputy Commissioner for evaluating the lands for the acquisition of which higher compensations had been claimed, taking into consideration the nature of land, yield, market value, etc.
(3) Subsequently, orders were issued in G.O. No. RD 1 AQW 96 dated 01.01.1996 (copy enclosed as Annexure-3) giving approval to pass consent awards for land acquisition. In the same G.O., Price Advisory Committees under the chairmanship of the respective Divisional Commissioners for Belgaum and Gulbarga Divisions were also constituted for deciding the rates of lands to be acquired under the consent awards. In subsequent corrigenda dated 29.01.1996, 10.07.1996 and 25.02.1997, new members were added to these Committees. In order to make the Committees more effective and impartial, the Price Advisory Committees were reconstituted under the chairmanship of the concerned Divisional Commissioner in G.O. No. RD 1 AQW 96 dated 28.03.1998. A Special Review Committee under the chairmanship of the Principal Secretary to Government, Revenue Department, was also constituted in the same G.O. to review the decisions of the Price Advisory Committees.

(4) The Price Advisory Committees were further reconstituted in G.O. No. RD 140 AQW 98 dated 19.06.1998 and once again reconstituted in G.O. No. RD 115 AQW 2000 dated 07.09.2000 (copy enclosed as Annexure-4) by inducting the local Member of Parliament, local Member of Legislative Assembly and local Member of Legislative Council.

(5) According to the Note received from the General Manager, UKP, R&R Organisation (vide copy enclosed as Annexure-5), the Price Advisory Committees have decided the rates for lands taking into consideration the category of lands i.e., dry land, one crop irrigated land and two crops irrigated land. Government has also issued several orders fixing the rates for lands of different categories in Belgaum and Gulbarga Divisions.

3.05 Valuation of structures:-

(1) As per the above said Note of the General Manager, UKP, R&R Organisation, 175 villages have actually come under the submersion of Alamatti and Narayanapur reservoirs (the FRL of Alamatti reservoir being 519.6 m) and compensation amounts have been disbursed for all the structures of these villages. Orders were issued in G.O. No. RD 140 LAW 98 dated 04.01.1999 (copy enclosed as Annexure-6) to evaluate the structures as per the following procedures while framing the consent awards:-

(i) The evaluated cost of the structures shall not be depreciated.
(ii) The structures shall be evaluated based on the SR of PWD prevailing on the date of 4(1) notification.
(iii) The value of the structures so determined without depreciation shall be enhanced by 50%.
(iv) The consent award amounts so decided shall be deemed to have included the solatium, margin towards higher market rates and interest.

(2) As regards, the revision of Schedule of Rates, Government issued orders in G.O. No. RD 115 AQB 2000 dated 27.07.2001 giving approval for increasing the rates of PWD SR of 1996 Belgaum Circle by 6% every year.

(3) The total number of the structures acquired for submersion under Alamatti and Narayanapur reservoirs are as under:-

<table>
<thead>
<tr>
<th></th>
<th>53,550 structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alamatti reservoir</td>
<td></td>
</tr>
<tr>
<td>Narayanapur reservoir</td>
<td>15,996 structures</td>
</tr>
</tbody>
</table>

| Total                    | 69,546 structures |
4.0 Rehabilitation and Resettlement (R & R) of Project Affected Families

4.01 Background:

(1) Though the construction of Alamatti and Narayanapur Dams was started in 1963 itself, much progress could not be achieved for more than a decade due to various reasons like shifting of sites, conducting detailed geological investigations, paucity of funds etc. The project works could be accelerated only after obtaining assistance from the World Bank in the later part of 1970’s.

(2) Proposals for obtaining assistance from the World Bank for 1st phase of UKP Stage-I were firmed up in 1977 and the project was implemented with the World Bank Assistance from 1978 to 1986. As per the SAR and Agreements of Phase-I Project, Narayanapur dam was to be completed for FRL 492.25 m and Alamatti dam was to be completed for FRL 512 m (crest level of 500 m plus 12 m height gates). Due to subsequent changes in the design of Alamatti dam, the dam construction was restricted to El 500 m in the I Phase. Much stress was not laid for rehabilitation of the families affected by the project either by the World Bank or by the Government. Though, it was stipulated in the project agreement that Karnataka should allocate to the extent possible, land suitable for cultivation to the farmers resettled from Alamatti and Narayanapur reservoir areas, implementation of this covenant was not particularly insisted upon during the execution of the project. Another factor contributing to the non-implementation of this covenant was, perhaps, non-availability of Government / Forest lands for allotment to the project affected families. In several other projects, Karnataka had allocated the available forest lands, as a rehabilitation measure, to the project affected families. But, consequent on the Forest Conservation Act which came into force in 1980, forest lands became non-available for allotment to the project affected families. As such, the families affected by UKP phase-I could not be provided with alternate lands though resettlement centers were constructed for relocating them.

(3) As reflected in the PCR of Phase-I project, it had been estimated at appraisal (the 1st phase project was appraised by World Bank in September 1977) that Alamatti and Narayanapur reservoirs under phase-I would submerge about 41,000 ha of cultivated lands and displace around 13,000 families. Provision had been made in the estimates for construction of 50 Resettlement Centers (25 each at Alamatti and Narayanapur). However, during implementation of the project (from 1978 to 1986), 55 Resettlement Centers were actually taken up for construction, out of which 27 centers for Narayanapur had been completed at the end of the project and the Centers for Alamatti were in progress.

(4) Proposals for obtaining World Bank Assistance for 2nd phase of the Stage-I project were initiated in 1985 itself. Alamatti dam was contemplated to be constructed in the 2nd Phase upto the permanent crest level of 509 m without gates. Since by that time the agonies and sorrows experienced by the project affected families of Narmada Project (Sardar Sarovar Project) in Gujarat had attracted the attention of environmentalists advocating for proper rehabilitation of the affected families, the Upper Krishna Project also drew the attention of World Bank in this aspect, so much so the Bank insisted upon a proper R & R plan before the 2nd phase project could be appraised. As per the R & R plan prepared by the consultants MYRADA in July 1986 (at the time of
preparation of the 2nd phase project for appraisal by the World Bank), the number of villages submerged and number of families affected were as under:-

<table>
<thead>
<tr>
<th></th>
<th>Narayanapur</th>
<th>Alamatti</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Number of villages submerged</td>
<td>37</td>
<td>57</td>
</tr>
<tr>
<td>(ii) Farm land submerged, of above villages</td>
<td>36%</td>
<td>29%</td>
</tr>
<tr>
<td>(iii) Number of villages whose agricultural lands submerged</td>
<td>53</td>
<td>28</td>
</tr>
<tr>
<td>(iv) Farm land of above villages</td>
<td>15%</td>
<td>3%</td>
</tr>
<tr>
<td>(v) Number of families affected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Losing land only</td>
<td>2897</td>
<td>3854</td>
</tr>
<tr>
<td>Losing house only</td>
<td>1933</td>
<td>5993</td>
</tr>
<tr>
<td>Losing both land &amp; houses</td>
<td>1605</td>
<td>3110</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,435</strong></td>
<td><strong>12,957</strong></td>
</tr>
</tbody>
</table>

4.02 Policies for R&R:-

(1) Even though the facilities to be extended to the project affected families under the R&R package had been discussed several times with the pre-appraisal Mission of World Bank, the policies could not be finalised in a hurry due to the heavy financial burden involved in the same. Moreover, no such facilities had been extended elsewhere in Karnataka. Considering these problems, it was decided in 1987 to enunciate a uniform policy for R&R of the affected families applicable not only to UKP but to other projects also. The World Bank Appraisal Mission was also consulted in the matter. A draft Bill viz “The Karnataka Resettlement of Project Displaced Persons Bill, 1987” was prepared and passed in both the Houses of Legislature in 1987. The Bill was sent to GOI for obtaining assent of the President of India and a copy of the same was also simultaneously sent to World Bank. As there was delay in getting clearances to the Bill from various Ministries in GOI and as there was urgency for negotiating the project with World Bank, the benefits under the R&R package had to be approved by the Government and issued in the form of executive orders. Accordingly, orders were issued in G.O. No. PWD 117 WBM 87 (P) dated 31.10.1988 approving the policies for R&R. In the same G.O., approval was also accorded for the R&R plan of UKP Stage-I Phase-II at a total cost of Rs.140.70 crores which included Rs.63.97 crores for compensation, Rs.9.06 crores for Bagalkot relocation and 25% contingencies.

(2) The 2nd Phase of the project was subsequently negotiated with World Bank at Washington during November 1988. As a matter of fact, the World Bank, during negotiations, wanted the policies for R&R to be revised. As the revision suggested by the Bank was not acceptable to the representatives of GOK, the negotiations almost came to a point of breaking down. But the urgency to accelerate the project works as well as the absolute necessity of funds required for this purpose, finally prevailed leading to acceptance of the revisions suggested by the Bank. It was only after giving such acceptance in the form of Agreed Minutes, the project was successfully negotiated on 23.11.1988. As per the Agreed Minutes of negotiations, a G.O. on the definition of terms, procedure & administrative set up and policies for R & R had to be issued urgently. The R&R policy approved in G.O. dated 31.10.1988 also required revision as per the Agreed Minutes. Accordingly, after holding discussions at Government level, an executive order meeting the requirements of the World Bank was issued in G.O. No. PWD 20 WBM 89 dated 03.03.1989 superseding the earlier G.O. dated 31.10.1988. The G.O. dated 03.03.1989 was very exhaustive defining the various terminologies used in the R & R plan and explaining the organisational set up and procedures for implementing the R & R
plan. Approval was also given in the said G.O. to the policies for R & R of project displaced families covering both phase-1 and phase-2. The policies included proving ex-gratia payment to the affected families depending on the extent of land lost and land left with after acquisition, payment of ex-gratia for income generating schemes, allotment of house plot in the resettlement center free of cost, transportation of belongings of the affected families from their original habitat to resettlement center free of cost, providing subsistence allowance, providing basic amenities and facilities of public utility in the resettlement centers, extending draw-down cultivation facility, exempting the stamp duty and registration fee involved in the purchase of alternate lands, charging of occupancy price in respect of house sites to UKP project funds etc.

(3) The above said G.O. dated 03.03.1989 was further discussed with World Bank supervision Mission on 05.06.1989 (i.e., after the presentation of the phase-II project before the Board of World Bank on 04.05.1989 but before signing of the agreements on 16.06.1989) and again on 25/27.07.1989. After considering the difficulties and operational problems, it was decided to modify the Government order suitably. A draft G.O. was finalised during these discussions with World Bank Mission and the draft G.O. along with the comments of GOK was sent to World Bank in Government letter No. PWD 113 WBM 89 dated 04.08.1989. The Bank, in its letter dated 31.08.1989, while suggesting some more modifications to the draft G.O., did not agree to the changes suggested in the GOK letter dated 04.08.1989. The World Bank also suggested to issue the modified G.O. at the earliest so that the R & R activities could start without further delay. Accordingly, orders were issued in G.O. No. PWD 274 WBM 89 dated 02.03.1990 approving the policies for R & R in supersession of the earlier G.O. dated 03.03.1989.

(4) Subsequently, it was found by Government that some of the Government Orders issued from time to time were not in consonance with the Agreement dated 16.06.1989. Government also felt that certain lack of consistency and clarity had crept in the Government orders issued from 02.03.1990 onwards due to inadequate appreciation and faulty understanding of the terms of the Agreement. Further, words and phrases used in various Government Orders were being interpreted differently by various consultants who were carrying out the detailed socio-economic survey of the project affected families. The Engineer-in-Chief & Ex-officio Special Secretary, UKP as well as the General Manager (R & R), UKP raised certain issues in the context of these surveys, thus making it necessary to clarify the doubts and to make the R & R policy to be strictly in tune with the letter and spirit of the Agreement. After careful examination of all the issues, orders were issued in G.O. No. RD 21 REH 94 (P) dated 15.05.1995 (copy enclosed as Annexure–7), approving afresh the policies for R & R.

4.03 Facilities extended under the R & R package:-

(1) The above said G.O. dated 15.05.1995 not only defines the various terminologies used in the R & R plan but also explains the various benefits extended to the project affected families, some of which are mentioned in brief as shown below:-

(i) Provision of ex-gratia amount for acquiring agricultural land upto 1.5 ha of irrigated land in the command area or 3 ha of non-irrigated land, not exceeding Rs. 60,000/- in a graded manner, to the affected family losing all their lands.

(ii) Provision of an income generating scheme costing not more than Rs.20,000/- to the affected family losing a part of its land and left with less than 1.5 ha of irrigated land in the command area or 3 ha of non-irrigated land.
(iii) The affected family losing a part of its land but left with more than 1.5 ha of irrigated land or 3 ha of non-irrigated land after acquisition, shall be eligible for ex-gratia payment not exceeding Rs.5,000/- to meet up to 25% of the cost of Income Generating Scheme and Bank loan not exceeding Rs. 7,500/-.

(iv) Landless affected family whose work, trade or business has been adversely affected, will be eligible either for -- (a) 0.5 ha of irrigated land in the command area or 1 ha of non-irrigated land (not exceeding Rs. 20,000/- in value), or (b) an ex-gratia grant not exceeding Rs. 20,000/- for income generating scheme.

(v) Provision of a house plot upto 400 Sq.mtrs at the Resettlement Center free of cost or Rs. 2,500/- in lieu there of to the affected family losing its house.

(vi) Provision of monetary assistance for transportation of the belongings of the affected families to the Resettlement Centers; if the family wants transportation of their belongings free of cost, the same will be provided by the project authorities.

(vii) Provision for payment of subsistence allowance of Rs. 2,800/- (fixed amount) to the affected family to defray the cost of food, medical care, fuel wood and fodder in the new location for the first six months.

(viii) Treating of adult brothers of the land owning displaced person of a displaced family, who may have attained the age of 18 years as on 01.01.1984 in respect of Narayanapur Dam & Canals / 01.01.1993 in respect of Alamatti Dam & Canals, and who on specified dates were residing in the same house as the displaced family, as not dependent on the displaced person (only for the purpose of R&R housing package). Each such major brother losing the house in which the family was living, shall be eligible for a residential site with an area not exceeding 100 Sq.mtr in the Resettlement Center or cash payment not exceeding Rs. 2,500/- in lieu of such a site and a Housing Grant of Rs. 22,000/- for construction of a house on the site granted to him or acquired by him.

(ix) The above housing package shall also be extended to not more than two major sons, the cut-off dates for their eligibility being the same as stated above, the choice of these two major sons being exercised by the main project displaced person.

(x) Major sons of a displaced family eligible for benefits as explained above are entitled in addition to the Housing Grant of Rs. 22,000/-, to a site of not exceeding 100 Sq.mtr free of cost in the Resettlement Center or to a Cash Grant not exceeding Rs. 2,500/- in lieu of a free site.

(xi) Similarly, all the never-married major daughters of a family, who have attained the age of 35 years as on the cut-off dates mentioned above, will also be eligible for the above housing facilities.

(xii) Land-less displaced family and also its major sons will be eligible for a free house site not exceeding 100 Sq.mtr in the Resettlement Centre and an ex-gratia Housing Grant of Rs.22,000/-.

(xiii) A land owning displaced family, which has lost one or more houses owned by it and living in at least one house, shall be eligible for a house site of not more than 400 Sq.mtr at the prescribed scale and a Housing Grant of not exceeding Rs.22,000/-.

(xiv) All adult land-less agricultural labourers (cut-off dates for adulthood being the same as mentioned above) will be eligible for an ex-gratia not exceeding Rs.20,000/- for an Income Generating Scheme.
(2) A corrigendum to the above referred Government Order dated 15.05.1995 has been issued in No. RD 21 REH 94 (P) dated 23.06.1995, vide copy enclosed as Annexure-8.

(3) Apart from the above, the following benefits are also extended to the displaced families:

(i) Vocational training programmes for the eligible children for periods varying from one to four years.

(ii) Limited skill development programmes through NGOs.

(iii) 5% job reservation in Government Departments in C&D categories.

(iv) Waiver of stamp duty on purchase of land / house upto the limit of compensation paid.

(v) Along with the subsistence allowance of Rs.2,800/- per family in the first month of displacement, free ration of 40 Kilo Grams of rice, 40 Kilo Grams of Wheat, 2 Kilo Grams of Sugar and 5 Litres of Kerosene oil are given to the family.

4.04 Status of land acquisition and R&R implementation:

(1) Magnitude:

As per another Note received from the UKP, R&R Wing, Bagalkot (vide copy enclosed as Annexure-9), the two reservoirs at Narayanapur and Alamatti (FRL 519.60 m) have together submerged 2.28 lakh acres of private agricultural land. For the dams, net work of canals, roads and 158 Resettlement Centres, another one lakh acres of land have been acquired. Thus, the total land acquired for the project is 3.28 lakh acres. Further, about 80,000 houses and other buildings in the 200 villages and a half of Bagalkot town coming under submersion of the twin reservoirs, have also been acquired. Nearly 80,000 families involving about 4 lakh population are required to be resettled and rehabilitated. Apart from the above population, a huge number of land-less agricultural labourers and people engaged in occupations have also lost their means of livelihood and they also have to be resettled and rehabilitated. Thus, Upper Krishna Project is perhaps the biggest resettlement project in the country.

(2) Land Acquisition:

(i) The compensation package has been comprehensively revised by introducing the consent award system in which the farmers / displaced persons are getting compensation for their lands, trees, crops and houses on par with the rural market value or in excess of it. Price Advisory Committees have also been appointed, which are fixing the reasonable market rates for different kinds of lands taking into account several factors that affect the land prices. At present, the land compensation is being paid at the following rates:

<table>
<thead>
<tr>
<th>Category</th>
<th>Compensation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry land</td>
<td>Rs.70,200/-</td>
</tr>
<tr>
<td>Irrigated land:</td>
<td></td>
</tr>
<tr>
<td>with single crop</td>
<td>Rs.1,17,000/-</td>
</tr>
<tr>
<td>with double crops</td>
<td>Rs.1,48,200/-</td>
</tr>
</tbody>
</table>
The following table gives a picture of the extent of land so far acquired (upto 31.08.2003) under the project for different purposes since inception:

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Purpose</th>
<th>Narayanapur</th>
<th>Alamatti</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Resettlement Centres</td>
<td>1,949 acres</td>
<td>8,389 acres</td>
<td>10,338 acres</td>
</tr>
<tr>
<td>2.</td>
<td>Structures</td>
<td>15,596 Nos.</td>
<td>53,589 Nos.</td>
<td>69,185 Nos.</td>
</tr>
<tr>
<td>3.</td>
<td>Submergence</td>
<td>37,000 acres</td>
<td>1,33,446 acres</td>
<td>1,70,446 acres</td>
</tr>
<tr>
<td>4.</td>
<td>Canals</td>
<td>36,903 acres</td>
<td>6,013 acres</td>
<td>42,916 acres</td>
</tr>
<tr>
<td>5.</td>
<td>Ayacut &amp; Link roads</td>
<td>-</td>
<td>4,296 acres</td>
<td>4,296 acres</td>
</tr>
<tr>
<td>6.</td>
<td>Others</td>
<td>956 acres</td>
<td>2,092 acres</td>
<td>3,048 acres</td>
</tr>
<tr>
<td><strong>Total(excluding structures):</strong></td>
<td><strong>76,808 acres</strong></td>
<td><strong>1,54,236 acres</strong></td>
<td><strong>2,31,044 acres</strong></td>
<td></td>
</tr>
</tbody>
</table>

An amount of Rs.1314.46 crores has been paid as compensation till 31.08.2003 to the land / property losers.

(iii) **Resettlement and Rehabilitation:**

(i) The resettlement programme has been implemented systematically by actively involving people at various stages of the project. People are consulted in selecting sites convenient to them for their new settlement. The sites mutually agreed upon are acquired for the project. After acquisition, proper layouts are prepared according sound norms of Town Planning. Since many of the existing norms of Town Planning are not adequate or appropriate to rural settings, relevant and suitable modifications have been made in the layouts for new villages. The modifications relate primarily to the provision of rick yards (Banavi), Compost pits (Thippe), Cattle collection area (Thuru Mande), Community Open lots (Jathra bayalu), Pasture land (Gomal), washing platforms (Dhobi ghats) and different types of internal roads. Adequate provision is also made for wood lots, cottage industries, play grounds, parks, area for future growth apart from the residential area, commercial area and area for allotment to displaced families as per the R&R policy. The internal and approach roads, drains, avenue trees, street lighting and water supply are also provided. Schools, primary health centres, Anganawadi, rural veterinary dispensaries, panchayat buildings etc have been built according to the population-size norms. Village gate and Chawadi, temples / masjids / Idgas / Basadis, Teachers’ quarters, Samudaya Bhavan, common work shed and toilets have also been built in the resettlement centres. All these amenities / facilities have been provided at project cost. Separate burial and cremation grounds have been earmarked for each village.

(ii) As already enumerated earlier, the project affected families have been provided various facilities under the R&R package approved by the Government from time to time. These facilities are in addition to the compensation amount paid to them towards acquisition of their land / house properties.

(iii) As per figures furnished by the General Manager, UKP R&R (vide Annexure-9), the total number of villages submerged, number of Resettlement Centres and number of project displaced families, are as under:-
<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Item</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Total No. of villages submerged [Alamatti Dam 147 (including Bagalkot City) and Narayanapur dam 40]</td>
<td>187</td>
</tr>
<tr>
<td>2.</td>
<td>No. of Rehabilitation Centres formed (excluding Bagalkot City) (Alamatti dam - 101 and Narayanapur dam - 33)</td>
<td>134</td>
</tr>
<tr>
<td>3.</td>
<td>No. of Project displaced families</td>
<td>92,292</td>
</tr>
</tbody>
</table>

(iv) **Achievements:-**

The following gives a picture of the achievements made under the various categories of the rehabilitation package since inception upto 31.08.2003 (vide copy of statement of progress report as received from the R&R Organisation, enclosed as Annexure-10) :-

(a) **House Construction Grant:-**

Under this scheme an amount of Rs.22,000/- is being paid to the main displaced person or two major sons and unmarried daughter and the brothers or brothers’ wives of main displaced person losing their houses. Cumulative progress achieved since inception upto 31.08.2003 under this category is as under:-

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Total No. of PDFs/CAFs</th>
<th>No. of PDFs eligible for House Construction Grant including major sons &amp; others.</th>
<th>Total Nos. sanctioned.</th>
<th>Amount sanctioned (Rs. In lakhs)</th>
<th>Total amount utilized (Rs. In lakhs)</th>
<th>No. of Houses completed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alamatti</td>
<td>52419</td>
<td>81036</td>
<td>69094</td>
<td>15199.14</td>
<td>10309.50</td>
<td>43137</td>
</tr>
<tr>
<td>Narayanapur</td>
<td>6325</td>
<td>11256</td>
<td>9694</td>
<td>2132.24</td>
<td>1644.08</td>
<td>7267</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>58744</strong></td>
<td><strong>92292</strong></td>
<td><strong>78788</strong></td>
<td><strong>17331.38</strong></td>
<td><strong>11953.58</strong></td>
<td><strong>50404</strong></td>
</tr>
</tbody>
</table>

(b) **Land Purchase Grant:-**

The land purchase grant is not available to big land holders owning more than 10 ha and who have lost all of their lands. It is also not paid to persons who own and lost less than half acre of land. Persons who are left with sufficient holdings after losing part of their lands are also not eligible to receive the Land Purchase Grant. Thus, this grant is limited to those who own less than 25 acres of land all of which has been acquired rendering them land-less. The amount of Land Purchase Grant varies from Rs.20,000/- to Rs.60,000/- to the displaced families depending on the extent of agricultural land holding lost and extent of land left after acquisition. The progress achieved under this category since inception upto end of 31.08.2003 is as under:-

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Total No. of PDFs/CAFs</th>
<th>No. of PDFs eligible for Land Purchase Grant</th>
<th>Total Nos. sanctioned.</th>
<th>Amount sanctioned (Rs. In lakhs)</th>
<th>Total amount utilized (Rs. In lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alamatti</td>
<td>49178</td>
<td>4069</td>
<td>2258</td>
<td>1252.78</td>
<td>784.38</td>
</tr>
<tr>
<td>Narayanapur</td>
<td>9393</td>
<td>1565</td>
<td>863</td>
<td>491.00</td>
<td>349.57</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>58571</strong></td>
<td><strong>5634</strong></td>
<td><strong>3121</strong></td>
<td><strong>1743.78</strong></td>
<td><strong>1133.95</strong></td>
</tr>
</tbody>
</table>
(c) **Subsistence allowance**: 

A subsistence allowance of Rs.2,800/- (fixed amount) per family is being disbursed in the first month of displacement along with free ration of 40 Kilo Grams of rice, 40 Kilo Grams of wheat, 2 Kilo Grams of Sugar and 5 Litres of Kerosene oil. The progress achieved under this category since inception upto 31.08.2003 is given below:-

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Total No. of PDFs/CAFs</th>
<th>No. of PDFs eligible for Subsistence Allowance</th>
<th>Total Nos. sanctioned</th>
<th>Amount sanctioned (Rs. In lakhs)</th>
<th>No. of PDFs who received the Subsistence Allowance.</th>
<th>Amount utilized (Rs. In lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alamatti</td>
<td>55823</td>
<td>50478</td>
<td>12520</td>
<td>350.55</td>
<td>11808</td>
<td>330.62</td>
</tr>
<tr>
<td>Narayanapur</td>
<td>6304</td>
<td>6152</td>
<td>1006</td>
<td>28.17</td>
<td>990</td>
<td>27.72</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>62127</strong></td>
<td><strong>56630</strong></td>
<td><strong>13526</strong></td>
<td><strong>378.72</strong></td>
<td><strong>12798</strong></td>
<td><strong>358.34</strong></td>
</tr>
</tbody>
</table>

(d) **Income Generating Schemes**: 

Inducement to occupational change has been the corner stone of economic rehabilitation policy in Upper Krishna Project. The core issue to be tackled was to provide suitable income generating schemes (non-agricultural and non-land based activities) to a large rural mass who were, till their displacement, dependent on agriculture and its allied occupations. The extent of ex-gratia amount being paid towards income generating schemes to different categories of project affected families varies from Rs.5,000/- to Rs.20,000/-. The progress so far achieved under this category since inception upto 31.08.2003 is as shown below:-

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Total No. of PDFs / CAFs</th>
<th>No. of PDFs eligible for Income Generating Scheme Grant</th>
<th>Total Nos. sanctioned</th>
<th>Amount sanctioned (Rs. In lakhs)</th>
<th>No. of PDFs who utilized the Income Generating Scheme</th>
<th>Amount utilized (Rs. In lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alamatti</td>
<td>49143</td>
<td>10005</td>
<td>3612</td>
<td>649.40</td>
<td>1230</td>
<td>246.05</td>
</tr>
<tr>
<td>Narayanapur</td>
<td>9602</td>
<td>5492</td>
<td>3396</td>
<td>464.83</td>
<td>1326</td>
<td>266.34</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>58745</strong></td>
<td><strong>15497</strong></td>
<td><strong>7008</strong></td>
<td><strong>1114.23</strong></td>
<td><strong>2556</strong></td>
<td><strong>512.39</strong></td>
</tr>
</tbody>
</table>

(e) **Reconstruction of submerged temples**: 

About 2,400 temples have come under submersion. For construction of these temples in the Resettlement Centres, local Committees had been formed as per guidelines issued by Government and the amount required for their reconstruction have been deposited in joint accounts. The total number of temples so far sanctioned for reconstruction and the amount sanctioned since inception upto end of 31.08.2003 are as shown under:-

No. of Temples………………………………………….1378  
Amount sanctioned………………………………..Rs.17.67 crore

(f) **Grave yards**: 

Grave yards have to be provided for 130 Resettlement Centres. They have already been provided in 55 Resettlement Centres and for the remaining 75 Resettlement Centres, formation of grave yards is under progress.
(g) Roads & buildings in Resettlement Centres:

An amount of Rs.241.78 crores has been spent till 31.08.2003 since inception for building and formation of roads in the Resettlement Centres. The roads include internal roads, asphaltalting approach roads / link roads and CD works. Buildings include school buildings, Anganawadi, ANM Centres, rural veterinary dispensaries, Samudaya Bhavan, bus shelter, Dhobi Ghat, CGPO and toilets. Electrification and water supply facilities have also been provided in each Centre.

(4) Status Report in brief:

According to the brochure prepared for the visit of the Hon'ble Chief Minister to Almatti on 11.10.2003 (vide copy enclosed as Annexure-11), the status of land acquisition and R & R is as follows:

(i) Total extent of land acquired for submersion, resettlement centers, canals, Ayacut and link roads etc................. 2,31,044 Acres
(ii) No. of structures acquired.......................................................... 69,185
(iii) Total amount of compensation paid towards acquisition paid towards acquisition of land / property.................... Rs.1,314.46 Crores
(iv) Total No. of villages submerged:-
   Alomatti reservoir................................................................. 137 (including Bagalkot town)
   Narayanapur reservoir.......................................................... 40
   ------
   Total 177
   ------
(v) Total No. of resettlement centers constructed:-
   Alomatti............................................................................... 101 (excluding Bagalkot)
   Narayanapur.......................................................................... 33
   ------
   Total 134
   ------
(vi) Total No. of displaced families.............................................. 92,232
(vii) Housing grant sanctioned:--
   No. of beneficiaries............................................................... 78,788
   Amount sanctioned............................................................. Rs 173.31 Crores
(viii) Land purchase grant sanctioned:--
   No. of beneficiaries............................................................... 3,121
   Amount sanctioned............................................................. Rs. 17.44 Crores
(ix) Subsistence allowance sanctioned
   No. of beneficiaries............................................................... 13,526
   Amount sanctioned............................................................. Rs.3.79 Crores
(x) Income Generating Schemes sanctioned
   No. of beneficiaries............................................................... 7,008
   Amount sanctioned............................................................. Rs.11.14 Crores
(xi) Reconstruction of temples coming under submersion
   Total No. of temples to be reconstructed................................. 2,400
   No. of temples sanctioned..................................................... 1,378
   Amount sanctioned............................................................. Rs.17.67 Crores
(xii) Provision of grave-yards:--
   Total No. of resettlement centers to be Provided with grave-yards......................................................... 134
   No. of resettlement centers provided with Grave-yards... 55
   No. of resettlement centers yet to be provided with grave-yards...79
5.0 Remarks:

Certain inconsistency has been observed in the figures furnished by the project authorities on different occasions, relating to number of villages coming under submersion and number of resettlement centers required. However, the figures reflected in the brochure presented to the Hon'ble Chief Minister on 11.10.2003 at Alamatti, as shown in Para 4.04 (4) above, may perhaps be taken as the correct figures.
CHAPTER-9*

RE-LOCATION OF BAGALKOT TOWN AND
DEVELOPMENT OF KUDALA SANGAMA COMPLEX.

1.0 RE-LOCATION OF BAGALKOT TOWN:-

1.01 Background:-

(i) The concept of Alamatti dam, as per the estimate for Upper Krishna Project Stage-I sanctioned for Rs.283.65 crores in Government Order No. PWD 123 GUK 78 dated 07.12.1978, was to construct the dam to a crest level of 1640 feet (500 m) and then erect crest gates of 40 feet height so that the FRL would be 1680 feet (512.06 m). Under the second Stage of UKP, it was contemplated to dismantle the crest gates erected in the first Stage, raise the crest level of the dam to 1680 feet and then re-erect the crest gates so that the FRL in the second Stage would be 1720 feet (524.256 m).

(ii) As per this arrangement, the Bagalkot town, situated on the Right Bank of Ghataprabha river and just upstream of the confluence of Ghataprabha and Krishna rivers, was coming under submersion in the second stage of UKP. One section of the society wanted the Town to be relocated whereas another section was urging for protection of the Town from submersion. To examine and furnish recommendations in respect of – (a) the ultimate FRL to be adopted for Alamatti dam keeping in view the allocated share for Karnataka in the Krishna Water Disputes Tribunal Award, and (b) the aspect of submersion of Bagalkot town in the final stage of the project, an Expert Committee under the Chairmanship of Shri.S.G.Balekundry, Retired Special Secretary to Government, was constituted in Government Order No. PWD 106 GUK 78 dated 20.09.1980. This Expert Committee, after examining the various issues, recommended to adopt a FRL of 1720 feet for Alamatti dam for utilizing 302 TMC of water under UKP and also suggested various measures for protecting Bagalkot town from getting submerged by the Alamatti reservoir.

(iii) Considering the problems involved in the dismantling of crest gates erected in the first stage and re-erecting them in the second stage after raising the crest level of the dam, it was ordered in Government Order No. PWD 264 GUK 81 dated 19.04.1982 to construct the dam upto a crest level of 1680 feet without crest gates in the first stage itself. With this change in design, major part of the Bagalkot town was going to come under submersion in the first stage itself. As the first stage of UKP was already in execution with 1991-92 as the scheduled date of its completion, immediate decision had to be taken whether to protect or rehabilitate the Bagalkot town.

(iv) In this regard, a meeting was held under the Chairmanship of the Chief Minister on 17.06.1983, which was attended by the Legislators and representatives of various sections of Bagalkot town. After elaborate discussions, a unanimous decision was taken to shift the town in the larger interest of the population of the town itself.

(*) Source of this chapter:- Notes furnished by the BTDA and the Commissioner for R&R and Land Acquisition, Bagalkot.
(v) Subsequently, a meeting was held under the chairmanship of the Hon'ble Minister for Public Works & Irrigation on 27.06.1983 followed by another meeting under the chairmanship of the Chief Secretary on 11.07.1983 to consider the necessary follow up action to be taken in this regard. It was agreed in the meeting to recommend the following:

(a) Constitution of an Action Plan Committee.
(b) Constitution of Bagalkot Town Development Authority.
(c) Constitution of a High Level Review Committee.
(d) To promulgate orders banning new construction in the municipal limits of Bagalkot town.
(e) To issue orders banning conversion of agricultural lands within a radius of about 6 KM from the Municipal limits of Bagalkot town for revenue sites or for any other non-agricultural purposes such as industrial sites, etc.
(f) Sanctioning of necessary staff for engineering and acquisition wings.

(vi) Thereafter, orders were issued in Government Order No. PWD 120 GUK 81 dated 24.08.1983 (copy enclosed as Annexure-1) approving the following:

(a) To shift the affected portion of the Bagalkot town to a higher location.
(b) To constitute an Action Plan Committee under the chairmanship of the Additional Chief Secretary (ACS).
(c) To constitute Bagalkot Town Development Authority (BTDA) for which the chairman would be nominated separately.
(d) To constitute a High Level Review Committee under the chairmanship of the Chief Minister.
(e) To sanction the establishment of engineering and land acquisition wings.
(f) To promulgate orders banning new construction in the municipal limits of Bagalkot town.
(g) To promulgate orders banning conversion of agricultural lands within a radius of about 6 KM from the Municipal limits of Bagalkot town for revenue sites or for any other non-agricultural purposes such as industrial sites, etc.

1.02 Enactment of the Bagalkot Town Development Authority:

The Karnataka Improvement Boards Act, 1976 was suitably amended providing for formation of the Bagalkot Town Development Authority, and the amendment received the assent of the Governor of Karnataka on 29.04.1985. This Karnataka Improvement of Boards (Amendment) Act, 1985 was notified as Karnataka Act No. 13 of 1985 in Government Notification No. LAW 7 LGN 85 dated 30.04.1985 (copy enclosed as Annexure-2) and published in the Karnataka Gazette dated 30.04.1985. This Act provides for, apart from constituting the BTDA, an Action Plan Committee under the chairmanship of ACS and a High Level Review Committee under the chairmanship of Chief Minister.

1.03 Area for New Township and appointment of Consultants:

(i) In Government Order No. PWD 208 WBM 84 dated 05.06.1985, approval was accorded for entrusting the consultancy work for providing the plan / layout of the New Township to M/s. Correa Consultants Private Limited, Architects & Planners, Bombay.

(ii) In Government Order No. PWD 95 WBM 85 dated 21.06.1985, approval was accorded for a site having an area of about 2500 acres for locating New Township for Bagalkot.
In Government Order No. PWD 160 WBM 85 dated 11.10.1985 (copy enclosed as Annexure-3), approval was accorded for entrustment of the following studies / jobs to various consultants and for payment of fees noted against them:-

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Studies / job</th>
<th>Consultants and payment of fees.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Regional, urban and housing studies</td>
<td>Indian Institute of Management, Bangalore, at a fees of Rs.11.88 lakhs.</td>
</tr>
</tbody>
</table>

1.04 Involvement of World Bank:-

(i) In the meanwhile, an agreement was entered into with World Bank during 1989 for extending assistance to UKP Phase-II. Relocation of Bagalkot town was also a component part of this project that came to be implemented with World Bank assistance. It was estimated that 529 Households put up in 518 structures of Bagalkot town were to be in-voluntarily resettled due to the backwater effect of Alamatti reservoir under the Phase-II project. As per the covenant included in the agreement, GOK had to furnish to the World Bank by 31.12.1990 an Action Plan for resettlement of the affected families. Accordingly, orders were issued in Government Order No. RD 177 AQJ 90 dated 21.09.1990 extending certain benefits to the affected persons of Bagalkot Town and an Action Plan was prepared by GOK based on this G.O. and promptly sent to World Bank which communicated its comments on 04.01.1991. Based on these comments of World Bank, GOK constituted a District Rehabilitation Committee in Government Order No. RD 168 AQJ 90 dated 16.03.1991 and on receipt of the recommendations of this Committee, orders were issued in Government Order No. RD 177 AQJ 90 dated 05.06.1991 approving the package of benefits and facilities to be extended to the affected families of Bagalkot town.

(ii) The number of house-holds and structures and the connected population, identified as getting affected by Alamatti reservoir under Phase-II of Stage-I and Stage-II of the project, assessed after door-to-door survey, were as shown in the following Table:-

<table>
<thead>
<tr>
<th>Back water elevation (RL)</th>
<th>No. of structures</th>
<th>No. of households</th>
<th>Population</th>
<th>Plinth area of structure in Sqm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>II Phase of Stage-I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 515 m</td>
<td>29</td>
<td>32</td>
<td>195</td>
<td>1130</td>
</tr>
<tr>
<td>515 to 517 m</td>
<td>489</td>
<td>497</td>
<td>3270</td>
<td>19326</td>
</tr>
<tr>
<td>Sub-total:</td>
<td>518</td>
<td>529</td>
<td>3465</td>
<td>20456</td>
</tr>
<tr>
<td>(Phase-II of Stage-I by 1994)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage-II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>517 to 519 m</td>
<td>1202</td>
<td>1214</td>
<td>7293</td>
<td>79332</td>
</tr>
<tr>
<td>Sub-total:</td>
<td>1720</td>
<td>1743</td>
<td>10758</td>
<td>99788</td>
</tr>
<tr>
<td>519 to 521 m</td>
<td>1780</td>
<td>1817</td>
<td>13142</td>
<td>124396</td>
</tr>
<tr>
<td>521 to 524 m</td>
<td>2328</td>
<td>2366</td>
<td>15852</td>
<td>156435</td>
</tr>
<tr>
<td>524 to 527 m</td>
<td>2362</td>
<td>2401</td>
<td>16495</td>
<td>233000</td>
</tr>
<tr>
<td>Grand total:</td>
<td>8190</td>
<td>8327</td>
<td>56247</td>
<td>613619</td>
</tr>
</tbody>
</table>

Stage-II (by 2000 AD)
(iii) The Action Plan was suitably modified to be in accordance with Government Order dated 05.06.1991 and sent to World Bank and the Bank communicated its acceptance to the modified Action Plan through its letter dated 22.08.1991. But the subsequent World Bank Mission, during its visit in November 1993, held a Wrap-Up meeting on 20.11.1993 and made some more recommendations in regards to the resettlement of Bagalkot town. These additional recommendations of the World Bank were accepted in Government Order No. HUD 710 MIR 93 dated 18.04.1994. However, this order was slightly modified, at the instance of the BTDA, in Government Order No. UDP 309 MIB 96 dated 25.09.1996.

1.05 Bagalkot Town Development Authority (allotment of sites) Rules, 1993:

(i) As required under the Karnataka Improvement Boards Act, necessary rules for the allotment of sites for the project affected families in the New Township were framed and published through Government Notification No. HUD 786 MIB 93 dated 16.05.1994 which was published in the Karnataka Gazette on 16.06.1994.

(ii) These rules have been amended several times based on the resolutions passed in the BTDA modifying / improving the package of benefits to be extended to the project affected families. Several Government Orders have also been issued in this regard.

1.06 Gist of benefits / facilities extended to the affected families of Bagalkot Town:

(1) The following are the dimensions and types of sites formed in the new Township:

<table>
<thead>
<tr>
<th>Type</th>
<th>Dimensions (in Meters)</th>
<th>Area in Sq.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8 X 9</td>
<td>72</td>
</tr>
<tr>
<td>B</td>
<td>9 X 12</td>
<td>108</td>
</tr>
<tr>
<td>C</td>
<td>12 X 18</td>
<td>216</td>
</tr>
<tr>
<td>D</td>
<td>15 X 24</td>
<td>360</td>
</tr>
<tr>
<td>E</td>
<td>18 X 27</td>
<td>486</td>
</tr>
</tbody>
</table>

(2) (a) The term "displaced person" includes the following:

(i) A person living in that portion of the town getting submerged and requiring to be resettled.

(ii) A person living outside the submersion area of the town but whose immovable property is situated in the submersion area requiring acquisition.

(iii) A person living in the immovable property coming under submersion of the town, as a tenant (for living / business / trade purposes) for a period of not less than five years earlier to the date of issue of land acquisition notification.

(b) Every affected family will be allotted a site of area 72 Sq.m., free of cost. This facility is applicable not only to the owner of the property but also to the tenants as classified under (iii) above. Irrespective of the size of the family, the facility of giving free site is limited to only one site per family.

(3) If a person or a family desires to have a site of more than 72 Sq.m. area, the cost of the excess area over and above 72 Sq.m. shall be payable as per the following rates:
<table>
<thead>
<tr>
<th>Type</th>
<th>Area in Sq.m.</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>72</td>
<td>Free</td>
</tr>
<tr>
<td>B</td>
<td>108</td>
<td>Rs.75/Sq.m.</td>
</tr>
<tr>
<td>C</td>
<td>216</td>
<td>Rs.95/Sq.m.</td>
</tr>
<tr>
<td>D</td>
<td>360</td>
<td>Rs.95/Sq.m.</td>
</tr>
<tr>
<td>E</td>
<td>486</td>
<td>Rs.95/Sq.m.</td>
</tr>
</tbody>
</table>

(4) Two adult children of every affected family will be eligible for a site of ‘A’ type at a cost of Rs.5400/- per site.

(5) Two adult brothers of every joint family, if they have separate kitchen and separate Ration Card, will be eligible for a site of ‘A’ type at a cost of Rs.5400/- per site.

(6) Free transportation facility will be provided to the displaced persons for transporting their belongings and materials salvaged from their buildings getting submerged, to the new township. Such facility will also be extended to the traders and businessmen for transporting the materials related to their profession to the new township.

(7) Preference will be given to the traders / businessmen / professionals who are affected by submersion, in the allotment of sites reserved for shops and other commercial purposes.

(8) Every industrial institution affected by submersion will be eligible for compensation varying from Rs.500/- to Rs.1000/- depending on its size.

(9) Every employee working in the affected institution (trade, business, or any other professional institute) will be given compensation in cash to the extent of one month’s salary based on the minimum basic pay subject to the following conditions:-

(a) Such an employee shall be working for a period of not less than one year prior to issue of 4(1) notification under the Land Acquisition Act.

(b) The owner of such institutions should give an undertaking that the employee will be continued in service for a minimum period of one year after resettlement / relocation of such trade / business.

(10) Profession related compensation will be paid in the following manner:

<table>
<thead>
<tr>
<th>Employment (trade) and size of profession</th>
<th>Monthly profit</th>
<th>Compensation amount (25% in cash and remaining as loan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very small</td>
<td>Upto Rs.500</td>
<td>Rs.1000</td>
</tr>
<tr>
<td>Small</td>
<td>Rs.500 to Rs.1000</td>
<td>Rs.3000</td>
</tr>
<tr>
<td>Medium</td>
<td>Rs.1000 to Rs.2000</td>
<td>Rs.6000</td>
</tr>
<tr>
<td>Large</td>
<td>Above Rs.2000</td>
<td>Rs.9000</td>
</tr>
</tbody>
</table>

Note: 25% will be paid as grant. Remaining 75% will be paid as loan against bank guarantee. Those desirous of availing the profession related compensation will have to produce proof of existence of their business / trade institution for a period not less than one year prior to issue of 4(1) notification under the Land Acquisition Act. They should also produce details of Income Tax being paid by them for the monthly income and profit or a suitable certificate from the Tahsildar to the satisfaction of Government.

(11) Every host family losing land in the new township, due to acquisition of such lands for construction of the new township, will be allotted a free site of area 72 Sq.m.

(12) The cost of extending facilities to the affected families, like water supply, underground drainage, electricity and telephone connections, will be met with by the Government provided that such facilities were being enjoyed by the families in the submerged area of the town.

(13) Authorised / unauthorized / encroached affected families living below the poverty line and getting compensation amount of Rs.75,000/- and less towards house acquisition, will be eligible to receive a
compassionate grant of Rs.22,000/- for construction of house in the new township. This amount will be released in two installments.

(14) Unmarried female children in an affected family, aged more than 35 years, will be eligible for a site of area 72 Sq.m. and also compassionate grant.

(15) The displaced families purchasing immovable properties will be exempted from payment of registration fee and stamp duty, the cost of such properties being limited to the amount of compensation received by them.

(16) The compensation amount payable to the affected families will be decided as follows:-

(a) If it is found that the property belonging to the affected family is authorized, the valuation of that property will be done at the rates prevailing on the date of 6(1) Notification and suitably depreciated, if it is a building. Thereafter, the value of the property will be estimated by adding solatium & interest charges.

(b) If it is found that the property belonging to the affected family is unauthorized, 100% of the valuated amount will be paid as ex-gratia subject to certain conditions.

(17) Wherever the land / property owners getting affected by submersion, agree for passing of consent awards, the valuation of such properties shall be made in accordance with the consent awards.

(18) A statement showing the benefits / concessions / facilities extended to the project affected families of Bagalkot town, which is in Kannada version, is enclosed as Annexure-4.

1.07 Present status of relocation (as per the progress report of June 2003):-

(1) During execution of work, the scenario of the actual number of house-holds and structures getting affected by Alamatti reservoir, changed as per the ground realities. The following Table gives an accurate picture of the affected house-holds and structures.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Backwater levels at Bagalkot in Mtrs.</th>
<th>No. of structures considered earlier</th>
<th>No. of structures now affected.</th>
<th>Population affected.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Authorized</td>
<td>Unauthorized</td>
<td>Total</td>
</tr>
<tr>
<td>1.</td>
<td>517.00 m</td>
<td>615</td>
<td>781</td>
<td>207</td>
</tr>
<tr>
<td>2.</td>
<td>521.00 m</td>
<td>2337</td>
<td>2512</td>
<td>1142</td>
</tr>
<tr>
<td></td>
<td>Sub-total:</td>
<td>2952</td>
<td>3293</td>
<td>1349</td>
</tr>
<tr>
<td>3.</td>
<td>521 to 525 m</td>
<td>4225</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>525 to 526 m</td>
<td>1872</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>526 to 527 m</td>
<td>1482</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sub-total:</td>
<td>10531</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Above 527 m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: (i) The information furnished in Sl. No. 1 & 2 (row wise) are as per issue of 6(1) notification of Land Acquisition Act. The information in Sl. No. 3, 4, 5 is as per survey conducted in 1986. The population considered is 5 persons per family.

(ii) The Alamatti dam construction is now completed by erecting the crest gates upto RL 519.6 Mtrs.
(2) **Development of sectors in the new township**:-

An area of 4320 acres has so far been acquired for construction of the new township. This area has been divided into 49 sectors of approximately 20 acres each. About 300 acres of land are used for roads and other civic amenities. Of the 49 sectors, 27 are earmarked for residential purposes and the remaining sectors for parks, hospitals, stadium, educational institutions, Government offices, etc. In addition to 49 sectors, 7 sectors (sector No.50 to 56) are developed for distribution of 'D' & 'E' plots to the displaced families. Further, sector Nos. 57 to 63 and 63A have been developed for distribution of plots to non-displaced families.

(3) **Acquisition of structures and compensation paid**:-

Following Table gives the details of payment made for compensation towards submergible structures:-

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Details</th>
<th>Previous approximate Nos.</th>
<th>Present Status</th>
<th>Compensation paid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total Nos.</td>
<td>Rs. in lakhs</td>
<td>Total Nos.</td>
</tr>
<tr>
<td>1.</td>
<td>A. Structures below RL 517m (1)Authorised structures (2)Unauthorised structures</td>
<td>615</td>
<td>781</td>
<td>572.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>207</td>
<td>40.03</td>
<td>201</td>
</tr>
<tr>
<td></td>
<td></td>
<td>988</td>
<td>612.13</td>
<td>957</td>
</tr>
<tr>
<td>2.</td>
<td>B. Structures between RL 517 &amp; 521m (1)Authorised structures (2)Unauthorised structures</td>
<td>2337</td>
<td>2512</td>
<td>8399.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1161</td>
<td>522.20</td>
<td>1137</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3673</td>
<td>8921.33</td>
<td>3510</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total: 2952</td>
<td>4661</td>
<td>9533.46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enhanced compensation paid due to Court awards</td>
<td>2354.56</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grand Total: 11795.55</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(4) **Distribution of plots**:-

At present 56 sectors have been developed in the township. Out of this, 35 sectors are residential wherein plots are demarcated for distribution, the details of which are as given below:-

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Total PDFs</th>
<th>Details of plots distributed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A type</td>
</tr>
<tr>
<td>A</td>
<td>PDFs below 517 m contour</td>
<td>846</td>
</tr>
<tr>
<td>B</td>
<td>PDFs between 517 &amp; 521 m contour</td>
<td>3285</td>
</tr>
<tr>
<td></td>
<td>Total:</td>
<td>4131</td>
</tr>
</tbody>
</table>
(5) **Infrastructure development:-**

(a) Construction of new link roads / improvements and asphalting of existing link roads, connecting the New Township to various places, has been completed.

(b) Peripheral roads and internal roads in the New Township connecting various sectors have been completed.

(c) Public buildings like -- high schools, primary schools, nursery schools, shops, shop-houses, Police Outpost, Police Stations, Bus shelters, 10 bedded hospitals etc, and 52 numbers of model houses as per the plan of Mr. Charles Correa, have also been constructed in different sectors.

(d) Electrification in all the sectors is completed and energized.

(e) 59 borewells have been dug in then new township, out of which 14 have been energized for pumping water to GLSR. Water is supplied from this GLSR by gravity to all the sectors. A comprehensive water supply scheme from Anadinni Head works has been provided to the new township.

(f) Underground drainage work in the new township has been completed and brought under operation.

(6) **Other works:-**

(a) **Rural development training center:-**

Construction of hostel building, administrative block with class rooms and residential quarters for the rural development training center in the new township, is nearing completion.

(b) **Storm water drain:-**

A storm water drain from the new township to Muchkandi nala has been constructed.

(c) **Public buildings of other departments and agencies:-**

(i) Various other Departments have undertaken construction of their buildings in the new township, like a 250 bedded district hospital, KSRTC Divisional Office & Workshop, District Court Complex & residential quarters, an Indoor & outdoor stadium with spectator's gallery, mini Vidhana Soudha, Fire Station office & residential quarters, KSFC office, hostels for SC / ST & BC students, Morarji school, Women's ITI, LIC office, Police quarters, Income Tax office, Ranga Mandira, Open air theatre,
Museum, District Library, Cultural Hall, Sahithya Bhavan, Ambedkar Bhavan, Town Municipal Council etc. Most of these are already completed and functioning.

(ii) Parks and Avenue Plantation have been developed in the new township.

(7) **Hazardous occupation and area classification:**

Considering the hygienic condition of the new town, a separate colony for Tanners and Tangawalas has been developed in consultation with the concerned people, for accommodating 22 families in the Tanner colony and 35 families in the Jataka colony.

(8) **Development of industrial area:**

It is programmed to develop an industrial area of 100 acres through the BTDA to meet the aspirations of all the businessmen of the Bagalkot town. At present, developmental activities have already been taken up in 50 acres. In the rest of the area, the KIADB is developing an industrial area layout for non-submergible industries.

1.08 **Actual shifting of the people – contingency plan of 2002:**

As the water was stored in Alamatti dam upto FRL 519.6 m during the year 2002, a contingency plan for shifting the affected families from the submerged area was prepared and timely action was taken to shift them, the details of which are as under:-

1. **1500 sheds constructed during previous years were repaired and brought for re-use.**

2. Built another 1500 sheds on a war footing and allotted to the PDFs.

3. All the facilities like medical facilities, food gram distribution center, police outpost, etc., were provided.

4. All the 4500 shifted families were distributed 20 kg rice, 20 kg wheat, 2 kg sugar and 5 litre kerosene oil during the time of shifting and also after one month of shifting.

5. All these families with their materials were shifted from old town by engaging trucks and tractors by the BTDA on hire basis.

6. Four primary schools and two high schools including one Urdu school and three private schools were shifted to the New Town and educational facilities were extended to the students of shifted population.

7. Concessional bus fare facilities (Re.1.00 per trip) were extended to all the persons who were traveling between old town & new town. Balance bus fare was borne by BTDA on monthly basis. This facility is extended up to 11.08.2003.

8. Service of Security guards and services of labour for maintenance of cleanliness in Shed area were also provided.
1.09 Development of house sites for non-displaced families:

Keeping in view the overall development of the new township and to meet the need of home sites for non-displaced families, action has been taken for development of seven sectors whereas two sectors are kept open to meet the future demands such as Bazaars, schools, etc. So far, 350 non-displaced families have already constructed their houses and started living.

1.10 Progress report upto end of June 2003:

The total estimated cost of Bagalkot relocation is Rs.1037.49 crores including the funds provided under 'Special package', the expenditure incurred upto end of June 2003 being Rs.314.26 crores. A Statement showing the progress achieved upto end of June 2003 in the Bagalkot relocation project is enclosed as Annexure-5.

2.0 DEVELOPMENT OF KUDALA SANAGAMA COMPLEX:

2.01 Background:

(i) The famous religious shrine of Shri Sangameshwara Temple and the Ikya Mantapa are situated at the confluence of Krishna and Malaprabha rivers. This confluence is also called as “Kudala Sangama”.

(ii) Narayanapur reservoir is situated at the downstream of the confluence of Krishna and Malaprabha rivers. The FRL of Narayanapur reservoir is RL 492.25 m. The dam is already completed in all respects and water is being stored in the reservoir since 1982. Narayanapur reservoir is also called as “Basava Sagara”.

(iii) The plinth level of the Garbha Gruha (sanctum sanctorum) of Sri Sangameshwara Temple is RL 493.37 m which means it is just 1.12 m higher than the FRL of Narayanapur reservoir. However, during flood season, due to backwater effect and wave action, water would enter the Garbha Gruha of the temple. As the temple was built centuries ago, there was always a fear that the backwaters of Narayanapur reservoir might endanger the safety of this historical and religious monument. As a matter of fact, during the 1918 floods, the structure suffered distress in the form of tilting and cracking. As the structure was built on made-up earth with alternate layers of rubble and clayey soil, there was fear of further damage / destruction due to flooding and saturation of foundation for long periods year after year. Thus, concrete measures had to be explored to protect this religious shrine and in this direction various measures were thought of, which are highlighted in the following paragraphs.

2.02 Various measures explored for protection / relocation of the Temple:

(i) In the meeting of the Major Irrigation Projects Control Board (MIPC Board) held under the Chairmanship of the Chief Minister on 05.08.1963, it was decided to construct a new shrine above the submergence level.

(ii) Thereafter, the Chief Engineer, Irrigation (North), Belgaum, submitted proposals for construction of dry well for Ikya Mantapa, raising the existing road from Bagalkot side, construction of a foot bridge to connect Sri Sangameshwara Temple with Ikya Mantapa, construction of dry well and other protective works for Sri Neelambika
Temple at Tangadgi, etc. His proposals also included, in order to protect the Sri Sangameshwara Temple, construction of RCC counter fort retaining wall enclosing a space of about 55 m x 25 m including the temple. An alternative proposal was also suggested by him for construction of masonry wall on the northern and eastern sides and an earthen embankment on western and southern sides. The estimated cost of the Chief Engineer’s proposals was Rs.60.18 lakhs.

(iii) The Technical Committee of MIPC Board in its meeting held on 28.10.1976 discussed the above proposals and agreed to the proposal of the Chief Engineer for providing protective works to Sri Sangameshwara and other Temples. An estimate amounting to Rs.25.20 lakh was also administratively approved in this direction vide Government Order dated 07.02.1977.

(iv) However, due to various reasons, the protective works approved in the above said G.O. dated 07.02.1977 could not be carried out. The subject was again discussed in the meeting of the MIPC Board held under the chairmanship of the Chief Minister on 01.12.1979. It was decided that the local people and the religious Heads may be consulted before finalising the proposals.

(v) Subsequently, the Chairman of the Irrigation Advisory Board, after ascertaining the views of the local people, submitted a proposal to Government on 31.05.1981. His proposal in brief was as under:-

(1) To respect the sanctity of the place and the sentiments of the people, the original Lingam may be allowed to remain where it is undisturbed. The sides, however, may be strengthened as may be necessary.

(2) A broad based concrete platform may be constructed on pile foundations at appropriate level (well above the reservoir level) with adequate plinth area sufficient to accommodate the visiting pilgrims.

(3) A new temple may be constructed on the platform directly above the old Lingam. A new Lingam may be installed in the new temple directly above the original Lingam. To facilitate darshan of the old Lingam from the upper floor, glass mirrors and flood lighting may be provided.

(4) Dry wells may be provided for Sri Basaveshwara and Neelambika Mantapas.

(vi) The above proposals were accepted by the Government and in this direction administrative approval of the Government was accorded to an estimate amounting to Rs.214 lakhs on 25.05.1982. The estimate also provided for several components towards the development of Sangama Complex. Accordingly, works were taken up for execution.

(vii) The Director of Archaeology was consulted regarding dismantling of the temple structure and in accordance with his suggestion, approval was communicated in G.O. dated 07.12.1983 to dismantle the temple without in any way disturbing the existing original Lingam and to stack the dismantled stones neatly after proper numbering.
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(viii) In accordance with the above said G.O. dated 07.12.1983, the Prakaram was dismantled taking all precautionary measures. Consequent on strong sentiments expressed by the people, further work of dismantling was stopped. The President of the All India Veerashaiva Mahasabha represented to the Government on 08.12.1986 urging to allow the temple to remain where it is and to establish an International Basava Centre in the area already acquired for the development of new Sangama complex.

(ix) The Public Accounts Committee which visited the Kudala Sangama on 27.10.1987 appraised the Government about the dissatisfaction of the people for relocation of the temple and suggested to take immediate measures for protection of the place where the great Social Reformer Sri. Basaveshwara dedicated himself in the 12th century to remove untouchability and creating a secular society.

(x) In G.O. dated 07.04.1987, a Committee under the Chairmanship of Shri.K.R.Datye, Technical Expert from Bombay, was appointed to examine the suggestions of the All India Veerashaiva Mahasabha. The Committee gave its report on 20.07.1987 making several recommendations for strengthening the temple.

(xi) The report of the Datye Committee was discussed in a meeting taken by the Chief Minister on 01.08.1987 and it was decided to constitute another Committee under the Chairmanship of Dr.B.D.Jatti, former Vice-President of India, to examine the report of the Datye Committee in greater detail. Accordingly, orders constituting this Committee were issued vide G.O. No. PWD 48 WUD 87 dated 09.12.1987. The Committee was required to give its report and recommendations within a period of three months.

(xii) Consequent on the resignation of Dr. B.D.Jatti, Shri. Vishwanath Reddy Mudnal, MLA, Yadgir, who was a Member of the Jatti Committee, was appointed temporarily as Chairman of the Committee in G.O. dated 26.02.1988. In the subsequent G.O. dated 12.04.1988, the period for submitting the report by the Committee was extended by three months. Later on, Shri.Vishwanath Reddy Mudnal was appointed as Chairman of the Committee in G.O. No. PWD 48 WUD 87 dated 21.05.1988.

(xiii) The terms of reference for the Mudnal Committee, which were earlier limited to Sri. Kudala Sangama Temple only, were extended to cover Sri. Kudala Sangama Kshetra and complex also in G.O. dated 06.06.1988.

(xiv) The Mudnal Committee gave its report to Government on 07.06.1988. Copy of Report is enclosed as Annexure-6.

2.03 Recommendations of Shri. Vishwanath Reddy Mudnal Committee:

(i) Following is the gist of some of the important recommendations of the Mudnal Committee:

(1) The Garbha Gudi of Sri Sangameshwara temple should not be dismantled. Its foundation and the structure should be strengthened by using latest technology. All precautionary measures should be taken, during strengthening work, for not disturbing or damaging the original Lingam. Cracks found in the outer wall of Garbha Gudi as well as in the Gopuram should be repaired. All damaged stones should be replaced.
(2) The temple Prakaram, which is already dismantled, should be reconstructed in the same place and shape using improved technology keeping in view all the technical aspects.

(3) A parapet wall using granite stones or sand stones should be constructed for a height not exceeding one meter all along the water profile to prevent waves of the reservoir entering the temple. The parapet wall should be so constructed as to ensure that the waves, even when the water level reaches FRL in the reservoir, do not enter the temple area.

(4) The old temples of Sri Jaathaveda Muni Gaddige, Sri Siddarameshwara and Sri Noorondeshwara, situated inside the Sangameshwara temple area, should be suitably protected at their existing places.

(5) As represented by the Brahmin community of Kudala Sangama, their Mutts should be relocated with all facilities at a place acceptable to them.

(6) Suitable measures should be taken, in consultation with experts, to prevent scouring of river banks on both sides of the temple.

(7) Bathing Ghats should be constructed.

(8) Mahadwaras should be constructed at suitable places on both the roads leading to Kudala Sangama.

(9) Development of a ‘Basava Vana’ should be undertaken in the Kudala Sangama complex area.

(10) An International Basava Centre should be established in the complex.

(11) Apart from the area of 102 acres already acquired for the complex, an additional area of 300 acres should be acquired.

(12) Kudala Sangama Kshetra should be developed as an International Tourist Centre.

(13) Until a new layout plan is prepared for the proposed new Kudala Sangama Kshetra and approved, construction of structures in the complex area should be banned.

(14) To prepare a layout plan of the new complex, a Technical Committee under the Chairmanship of Shri.S.G.Balekundy, Retired Special Secretary to Government, should be constituted.

(15) Provision should be made in the complex for establishment an International Basava Memorial and for this purpose an area of 100 acres should be earmarked. Provision should be made in this Memorial for a Library, an Audio-video Wing, a Research Centre, an Administrative office and an Open Air Theatre.

(16) Provision should be made in the complex for construction of ‘Anubhava Mantapa’ with a sitting capacity of 1000.

(17) Provision should also be made in the complex for construction of a Prayer Hall, a Traveler’s Bungalow with all facilities, Choultries, Dormitories, Commercial / Trade Complex, Entertainment Centres, Health Centres, Schools, a small Airport, etc.
(18) A Trust should be formed to manage the new Sangameshwara complex on the lines of Trust formed for Sri Yadiyur Siddalingeshwara Temple.

(19) A Monitoring Committee under the chairmanship of the Chief Minister should be formed to effectively monitor the implementation of the recommendations of the Committee.

(ii) The recommendations of the Mudnal Committee were accepted in Government Order No. PWD 73 WUD 88 dated 22.09.1988 (copy enclosed as Annexure-7). The detailed recommendations of the Mudnal Committee accepted in this Government Order, are enclosed to the G.O.

2.04 Follow up action taken on the recommendations of Mudnal Committee:

(i) As recommended by the Mudnal Committee, a Technical Committee under the Chairmanship of Shri. S.G. Balekundry was constituted in Government Order dated 06.05.1989 to prepare a layout plan for the proposed new complex. The new layout plan, prepared by this Committee in consultation with the Basava Samithi, All India Veerashaiva Mahasabha and local Legislators, was forwarded by the ECPC, UKP, Alamatti, to Government through his letter dated 19.05.1989. Approval of Government to this new layout plan was accorded in G.O. dated 19.07.1989 subject to the condition that no further works should be taken in the complex until approval is given to the overall estimate for the development of Sangama Complex.

(ii) Subsequently, a meeting was taken by the Chief Secretary on 12.09.1989 to discuss the follow-up action to be taken on the recommendations of the Mudnal Committee and to identify the departments responsible for implementation of the same so far as they pertained to their departments. A copy of the proceedings of this meeting is enclosed as Annexure-8.

2.05 Works undertaken against G.O. dated 25.05.1982:

In the meanwhile, several works had been taken up for execution in accordance with the estimate for Rs.214 lakhs administratively approved in G.O. dated 25.05.1982. Further works contemplated in this estimate were stopped consequent on the directions given in G.O. dated 19.07.1989. A statement showing the works contemplated under the G.O. dated 25.05.1982, works executed and further works stopped, is enclosed as Annexure-9.

2.06 Constitution of a Committee for protection and strengthening of the temple:

For protection and strengthening of the temple, one more Committee was formed under the chairmanship of the Engineer-in-Chief and ex-officio Special Secretary (ECSS), UKP, Alamatti, the composition of the Committee being as under:-

(1) ECSS, UKP, Alamatti……………………………………… Chairman
(2) Shri. B.C. Angadi
    Retired Special Secretary, Bangalore………………… Member
(3) Shri. T. Rama Iyengar,
    Retired Superintending Engineer, Bangalore……… Member
(4) Director of Archealogy, Bangalore………………… Member
(5) Superintending Engineer (Designs),
    UKP, Bheemarayanagudi…………………………… Member
The above Committee met at regular intervals and its recommendations carried out.

2.07 Formation of Kudala Sangama Development Board:-

(i) The subject of formation of Kudala Sangama Development Board was discussed in the meeting taken by the Chief Minister at Belgaum on 1st & 2nd August 1994. It was decided in that meeting that all the civil works pertaining to the proposed Sangama Complex be handed over by the Irrigation Department to the Public Works Department.

(ii) However, while the issue of handing over of works to Public Works Department was under process, orders were issued in Government Notification No. LAW 64 LGN 94 dated 06.10.1994 constituting the Kudala Sangama Development Board. Copy of this Notification is enclosed as Annexure-10. The composition of the Board is as under:-

(1) Chief Minister……………………………………………………… Chairman
(2) Minister in-charge of Major Irrigation………………………..… Member
(3) Concerned Members of Parliament……………………………… Members
(4) Concerned Members of Legislature……………………………… Members
(5) President of the Basava Samithi………………………………… Member
(6) President of the All India Veerashaiva Mahasabha…………… Member
(7) Five members who are dedicated to the philosophy of 
   Sri Basaveshwara, to be nominated by the Government……… Members
(8) Concerned officers of various departments in Government…… Members

(iii) In the subsequent Government Notification No. RD 8 REH 92 dated 18.07.1995, the effective date of implementation of the above said notification was stipulated as 01.08.1995.

(iv) One of the provisions in the above said Government Notification constituting the Board [vide section 19(5)] is that the development plan approved by the Government should be implemented by the Board within three years of the date from which the notification constituting the Board became effective.

2.08 Creation of fund Head and appointment of Drawing Officer:-

(i) The Government in G.O. No. RD 8 REH 92(P) dated 08.08.1995 created a fund Head for the said Board and appointed the Deputy Commissioner, Bijapur as the Drawing Officer until a regular Commissioner for the Board is appointed.

(ii) In turn, the Deputy Commissioner, Bijapur, authorised the Tahsildar, Hungund, through his letter dated 31.07.1995 to act on his behalf at field level.

2.09 Preparation of Action Plan and present stage of works:-

(i) In accordance with Section 19 of the Bye-laws of the Board, an Action Plan for implementing the works in the first three years was prepared by the Commissioner for R&R and Land Acquisition, UKP, Bagalkot.
(ii) The total estimated cost of the work including roads, shops, buildings, Temple complex, water supply, compound wall with side drains and entrance main gates, is Rs. 41.05 crore, the expenditure incurred upto end of February 2003 being Rs. 31.15 crore. A statement showing the progress report for the month of February 2003 prepared by the implementing agency i.e., the Karnataka Land Army Corporation Limited, is enclosed as Annexure-11. The statement shows the stage of various works at Kudala Sangama as on February 2003.

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CHAPTER-10*

CONTRACT MANAGEMENT AND DISPUTES SETTLEMENT

1.0 Introduction:

1.01 Effective contract management is a key factor to the successful execution of any work taken up on contract basis. All the personnel connected with the execution of works, either directly or indirectly, have to be well conversant with the conditions of contract, detailed specifications and drawings according to which the works have to be carried out. Especially the Personnel directly connected with the execution and the contractor or the agency to whom the work is entrusted, will have a greater responsibility in this direction. If the conditions of contract are properly understood and followed, many problems that could crop up during the course of execution can either be avoided or minimised to a great extent.

1.02 Contract management is more tested when disputes arise out of a contract, which is not uncommon in the prevailing system. Going by experience, most of the disputes arise due to the following main reasons:-

(i) The Department will not have acquired the entire extent of land required for the work as a result of which it will be unable to hand over the full extent of land in time to the contractor as per the agreement.

(ii) Even where the land is in possession of the Department, there will be delay in handing over the same to the contractor. In many cases the land owners will put forth obstacles for the smooth progress of work on the plea that the compensation paid to them by the Department is insufficient. They even resort to litigation by going to Law Courts claiming higher compensations.

(iii) Delay by the Department in furnishing the approved designs and drawings to the contractor.

(iv) Delay by the Department in giving approval to extra items / increase in quantities of tendered items / unavoidable changes in designs and specifications / changes in classification of strata during excavation / unavoidable extra leads and lifts, etc.

(v) Delay by the Department in payment of Interim Bills of the contractor.

(vi) Delay by the Department in sanctioning of mobilisation / machinery / material advances sought for by the contractor in terms of the contract agreement.

(vii) Recovery of excess amount by the Department from Interim Bills of the contractor towards interest charges on advances or penalty levied on the contractor for slow progress.

(viii) Delay or failure by the Department in prompt supply of Schedule-A materials to the contractor.

(ix) Failure of the Department in extending the required assistance to the contractor, in terms of contract, regarding issues like ensuring required power supply at the site of work, supply of blasting materials, etc., required for the work.

1.03 On account of these delays, completion of work within the agreed period becomes an impossibility. It is found that, in many cases, even the required time extensions arising out of the delays attributable to the Department, are granted belatedly.

(*) Source of this Chapter:
1. Notes furnished by Irrigation Department to Technical Advisory Committee.
2. Notes and records furnished by the Chief Engineer, UKP, Canal Zone No.1, Bheemarayanagudi.
1.04 It is also found that, in many cases, wherever the contractor is at default in adhering to the conditions of contract / specifications / drawings, the Department has failed to take prompt action in levying liquidated damages / penalties in terms of the contract or to terminate the contract at the risk and cost of the contractor by invoking the relevant clauses of the contract agreement. Even in cases where liquidated damages / penalties are levied, they will be disproportionate to the default.

1.05 Taking advantage of the failure / lapses / deficiencies on the part of the Department in adhering to the contract conditions, the contractors tend to put forth heavy claims and also resort to slow down the progress of work. Failure of the Department in giving timely decisions on disputes not only affects the progress of work but also results in avoidable abnormal increase in cost. In order to avoid such contingencies and also in the interest of speedy completion of works, the Departmental officers will have to act with due diligence, without fear or favour, in taking prompt and timely decisions whenever a dispute crops up and it is in such circumstances effective contract management will have an important role to play. Contract management should not be approached with conservative perceptions like the departmental personnel always trying to read the contract conditions to the department's best advantage irrespective of the circumstances / ground realities or the contractor trying to use the contract provisions for making fast money even if it is at the cost of quality / progress of work. The bitter truth is that either way it is the work and the Government that ultimately suffer.

1.06 Contract management becomes more meaningful and purposeful when it is better understood by both the parties that their sole and common objective is to complete the work successfully within the agreed time frame. It is better for the work if it is realised that the conditions of contract are there to help solve the problems and not to aggravate them. To achieve the desired results, it is necessary that both the parties work together and address the problems they may encounter during execution with a wider vision and perspective without any prejudice and without in any way sacrificing the spirit of the agreement.

1.07 A few classic cases, where certain major disputes cropped up due to ineffective contract management during the execution of World Bank aided UKP Phase-I & II projects and reached disastrous proportions, and how the works were badly affected due to not taking prompt and proper decisions at the appropriate time, misreading / misinterpretation of the contract conditions / specifications and not appreciating the need to accelerate the project to safeguard the interests of the State, are highlighted in greater detail in the following paragraphs.

2.0 Disputes and Arbitration cases arising out of ICB/LCB contracts in UKP Phase-I with World Bank assistance, settled in 1984:-

2.01 UKP Phase-I was commenced with World Bank assistance in May 1978 and as per the agreement with World Bank, the project should have been completed by March 1983.

2.02 In accordance with the agreement made with World Bank, the works of Narayanapur Left Bank Canal (NLBC) from KM 35.5 to 77.8 and the works of Shahapur Branch Canal (SBC) from KM 0 to 76, were entrusted to Agencies on ICB contract basis by dividing them into 41 reaches. Works were taken up on most of these reaches during the year 1978-79. During execution, quantities of many items exceeded the tender quantities by more than 25% and many extra items were also got executed. As per the
conditions of contract, such excess quantities and extra items had to be paid at mutually agreed rates.

2.03 As no serious attempts were made by the Department to settle the claims of the Agencies mutually, many Agencies referred their disputes to arbitration by invoking the arbitration clause existing in the contract agreement. The Agencies, after preferring for arbitration, either stopped the works or slowed down the pace of work. A few Agencies also went to Court and brought injunction orders against the termination notices issued by the Department. The stoppage of work for a very long period (for nearly 1 to 1½ years) badly affected the progress of the project inviting severe comments from the World Bank which insisted on early settlement of the disputes of the Agencies so that the works could be re-started at the earliest possible.

2.04 The matter was taken seriously by the Government and after holding meetings with the project authorities as well as the Agencies, a formula for determination of rates for excess quantities and extra items was evolved for expeditious settlement of the disputes. This formula was called ‘Government Norm’. Approval of Government, to this Norm, was communicated to the project authorities in Government letter No. PWD 77 GUK 83 dated 20.06.1983 (vide copy enclosed as Annexure-1) and it was decided to settle the disputes of all those Agencies who came forward to accept the Government Norm.

2.05 The Credit Agreement with the World Bank, which was to have closed by March 1984, was in the meanwhile extended by one year i.e., upto 31.03.1985. It therefore became necessary to ensure that the works were resumed on top priority in order to make good the shortfall in progress that had already reached alarming proportions and utilise as much credit assistance as possible before the credit closing date.

2.06 In order to achieve the desired results, the grievances / disputes of the Agencies had to be resolved in right earnestness. To hear the grievances of the Agencies, a Committee comprising -- (i) PWD Secretary, (ii) Special Secretary (Irrigation), (iii) Special Officer, Finance Cell and (iv) Special Secretary, Law Department, was constituted at Government level. All the concerned ICB Agencies were invited to put forth their offers before the said Committee. Agencies in respect of 23 cases, who came forward for a settlement, presented their cases before the Committee during the course of its meetings held on 15th, 16th, 20th and 21st February 1984. They gave the necessary undertakings in terms of the settlement so reached during the said meetings. The Chief Engineer, UKP Canals, Bheemarayanagudi, who was also present in the meetings, furnished the required particulars of each case and recommended the offers of the Agencies for favourable consideration.

2.07 For purposes of processing the offers of the Agencies, the works / agencies were divided into categories, as stated below:-

(i) Category-1 ... Works completed and arbitration awards passed (5 cases under this category).

(ii) Category-2 ... Works not completed, arbitration awards passed and Agencies agreeable to continue and complete the works. (2 cases under this category).

(iii) Category-3 ... Works stopped, gone for arbitration and the Agencies offered to quit the sites. (9 cases under this category).
(iv) Category-4 … Works stopped, gone for arbitration and Agencies agreeable to continue and complete the works. (5 cases under this category).

(v) Category-5 … Works stopped – Court cases. (2 cases under this category).

2.08 Subsequently, the Chief Engineer, UKP Canals, Bheemarayanagudi, formulated a draft supplementary agreement format for obtaining supplementary agreements from the Agencies whose cases were proposed for settlement, and sent the same through his letter dated 27.02.1984 to Government for obtaining the opinion of Law Department. The format was suitably modified by the Law Department, which gave an exhaustive opinion on all the related issues and suggested that we could not refrain an Agency from going to arbitration through a supplementary agreement by obtaining an undertaking from him that he would not go to arbitration so long as there existed an arbitration clause in the original agreement. The Law Department therefore suggested to obtain supplementary agreement incorporating therein that the arbitration clause existing in the original agreement is revoked by mutual consent. This entire opinion of the Law Department was communicated to the project authorities in Government letter No. PWD 34 WUC 84 dated 29.03.1984 (vide copy enclosed as Annexure-2).

2.09 After processing the undertakings given by the Agencies who had come forward for settlement with the Government, necessary Orders were issued in G.O.No. PWD 21 WUC 84 dated 30.03.1984 (vide copy enclosed as Annexure-3), giving approval to the following:

(a) To accept the offers of the various contractors of 23 cases as categorised and detailed in the preamble to the Government Order, subject to the following conditions:

(i) All the contractors who have gone to arbitration and whose awards are already received or yet to be received and whose offers are now being accepted, should forego the interest on their award amounts.

(ii) Quantities should be correctly assessed and satisfied by the Superintending Engineers before making payment as per the awards / Government Norms.

(iii) The rates shall be arrived at as per Government Norms wherever applicable and certified by the Chief Engineer for their correctness.

(iv) Wherever the compromise is reached with the contractors whose awards are passed by the arbitrators and also decreed, the same should be reported to the Court stating that the decree is settled satisfactorily outside the Court.

(v) In cases where arbitration is in progress, the compromise effected by the parties should be brought to the notice of the arbitrators to enable them to pass an award in terms of the compromise agreement by the parties. It should be made a decree of the Court.

(b) Suitable supplementary agreements shall be obtained by the contractors incorporating the above said conditions and based on the opinion of Law Department already communicated, and

(c) To empower the Chief Engineer, UKP Canals, Bheemarayanagudi, to take a final decision whether to allow any contractor to continue and complete the work, if such an offer comes from a contractor who had earlier offered to quit the site, after satisfying himself of the credibility and the competency of the contractor and reasonableness of the offer of the contractor based on the lines similar to such cases where the contractors have agreed to continue and complete the work.
2.10 The above decision of the Government played a crucial role in the resumption of suspended works and claim full credit assistance from World Bank before the credit closing date which had subsequently been further extended up to 31.03.1986.

3.0 **Dispute regarding classification of hard shale in Mudbal Branch Canal, Slice Nos.1, 2 and 3 in Upper Krishna Project Phase-II with World Bank assistance, settled in 1991:**

3.01 **Preamble:**

Construction of the Mudbal Branch Canal was started during the year 1989. The work was split up into three slices viz., Slice No.1 from KM 0 to 18, Slice No.2 from KM 18 to 32 and Slice No.3 from KM 32 to 39 and entrusted to contractors on ICB contract basis. The work had to be completed by mid 1993 as per contract. The disputes settlement clause in the contract provided for the Agency to approach Law Courts in case he was not satisfied with the decision of the departmental officers or the departmental officers failed to give their decision within the prescribed time limit.

3.02 **Genesis and history of the dispute:**

(i) The excavation items in the contract agreement included the following classifications:

(a) **Soil (referred as E-1 in the Bill of Quantities):** This shall include the following:

Vegetable or organic soil, turf, sand, silt, loam clay, mud, peat, black cotton soil, soft shale which yields to the ordinary applications of pick and shovel rake or other ordinary digging implement. XXX XXX XXX

(b) **Soft rock (referred as E-2 in the Bill of Quantities):** This shall include:

Sand stone, laterite, hard conglomerate, laminated lime stones, shales, and other soft or disintegrated rock which may be quarried or split with crow bars.

(c) **Hard rock (referred as E-3 in the Bill of Quantities):** This shall comprise:

Any rock viz massive lime stone, granite, quartzite, trap, dolerite, pegmatites, etc for the excavation of which blasting is required. XXX XXX XXX

(ii) During the course of excavation for the canal, hard shale was met with in all the three slices. The Agency for slice No.2 from KM 18 to 32 represented to the project authorities during December 1989 stating that the hard shale that was met with in the excavation was too hard to excavate with crow bars, that it needed blasting for its removal and that it should be classified as hard rock and paid under item E-3 of the Bill of Quantities. As the Department did not agree with this view, the Agency represented to the Chief Engineer through his representation dated 04.01.1990 for redressal of his claim in this regard. But the Chief Engineer, UKP Canal Zone No.1, Bheemarayanagudi, after inspection of the site, issued inspection notes dated 09.01.1990 stating that, irrespective of the method used for excavation, hard shale has to be classified under item E-2 of the excavation items i.e., under ‘soft rock’ and not under ‘hard rock’.
(iii) The Agency, not satisfied with the reasoning of the Chief Engineer, went on representing to the project authorities stating that, as per the contract conditions, classification was based mainly on the mode of execution and that any rock for the excavation of which blasting was required should be classified as hard rock.

(iv) The Senior Geologist in the office of the Chief Engineer reported in his letter dated 08.03.1990 that the horizontal shale bed met with was massive and that it required blasting. The concerned Executive Engineer in his letter dated 11.04.1990 also reported that blasting was required for the excavation of the strata met with and that the Agency was resorting to blasting. But the Superintending Engineer differed from this view stating that the Agency had resorted to blasting for his own convenience. The Chief Engineer in his letter dated 18/19.05.1990 addressed to the Agency rejected the claim for classifying hard shale under item E-3 'hard rock' stating that, in the conditions of contract soft shale was included under 'soils', other shales were included under 'soft rock' and no mention of shale was made under 'hard rock'. The Chief Engineer in his subsequent letter 13.06.1990 informed the Agency that hard shale had not been mentioned in the contract conditions / specifications and that, presuming but not accepting the excavation under item E-3, the rate for the same would be paid at DSR plus extra lead and lift charges as per the contract conditions.

(v) In the meanwhile, the Agency for slice No.2 in his representation dated 12.06.1990 addressed to the Government, pointed out that any rock, for the excavation of which blasting was required, had to be classified, in terms of the specifications, as hard rock only and that the Chief Engineer had conveyed his decision without considering the above provisions. The Agency requested the Government to intervene in the matter immediately. A copy of this representation was forwarded in Government letter No.PWD 51 WUC 90 dated 09.07.1990 to the Engineer-in-Chief cum Project Coordinator (ECPC), UKP, Alamatti for an immediate report in the matter.

(vi) In response, the ECPC in his letter No.ECPC/30/MBC/89/1215 dated 26.09.1990 (enclosed as Annexure-4) sent a detailed note to Government duly analysing the contract provisions and the opinion of the Departmental officers thereon. According to the note of ECPC, the Engineer-in-charge (i.e., the Superintending Engineer) classified the hard shale under soft rock and the Engineer, on an appeal from the Agency, held the action of the Engineer-in-charge as correct. Several reasons were given by the Engineer-in-charge for not classifying hard shale as hard rock. The above stand of the Engineer-in-charge and the Engineer was not accepted by the Agency. After analysing the stand of the departmental officers and the contention of the Agency, the ECPC gave his opinion in the said note, which is summarised as under:-

(a) From the stand taken both by the Department and the contractor, there appears to be some loose ends in the technical specifications which may have to be tied down for the future bids.

(b) In the instant case, there is no dispute between the Department and the contractor about classifying shale as rock. There is no dispute between the Department and the contractor that the hard shale met with requires blasting. The only dispute is about classifying hard shale whether it should be under soft rock or under hard rock.

(c) The wording of the technical specification under soft rock is such that the phrase viz. "which may be quarried or split with crow bars" can be taken as to qualify "other soft or disintegrated rock" as well as to qualify the wordings starting from "sand stones to disintegrated rock". The wording of technical specification for hard rock is such that the phrase viz. "for the excavation of which blasting is required" qualifies the word 'any rock'. If the grammar of the sentences formulated and included in the technical specifications is strictly seen, the rock which requires blasting falls under hard rock.
(d) The points made out by the contractor based on the bid documents appear to be on a stronger footing. Therefore, if a decision is taken to meet the claim of the contractor in Law Courts, the prospect of decision favourable to the Department appears to be remote.

(e) The rate quoted for item of soft rock by the contractor is lower than the Department SR inclusive of lead & lift mentioned in the bid documents for the item of hard shale. The rate quoted for hard rock is far higher than the hard shale. Therefore, the question arises when the hard shale is neither taken under soft rock nor under hard rock, whether the same could be treated as extra item under Clause-52(5)(ii). When the item is considered to fall under hard rock as contended by the contractor, the question arises whether the rate could be decided under Clause-52(5)(i).

(f) In view of the different stands taken by the Department and the contractor and for reasons given in the Note, the decisions at the Government can be referred to a Committee to adjudicate.

(vii) As the progress of works had been greatly affected due to many factors like non-settlement of disputes, etc., the World Bank viewed the slow progress very seriously. Every progress review Mission of World Bank that visited the project urged the State Government to settle the dispute quickly in order to step up the progress. In this connection, the Hon'ble Chief Minister took a review meeting of Upper Krishna Project at Bagalkot on 08.08.1990 and during the course of the meeting, the officers mentioned about the disputes in canal contracts. The Hon'ble Chief Minister, while asking the Irrigation Secretary to look into this, pointed out why the Board set up for Major Irrigation could not sort out these issues. The Minutes of this review meeting were communicated to the Irrigation Secretary by the Deputy Secretary to the Chief Minister in his Note No.CM 1059 DEP(2) 90 dated 03.09.1990 (vide copy enclosed as Annexure-5).

(viii) The Hon'ble Chief Minister again reviewed the progress of Upper Krishna Project on 11.09.1990 at Bheemarayanagudi and during this meeting, the contractors complained that their claims were not being settled even where they were justifiable due to which the progress had been affected. They also said it was not possible to approach the Courts every time for settlement of their claims. The Chief Minister indicated that he would examine their suggestion to constitute a Panel of Experts to look into such cases. He also wanted to know whether the Major Irrigation Projects Control Board could solve such disputes. The Minutes of this review meeting were communicated to the Irrigation Secretary by the Secretary to Chief Minister in his Note No.CM 1074 DEP(2) 90 dated 15.09.1990 (vide copy enclosed as Annexure-6).

(ix) Inviting reference to the ECPC's letter dated 26.09.1990 wherein he had given his opinion on the issue, the Government addressed the ECPC vide Government letter No.PWD 51 WUC 90 dated 31.10.1990 (copy enclosed as Annexure-7) requesting him to inspect the site jointly with all the Chief Engineers of UKP and take a final decision on the classification of hard shale at project level itself. It was also suggested in the Government letter that, if necessary, he could draft the services of a senior and experienced Geologist either from the Department of Mines & Geology or from any other Zones of Irrigation Department for the above said joint inspection.

(x) In the meanwhile, when the project authorities started paying lesser rates than his tender rates for the quantity of excavation done in hard shale requiring blasting and initiated recovery of excess payments made at tender rates, the Agency for slice No.3 from KM 32 to 39 filed a suit in the Civil Judge's Court at Yadgir in July 1990 vide O.S. No.32/1990 and the Court issued orders on 24.07.1990 directing the Government to maintain status-quo.
During the course of the review meeting taken by the Irrigation Secretary at Bheemarayanagudi on 01.01.1991 to review the progress of Upper Krishna Project Canal Zone No.1, the ICB and LCB Agencies (vide extract of proceedings enclosed as Annexure-8), while putting forth several grievances / points, made out that the hard shale that was being removed by blasting operations should be classified as hard rock. The Chief Engineer stated that though blasting was required for the removal of hard shale, a decision had been taken at project level to classify it under soft rock by treating it as a form of “shales”. One of the Agencies argued that the hard shale, since it required blasting as accepted by the Department itself, should be classified as hard rock only. He also stated that, as per the tender conditions, all the types of rocks shown in the specifications that require to be quarried or split with crow bars, come under the purview of soft rock. The Chief Engineer, however, did not agree to the above interpretation saying that the criteria of quarrying and splitting with crow bars applied only for other soft or integrated rocks. The ECPC was of the opinion that even if hard shale was considered as hard rock, at best it could be treated as an extra item in which case tender rate would have to be paid for tender quantities + 25%, and thereafter at SR ± tender premium. This contention was not accepted by the Agencies who pointed out that any additions or extra items will have to be paid at tender rates as per tender conditions. This argument was found to be not acceptable by the Chief Engineer who stated that the financial implications in making payment at tender rates for hard shale, if classified as hard rock, would amount to crores of rupees. The ECPC pointed out that, even though Government had directed him to inspect the site jointly with the Chief Engineers of UKP and a Senior Geologist, no decision could be taken in view of the above said controversy. Considering the dispute arising out of not only classification of hard shale but also the mode of payment, and also due to the fact that there were already many disputes on hand and many more disputes may arise in future, it was decided to constitute a Disputes Settlement Committee which would have the powers of adjudication under the Arbitration Act. This would be a standing Committee till the completion of UKP Second Phase. This was subject to final decision by the Government.

An amendment to the above said paragraph of the proceedings was issued on 01.03.1991, to the effect that the ECPC was of the opinion that if hard shale removed by blasting was not treated as coming under soft rock classification, at best it could be treated as extra item and rate could be determined as per terms of agreement.

Subsequent to the review meeting taken by the Irrigation Secretary at Bheemarayanagudi on 01.01.1991, the UKP Contractors’ Association, in its representation dated 22.01.1991 (copy enclosed as Annexure-9) addressed to the Hon’ble Chief Minister, pointed out that the progress on project works had been very slow mainly due to the fact that the Department had not been strictly implementing the tender conditions regarding excavation items. It was also pointed out in the representation that several other disputes had arisen regarding interpretation of contractual clauses, payment of rates, etc., and that the project authorities had not been able to take any decision to settle the disputes and that, as a result, the project works had almost come to a grinding halt. The UKP Contractors’ Association also putforth in its above said representation that, in the interest of early completion of project works by fully utilising the World Bank aid, a Committee of two experts (such as Senior Retired Chief Engineers) may be immediately constituted to go into the issue of classification of excavation items and finalise the same within a fortnight. Another request made therein was to constitute a Disputes Settlement Committee with adjudication powers under the Arbitration Act, for settlement of all other regular disputes.
3.03 Constitution of an Expert Committee for classification of disputed excavation items:

As the dispute could not be resolved by the Chief Engineer and it still remained unresolved even after directing the ECPC to undertake a joint inspection of the site and take immediate final decision in the matter, thus affecting the progress of the project, the Government decided to constitute a Committee of Experts to examine the issue. Accordingly, in Government Order No. PWD 51 WUC 90 (P) dated 14.05.1991 (copy enclosed a Annexure-10), an Expert Committee was constituted to examine the issue of classification of disputed excavation items in the ongoing ICB contracts of Mudbal Branch Canal of UKP and make suitable specific recommendations taking into consideration the contract provisions and the actuals on the field. The Committee comprised Sri.B.A.Raddi, Retired Engineer-in-Chief and Sri.H.S.Bhat, Retired Chief Engineer and was required to give its report within 15 days. The period for giving its report was extended, at the request of the Committee, by one month vide copy of the Government Order No. ID 51 WUC 90 dated 26.06.1991. The Committee forwarded its report to Government on 29.06.1991.

3.04 Project kept under Red Alert by World Bank and review meetings by Hon'ble Chief Minister:

Considering the continued poor progress of the project, the World Bank in the meanwhile kept the project under Red Alert. As this was a matter of serious concern, the Hon'ble Chief Minister took a series of review meetings including field visits from 28th June to 3rd July 1991. The World Bank Supervision Mission which was present in the Hon'ble Chief Minister's review meeting at Bheemarayanagudi on 03.07.1991 stressed the urgent need of settlement of the about said dispute for which the Hon'ble Chief Minister responded by stating that the Expert Committee had given its report and that it would be accepted very shortly (extract of the proceedings of the said review meeting is enclosed as Annexure-11).

3.05 Recommendations of the Expert Committee and acceptance by Government:

(i) The Expert Committee held several meetings with the officers of the Department and the concerned ICB Agencies of Mudbal Branch Canal to hear their contentions in the matter of the said dispute and after examining the records and documents received from both the parties and the tender agreement conditions & specifications and also after assessing the ground realities by way of making field visits, framed the following three issues for detailed deliberations:-

(1) Whether hard shale met with requires blasting for its removal;

(2) If blasting is required for the excavation of hard shale, can it be classified as hard rock under item E-3 of the Bill of Quantities; and

(3) If the hard shale is classified as hard rock under item E-3 of the Bill of Quantities, what rate is to be paid ?

(ii) As recorded in the report of the Expert Committee, the Executive Engineer had stated that the hard shale met with in Mudbal Branch Canal required blasting operations and that it could not be done otherwise. The Committee has also recorded the opinion of the Chief Engineer that he had agreed (during the meeting with the Irrigation Secretary on 01.01.1991) that blasting was required for the removal of hard shale. The Senior Géologist attached to the Chief Engineer's office had also inspected certain reaches of the canal and expressed the same opinion. The core logs furnished
to the Committee by the Department showed that fresh hard compact shale was met with in all the three slices of the canal and that the compressive strength, after the tests done by the Department on a few samples of hard shale, varied from 671 to 932 Kg per Sq.Cms. under saturated conditions indicating that these shales were very hard requiring explosive for their removal. The Committee has discussed the tender conditions and specifications in great detail and also referred to literatures before coming to the conclusion that the hard shale requiring blasting has to be classified as hard rock under item E-3 only. As regards the rate to be paid for the quantities under item E-3 after classifying hard shale as hard rock, some of the contractors had even demanded rates higher than their quoted rates. The Committee has analysed Clauses-51 & 52 of the contract conditions in greater detail before coming to the conclusion that only tender rate has to be paid for all quantities of hard rock classified under item E-3 (extract of the report of the Expert Committee pertaining to the three issues examined by it is enclosed as Annexure-12).

(iii) Following were the concluding recommendations of the Committee:

(a) The hard shale met with in the excavation of Mudbal Branch Canal requires blasting for its removal and it has to be classified as hard rock under item E-3 of the Bill of Quantities. The quantification has to be done by field officers.

(b) For all quantities classified as hard rock under item E-3 of Bill of Quantities, as stated above, tender rate has to be paid. This applies to quantities executed within the tender quantities and also all excess quantities.

(iv) With a view to expediting the work which had already been hampered on account of the said dispute, Government decided to accept the recommendations of the Expert Committee. Accordingly, the Committee’s recommendations were accepted in Government Order No.ID 51 WUC 90 dated 14.08.1991 (copy enclosed as Annexure-13) subject to the condition that these recommendations were exclusively for Mudbal Branch Canal and that they should not become a precedent for any other work.

3.06 Audit objections and World Bank comments:

Subsequent to the issue of the Government Order accepting the recommendations of the Expert Committee, the Accountant General in Karnataka (Audit-II) raised several objections in the matter of acceptance of the recommendations of the Committee and the inability of the Department in not strictly enforcing the provisions of the contract resulting in extending unintended benefit to the Agencies. One of the more important objections of the Accountant General mostly related to the procedure followed by Government to find a solution through the Expert Committee. The World Bank, considering the substantial increase in the cost of contract amounts and the audit objections, informed the State Government that the Bank had accepted the objections of the Accountant General and that the amount of expenditure so held under objection by the AG would be disallowed for reimbursements. The Bank also intimated that, in the event GOK getting the Accountant General to withdraw the objections, it can make supplementary disbursement upon the receipt of facts from GOK. The Engineer-in-Chief and Ex-officio Special Secretary (ECSS), UKP, Alamatti, drew the attention of Government in his D.O. letter dated 08.09.1993 (copy enclosed as Annexure-14) about the said comments of World Bank and requested the Government to take up the matter with the Accountant General immediately for accepting the replies given by the Department and to drop the Audit objections so that the World Bank may be addressed in the matter accordingly.
3.07 Clearance Certificate of Accountant General:-

The matter was thereafter taken up at Government level and suitable para wise replies to the draft paragraph of Accountant General were sent to the Accountant General (Audit-II) in Government letter No.ID 292 WBM 93 dated 27.07.1994 with a request to drop the audit objections. Subsequently the Accountant General (Audit-II), on the basis of detailed satisfactory compliance received from the Government through its letter dated 27.07.1994, communicated to the ECSS vide letter No.AG(Au)-II/IAU-II/B/94-95/65 dated 24.11.1994 (copy enclosed as Annexure-15), the clearance certificate in respect of the amounts which were proposed for dis-allowance relating to classification of hard shale as hard rock in the three ICB contracts of Mudbal Branch Canal. The amount so cleared by audit, as per the clearance certificate, is Rs.9.75 crores.

3.08 Improvement in progress observed by World Bank:-

Consequent on the settlement of the dispute by way of accepting the recommendations of the Expert Committee in Government Order dated 14.08.1991, the progress of canal works picked up, as observed by the World Bank Supervision Mission in its field report of December 9-13, 1991, an extract of which is reproduced below:-

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XXX XXX XXX
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"Summary:-
1. There is some noticeable progress in earth works in the Indi and Mudbal Branches after the resolution of a dispute on soil work classification. ................."

4.0 Interpretation of Clause-52 of ICB & LCB contract agreements in U.K.P. Phase-II with World Bank Assistance:-

4.01 Introduction:-

(i) The works of Upper Krishna Phase-II project were taken up with World Bank assistance during 1989. The works were executed through ICB / LCB contracts which were quite different from the PWG-65 Form. Clauses-51 & 52 of these ICB and LCB contracts related to the execution of extra work / additional work and determining the rates for such extra or additional works and increased or decreased quantities (extract of clauses-51 & 52 is enclosed as Annexure-16).

(ii) During the course of execution of the works, quantities of many items exceeded the tender quantities plus 25% attracting clause-52 for determination of rates to be paid for such excess quantities. Since all the works of UKP Second Phase with World Bank assistance were taken up through the same ICB / LCB contract form, all the excess quantities executed had to be paid at tender rates if the logic of the G.O. dated 14.08.1991 relating to Mudbal Branch Canal (which had already been accepted by the Accountant General as explained in paragraph-3 above) is extended to other contracts / works also. Accordingly the project authorities started making payment for excess quantities at tender rates as per clause-52(1) of the contract. However, the issue of payment of tender rates or otherwise for the excess quantities became more complicated as the Chief Engineer, UKP Canal Zone No.1, Bheemarayanagudi had, in the meanwhile, issued a Circular on 02.05.1990 (vide copy enclosed as Annexure-17), giving directions to the implementing authorities as stated below:-

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XXX XXX XXX There may be cases where the contractor has quoted high rates and the revision of rates as per clause-52(5) is advantageous to Government. In such case, there should not be any failure on the part of the Executive Engineer to issue
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notice as envisaged in clause-52(4). Therefore, whereas the cost of an item at tendered rate is higher or is likely to cross the limit of 2% of contract price and the variation in quantity is likely to be more than 25%, if the refixing of rates as per clause-52(5) is advantageous to Government, Executive Engineer should issue notice to contractor as per clause-52(4) under intimation to Superintending Engineer and Chief Engineer."

4.02 Legal opinion:-

(i) When the matter was referred by the project authorities to Government to clear the ambiguity in the interpretation of Clause-52, the matter was referred to Law Department in Government for an opinion in the matter. The Law Department in turn gave its opinion on 14.05.1993 in File No. ID 75 WUC 92 (copy enclosed as Annexure-18), which reads as follows:-

" XXX XXX XXX

As could be seen from Clause-52(1), it reveals that all extra or additional work done by the contractor shall be valued at the rates and price set out in the contract. If the contract does not specify any rates or price in respect of the extra additional work, the suitable rates and prices shall have to be mutually agreed between the Engineer and the contractor. In the event of disagreement, the Engineer can work out and fix the rate as set out in Clause-52(5) thereof.

Regarding fixing the rate for the work done by the contractor, it is for the Administrative Department to ascertain and find out on the basis of the terms and conditions of the contract as to whether the rate for extra work has been set out in the contract or not, and in case of the rate for the extra work done is set out in the provision of Clause-52(1) have to be followed. Otherwise, i.e.., if there is no specified rates for the extra work and if there is disagreement, then Clause-52(5) has to be followed."

Sd/-
(B.P.Jayakar) 14.05.1993
Secretary to Government
and Draftsman,
Department of Law and
Parliamentary Affairs.

(ii) When the file was once again referred back to the Law Department for giving a more specific and clear opinion, the Law Department in its note No. LAW 523 OPN.III.93 dated 16.08.1993, recorded in file No. ID 75 WUC 92 (copy enclosed as Annexure-19), gave the following opinion reiterating its earlier views:-

"The opinion of this Department in respect of point No.32(i) recorded in para 35 N/f is very clear and free from any ambiguity. Hence, the question of confirming the presumption of the Administrative Department referred to in para 36 N/f does not arise. However, to make it further clear, it may be stated that if the contract specifies that all extra or additional work done by the contractor shall be valued at the tender rate only, the same has to be valued accordingly. If the contract however does not specify valuation at tender rate, valuation has to be made at the rates and price set out in the contract. In case, the contract does not specify any rates or price in respect of extra or additional work, the suitable rates and prices shall have to be mutually agreed between the Engineer and the contractor and in the event of dis-agreement, it is open to the Engineer to work out and fix the rates as set out in Clause-52(5) of the contract.

Sd/-
(Y.N.Naganna) 17.08.1993
ALS Opinion.

Sd/-
(M.Ramesh Rao) 17.08.1993
Under Secretary to Government,
DLPA (Opinion-III)."
The above said opinions dated 14.05.1993 and 16.08.1993 of the Law Department were communicated to the project authorities in Government letter No.ID 75 WUC 92 dated 08.09.1993.

Contention of the ECSS, UKP, Alamatti, made out in his Letter dated 02.04.1994:

(i) The ECSS, UKP, Alamatti, in his D.O. letter No. ECSS/CON/BGA/93-94/1 dated 02.04.1994 addressed to the Irrigation Secretary (vide copy enclosed as Annexure-20) raised many contentious issues quoting the different opinions about the interpretation of clause-52, expressed on various occasions by the Finance Department, the Law Department, the Irrigation Department and the Expert Committee on Mudbal Branch Canal, and requested for convening an urgent meeting under the chairmanship of Additional Chief Secretary to take a final decision in the matter so as to ensure that excess payments are not made and that payments already made are recovered. He also mentioned in his letter that the Accountant General of Karnataka in his audit report for the years 1991-92 and 1992-93 had disallowed a sum of Rs.8.12 crores and Rs.5.03 crores respectively and that these amounts related to not only to change in classification of soil in Mudbal Branch Canal but also to incorrect interpretation of Clause-52 by the implementing officers. The letter of the ECSS is self-explanatory.

(ii) The ECSS also mentioned in his above said letter that the Law Department, while giving its opinion in file No. ID 75 WUC 92, had only considered the provision of clause-52(1) and conveniently chosen to omit the cream of the clause viz., “opinion of the Engineer”. While stating that, as per the contract conditions, the opinion of the Engineer was very significant, he has expressed that the Engineer should always aim to protect the interests of the Government and that his opinion should be favouring the Government. According to ECSS, the Engineer should not offer tender rate for excess quantities but only offer a mutually agreed rate, finally leading the contractor to agree to a rate fixed under clause-52(5).

Meeting taken by the Additional Chief Secretary on 04.07.1994:

In accordance with the suggestions made by the ECSS, UKP, Alamatti, the Additional Chief Secretary to Government took a meeting on 04.07.1994 (copy of the proceedings enclosed as Annexure-21) to discuss the interpretation of clause-52. In the meeting, the ECSS stated that the Chief Engineers of UKP Canal Zone, were allowing tender rates for the quantities executed beyond 125% of the tender quantities resulting in huge financial implications and that the Resident Audit Officer was objecting to such regulation of rates. The Additional Chief Secretary, analysing the issue stated that, in his opinion clause-52(1) was applicable not absolutely but was strictly subject to certain limitations specified in clause-52(3) and that the discretion given to the Engineer under clause-52(1) to apply the tender rate could not be considered as absolute. According to him, the rates are to be regulated as per clause-52(5)(i) only whenever the situation was as contemplated under clause-52(3). The view of the Finance Department that the rates are to be regulated under clause-52(5)(i) only and the view of the Law Department already expressed on earlier occasions that the provisions of clause-52(1) shall be applicable for all extra / additional work done, have also been recorded in the proceedings of the said meeting taken by ACS. It was decided in the meeting that the Law Department should review the issue in a comprehensive manner and furnish its opinion early for taking a final decision in the matter.
4.05 Contractors’ representation dated 03.08.1994 and directions of Government thereon:-

(i) The Upper Krishna Project Contractors’ Association in its representation dated 03.08.1994 addressed to the Hon’ble Deputy Chief Minister made a detailed analysis of Clauses-51 & 52 and urged for making payments for all excess quantities at tender rates only on the basis of the opinion already expressed by Law Department. They also made out that it was not proper for the project authorities to change their stand at this stage and that any change in their stand would not only be contrary to the contractual conditions but also result in unnecessary litigation and stoppage of works.

(ii) The Hon’ble Deputy Chief Minister in his Note No. DCM/5869/94-95 dated 06.08.1994 (copy enclosed as Annexure-22) addressed to the Irrigation Secretary stated that the decision taken in the meeting held on 04.07.1994 to refer the matter once again to Law Department, even though that Department had already given its opinion in the matter twice, was not in the interest of smooth functioning of the project especially when we were fighting against time to complete the project by 2000 AD. He also instructed the Irrigation Secretary to issue necessary directions to the concerned Chief Engineers, to follow the already established norms and the interpretation of the clauses already approved by the Law Department in earlier cases, so that the settled issues were not reopened. The directions of the Hon’ble Deputy Chief Minister were communicated to the ECSS for necessary action in Government letter No. ID 160 WBM 94 dated 27.08.1994.

(iii) The Hon’ble Minister of State for Irrigation in his Note No.MS/MJI/N/1211/94 dated 19.09.1994 (copy enclosed as Annexure-23) addressed to the Irrigation Secretary observed that the directions issued by the Hon’ble Deputy Chief Minister in his Note dated 06.08.1994 had not yet reached the concerned Chief Engineers. Taking strong objection for not yet implementing the directions of the Hon’ble Deputy Chief Minister, the Hon’ble Minister of State for Irrigation noted that the determination of the Government to complete this project by 2000 AD would be jeopardised by such in-actions. With this background, the Hon’ble Minister desired that the concerned Chief Engineers should be immediately directed to implement the directions of the Hon’ble Deputy Chief Minister. Subsequently, the directions of the Hon’ble Minister of State for Irrigation were communicated to the Chief Engineers of UKP in Government letter No. ID 160 WBM 94 dated 23.09.1994 for taking immediate necessary action in the matter.

4.06 Withdrawal of directions of Government:-

Referring to the earlier Government letters dated 27.08.1994 and 23.09.1994, wherein the directions of Hon’ble Deputy Chief Minister and the Hon’ble Minister of State for Irrigation respectively were communicated to the project authorities, the Government issued further directions in Government letter No.ID 160 WBM 94 dated 24.09.1994, directing the Chief Engineers not to act on the earlier directions given in the above cited Government letters until further communication from the Government. Copy of this Government letter was also marked to the ECSS, UKP, Alamatti and others.

4.07 Further opinion of Law Department and directions of Government:-

(i) The UKP Contractors’ Association in their telegram received in Government on 06.10.1994 represented to the Hon’ble Deputy Chief Minister about the hardships caused to them due to misinterpretation of Clauses-51 & 52 in contravention of the conditions of contract and stated that the project authorities were initiating action
for recovery by reopening the settled issues thus denying them their legitimate payments at tender rates for increased quantities. The matter was referred to the Law Department by the Hon'ble Deputy Chief Minister in File No.ID 160 WBM 94, for opinion on the following points:-

(a) The rates to be paid for the increased quantities in the light of the telegram given by the ICB & LCB Contractors' Association of UKP;

(b) Whether ECPC, UKP, Alamatti, is empowered to stop payments and start recovery on the basis of objection raised by the Resident Local Auditor, against the contractual Clauses; and

(c) To examine the DCM's Note placed at page 57 C/F which has been issued on the representation of the contractors.

(ii) The Law Department, after examining the issues referred by the Hon'ble Deputy Minister, gave its opinion in its Note No. LAW 1002 OPN-III 94 dated 23.11.1994 (copy enclosed as Annexure-24) which is reproduced below:-

" xxx xxx xxx xxx

This department has already furnished opinion in file No. ID 75 WUC 92, indicating the rates to be paid to contractors in respect of extra / additional work (page 60-58 c/f). It appears that the Deputy Accountant General (W & F) has in his note (page 8-1 c/f) (in file placed below), made certain observations about the excess payment made to the contractors. Those objections are pertaining to accepting of export committee report by Government regarding classification of work. Those objections relate to factual aspects and not on legal aspects. It appears based on the objections of A.G. ECPC decided to start recovery of excess payment made to the contractors. The contractors have in their telegram to the Hon'ble Deputy Chief Minister (page 74 c/f) requested for directing the authorities to effect payment as per the opinion of the Law Department. The Hon'ble Deputy Chief Minister has put up a note at page 57 c/f directing the authorities to effect the payment in terms of the opinion of Law Department. Therefore the file is sent for furnishing opinion and to examine the note put up by the Hon'ble Deputy Chief Minister vide page 57 c/f.

Point 52(b)

If the payment is not made in accordance with the opinion of this department as per page 60-58 c/f, then it will be against the contractual clauses. Action of ECPC to stop the payments and start recovery would not be on the lines of the opinion furnished by this department as per page 60-58 c/f.

Thus, ECPC, Alamatti, is not empowered to stop payments and start recovery on the basis of the objections raised by the Resident Local Auditor, against the contractual clauses.

Approved by the }
Law Secretary     }     Sd/-
                   }       (M.Ramesh Rao)
                   Under Secretary to Government
                  DL & PA (Opinion III).

(iii) Following the above said opinion of Law Department, the Hon'ble Deputy Chief Minister conveyed his strong objections to the action of the ECPC, UKP, Alamatti in starting recovery on the basis of objections raised by the Resident Local Auditor, which were communicated to the project authorities in Government letter No. ID 160 WBM 94 dated 08.12.1994.
4.08 Directions of Government once again withdrawn:-

The Government through its letter No. ID 160 WBM 94 dated 15.12.1994 once again intimated the project authorities not to act on the directions given in the earlier Government letter dated 08.12.1994 stating that the issue was to be examined at Government level.


(i) The ECSS, UKP, Alamatti, in his D.O. letter No. ECSS/QAA/CL-52/94-95/267 dated 30.12.1994 (copy enclosed as Annexure-25) addressed to the Irrigation Secretary pointed out that frequent directions from the Government to act and withdrawing the same had created confusion thus affecting the progress of work. He also stated that the excess amount paid under clause-52(1) was to the tune of Rs.6.88 crores and that due to frequent change of directions from Government only Rs.0.57 crore could be recovered. He desired a firm decision in this direction from the Government.

(ii) It may be noted that no mention was made in the above said letter dated 30.12.1994 of the ECSS about the clearance certificate issued by the Accountant General (Audit-II) of Karnataka on 24.11.1994 in respect of expenditures incurred against the G.O. dated 14.08.1991 wherein the recommendations of the Expert Committee for Mudbal Branch Canal for making payment at tender rates for excess quantities also had been accepted, even though AG’s clearance certificate had been received by that time.

4.10 Fresh contentions of the ECSS, UKP, Alamatti, made out in his letter dated 18.04.1995:-

(i) The ECSS, UKP, Alamatti, in his letter No. ECSS/QAB/IBC/30-64/76/94-95 dated 18.04.1995 (copy enclosed as Annexure-26) brought to the notice of Government a circular issued by Government as back as in 1977, wherein clarifications had been issued regarding the rates to be paid for excess quantities in accordance with Clause-13 of the conditions of contract. While enclosing a copy of said circular instructions contained in Government letter No. PWD 30 MKR dated 21.01.1977 (copy enclosed as Annexure-27), the ECSS stated that the present situation relating to interpretation of Clause-52 was similar and therefore the instructions contained in that circular were very clear and applicable to any case of canal excavation in general. He further stated that he was fully convinced that the circular instructions issued in that Government letter, though it pertained to Clause-13 of PWG-65 Form, could be Mutatis-Mutandis applied to such increased quantities under LCB contract covered by Clauses-51 & 52. The ECSS also expressed his strong reservations stating that the Expert Committee for Mudbal Branch Canal had gone beyond its terms of reference by way of recommending payment of tender rates for excess quantities. He even went to the extent of stating that the Government in its wisdom had accepted the recommendations of the Expert Committee but had saved its decision by stipulating in the Government Order that the application of the Expert Committee’s recommendations was limited only to Mudbal Branch Canal slice Nos.1, 2 and 3 and that it should not be quoted as precedence. He also mentioned in his letter that the said decision of the Government appeared to be incorrect and that it was for the Government to examine whether it was possible to go back on its decision in respect of Mudbal Branch Canal or not. While strongly emphasising his contention that excess quantities had to be paid as per clause-52(5) only, the ECSS stated that he was ready to accept the final view of the Law Department on this issue.
(ii) It may be noted that the same ECSS who had earlier strongly urged the Government to take up the matter with Accountant General (Audit) for dropping the audit objections to the G.O. dated 14.08.1991 relating to Expert Committee’s recommendations for Mudbal Branch Canal (vide paragraph 3.06 above and ECSS’s letter dated 08.09.1993 at Annexure-13), chose to make comments on the same Expert Committee and questioned the Government Order itself, as he did in his above said letter dated 18.04.1995.

4.11 Opinion of Finance Department:

The Finance Department in its note No.PWD 1242 FC-I/94 dated 27.05.1995 (copy enclosed as Annexure-28) communicated its opinion in the matter to the Irrigation Department, the gist of which is as noted below:

(a) In respect of the extra or additional work done due to change in design, location or unforeseen work, etc., ordered by the Engineer, a specific order must exist and payment has to be made as per clause-52(1).

(b) In respect of variations occurring due to increase or decrease in quantity of work, payment shall be made as per clause-52(5) if clause-52(3) is satisfied.

4.12 Matter referred to the Technical Advisory Committee, Irrigation Projects:

As the matter of interpretation of Clause-52 remained unresolved, the subject was referred to the Technical Advisory Committee, Irrigation Projects (TAC), by the Irrigation Department on 20.06.1995. The Committee in its 6th meeting held on 4th & 5th September 1995 (extract of the proceedings enclosed as Annexure-29), after considering the procedure followed in World Bank aided power projects in Karnataka Power Corporation Limited (KPCL), where the LCB / ICB contract format followed was similar, gave the opinion that clause-52(1) of the agreement was applicable for payment at tender rates for quantities in excess of 125% of tender quantities. This opinion of the Technical Advisory Committee was based on the opinion of the Civil Committee of KPCL expressed in its 200th meeting held on 01.09.1990 under the chairmanship of Srl.S.G.Balekundy and attended by Srl.S.V.Unnikrishnan, the then Accountant General in Karnataka who was also the Finance Director of KPCL. The Civil Committee of KPCL, after perusing the relevant clauses, viz. 52(1) to 52(5) of the agreement, felt that clause-52(1) was applicable for payment of quantities in excess of 125% of tender quantities also. The Minutes of the above said Civil Committee meeting together with the interpretation of Clause-52 made by KPCL where the same LCB / ICB contract document had been followed in the power projects, are enclosed as Annexure-30.

4.13 Decision of the Major Irrigation Projects Control Board:

(i) The recommendations of the Technical Advisory Committee were examined by the Major Irrigation Projects Control Board (MIPC Board) and the Board in its 5th meeting held on 08.05.1996 under the chairmanship of the Hon’ble Chief Minister, examined the opinion furnished by the various authorities viz. Law Department, Additional Chief Secretary, Finance Department and the Technical Advisory Committee and decided to obtain an independent legal opinion from the Advocate General of Karnataka. The Advocate General, after examining the opinions given by various authorities as stated above and the contract conditions as well, furnished his opinion through his letter No. 174/AGB/96-97 dated 19/23.10.1996 to the MIPC Board. The opinion expressed by the Advocate General is extracted as under:-
"QUERY:

In the light of several opinion, whether Clause No.52(1) of the agreement is to be made applicable for payment of tender rates for the quantities executed in excess of 125% of the quantities specified in the Schedule 'B' of the contract.

"OPINION:

Clause-52(1) says that all extra or additional work (the two terms are synonymous in that according to the dictionary both mean added / additional) done or omitted shall be valued at the rate and price set out in the contract. The word 'shall' is mandatory. The exceptions to this mandatory term of the contract is when the contract does not contain rates or prices which apply to the extra / additional work. In that event, the rates or prices will have to be arrived at by mutual agreement. If there is no agreement, the rates or prices will have to be determined with reference to Clause-52(5).

Whereas, sub-clause (1) of Clause-52 is concerned with valuation of variation, sub-clause (3) of Clause-52 deals with eligibility for revision of rates. Sub-clause (5) of Clause-52 comes into play only when under sub-clause (1) of Clause-52 the Engineer is required to fix the rates with reference to sub-clause (5).

I am of the opinion that all extra or additional work executed will have to be valued in the manner specified by sub-clause (1) of Clause-52.

(ii) The subject was again discussed in the 9th meeting of MIPC Board held under the chairmanship of the Hon'ble Minister for Major Irrigation on 16.12.1996 (by then the MIPC Board had been reconstituted with the Hon'ble Minister for Major Irrigation as the Chairman) and it was decided to obtain the views of Finance Department on the opinion of the Advocate General. The issue was therefore referred to Finance Department on 21.12.1996 for its views.

(iii) The MIPC Board in its 14th meeting held on 6th and 23rd May 1997 under the chairmanship of the Hon'ble Minister for Major Irrigation considered the above said opinion of the Advocate General in the matter and also the fact that the Accountant General (Audit) had already cleared the G.O. dated 14.08.1991 (wherein the recommendations of the Expert Committee for Mudbal Branch Canal for making payment for all excess quantities at tender rates had been accepted) by way of dropping the objections and issuing a clearance certificate. Even though the issue had been referred to Finance Department on 21.12.1996 itself, its views were still not forthcoming. However, as the Finance Department was also represented in the MIPC Board, it was decided to discuss the issue for a decision. After discussions and in the circumstances explained above, the Board resolved to accept the independent opinion and advice of the Advocate General of Karnataka (vide copy of the proceedings of the said meeting enclosed as Annexure-31).

(iv) The decision taken in the above said meeting of the MIPC Board was communicated to all the project authorities in UKP in Government letter No. ID 160 WBM 94(Vol.2) dated 21.07.1997 for information and implementation with the stipulation that necessary competent approvals for the revised estimates of individual works should be obtained wherever required, separately.

4.14 Contentions of World Bank:-

With a view to clear ambiguity arising out of interpretation Clause-52, the project authorities, while formulating the LCB tender document for construction of Distributary Nos.23 & 24 of SBC, had suggested a modification to clause-52(1) duly specifying that the quantities exceeding 125% of the tender quantities would be paid at SR only. After acceptance of the tender and executing the agreement, the tender was sent to World
Bank for post-review. But the World Bank did not agree to the modified clause which had to be eventually withdrawn.

4.15 Remedial action taken to eliminate the delays:

In order to eliminate the possible delays for reasons set out in paragraph No. 1.02 and with a view to protecting the interests of the Government, the Krishna Bhagya Jala Nigam Nigam (KBJNL) has taken the following corrective measures:

(i) It is made specific in the tender document that it shall be the responsibility of the contractor to take possession of lands required for the work by consent wherever such lands are not yet acquired by KBJNL, at no extra cost to the Nigam.

(ii) Clause 13(b) of the tender document, relating to determination of rates for excess quantities beyond 125% of the tender quantities, has been modified making it very clear that all such excess quantities shall be paid at tender rate or SR ± tender premium whichever is lesser.

(iii) It is being clearly mentioned in the documents at the time of tendering that it is the responsibility of the contractor to make his own arrangements for supply of power and also supply of all materials required for the work like steel, cement, explosives, etc.

(iv) Designs of major structures are being entrusted to private consultants.

(v) An exclusive Technical Sub-Committee has been formed to advise the KBJNL Board and the project authorities on all matters relating to technical problems, estimates, Draft Tender Papers, tenders, claims of contractors and other related issues.

(vi) Price escalation clause and mobilisation advance clause have been removed from the tender document.

(vii) Clause No. 29 relating to settlement of disputes has been modified making it very clear that no part of the clause shall be construed to be an Arbitration clause.

(viii) Necessary funds are generated by KBJNL keeping in view the requirements.

4.16 Conclusion:

Because of the reasons set out in paragraph No.1.07, it took considerable time for the Government to reach a final decision. With the opinion of the Advocate General in Karnataka, who is the highest legal authority to advise the Government, and the decision of the MIPC Board thereon, the matter came to a finality.
CHAPTER-11

DAMAGES TO RADIAL CREST GATE OF NARAYANAPUR DAM

1.0 **Background:**

1.01 Narayanapur dam has 25 spillway gates in the central portion and 5 additional spillway gates in the right flank. The work of providing and erecting 15 m x 12 m (i.e., 50 feet x 40 feet) size radial crest gates to the 5 additional spillways in the right flank was entrusted to M/s. Sikka-N-Sikka in December 1979 with the stipulated date of completion as January 1981. Due to poor progress given by the agency, their contract was terminated in October 1982. Since an assurance had been given to World Bank and also to Government of India, that water from Narayanapur reservoir would be allowed for irrigation from June 1982 onwards, it became necessary to store water in the reservoir by using stop-log gates and bulk heads. The work of providing 3 stop-log gates and 2 bulk heads to the 5 additional spillways was entrusted to M/s. Tungabhadra Steel Products Limited (TSP) as per the directions of Government and the work was completed in a quick time and water stored in the reservoir in June 1982 itself. It was contemplated at the time of providing bulk heads that they would be converted later as additional stop-log gates. Subsequently, the balance works of providing and erecting radial gates for the 5 additional spillway vents were also completed by M/s. TSP.

1.02 Thereafter the project authorities referred the matter of conducting model studies for conversion of bulk heads into stop-log gates to the Central Water & Power Research Station (CWPRS), Pune, in August 1982. By 1991, the model was kept ready by CWPRS but the studies still remained to be completed. No further report is available about the completion of the study and the results obtained therefrom.

2.0 **Incident:**

2.01 In the early morning of 3rd November 1992, damage occurred to radial gate No.5 of the additional spillway when the water level in the reservoir was 491.48 m. On inspection by the project authorities, it was found that the bulk head provided to gate No.5 had yielded and hit the radial gate resulting in considerable damages to the radial gate itself. On account of this, there was heavy leakage of water passing through the gate. The matter was intimated to the higher authorities on 3rd itself. The Government was informed of the incident by the Engineer-in-Chief cum Project Coordinator (ECPC) on 4th November 1992.

2.02 On a more detailed inspection, it was found that the bulk head had been bent in the shape of an arrow head and had released itself from the grooves and struck the skin plate of the radial gate. As a result, a vertical dent of about 1.20 m was observed on the skin plate. The sides of the radial gate were found to be bent and the horizontal girders with their bracings twisted. On account of the impact created by the bulk head on the middle of the radial gate, its arms had been subjected to stresses with the result the lower end of the left arm near the skin plate had been cut to most of its width. The impact had also slightly displaced the trunnion base seated on the piers.

(*) Source of the chapter:-

(1) Government file No.ID 62 WUD 92.
(2) Note furnished by the CE, O&M, UKP, Narayanapur.
3.0 Immediate follow up action taken:

3.01 As the situation was critical, the Executive Engineer rushed to Hospet for urging M/s.TSP to immediately inspect and take up emergent repairs. Simultaneously, KEB was also requested to spare the services of divers for under-water investigations. Whereas the divers arrived on 4th November, the representatives of M/s. TSP arrived at the site on the morning of 5th November. After inspections, the representatives of M/s.TSP opined as follows:-

(i) The bent up bulk head elements in the existing bent condition should not be disturbed as they are acting as a sort of protective and supportive structure to the main damaged radial gate.

(ii) A major portion of the water load is borne by the bent up bulk head elements. It appears that the guide track of the bulk head is not totally free to lower any other stop-log / bulk head elements to stop the leakage and safeguard the damaged radial gate from further deterioration and to prevent further damage which may arise out of the possibility of washing away of the radial gate itself.

(iii) Due to heavy water pressure caused on account of the flowing of leakage water through the gate, it is not possible even for divers to do any under-water works such as cleaning the guide track, etc. This can be done only when the water is completely depleted.

(iv) The only solution for saving the gate is to provide new bulk head elements. However, no action whatsoever in the form of rectification can be resorted to now either in the form of removal of obstruction in the guide track or replacement by a new one without the depletion of water level.

(v) As a first step, the water level in the reservoir should be reduced by one meter so as to reduce danger to the safety of the gate. However, safety cannot be fully guaranteed in spite of such reduction.

3.02 Accordingly, action was taken to gradually deplete the water level of the reservoir by one meter.

3.03 Directions were issued through telex by Government on 6th November to the project authorities to immediately take the following actions:-

(i) To plug the leakage by welding MS plate members and supporting vertical channels to the damaged crest gate.

(ii) To tackle the MS plate welding from both the sides.

(iii) To take up under-water cutting of bulk head either simultaneously or after plugging the leakage.

(iv) To take up the above measures only after close examination and if found feasible.

3.04 The representatives of M/s. TSP held further discussions at Alamatti with the ECPC to chalk out a programme about the further course of action to be taken in respect of gantry, strengthening of damaged gate, etc.
3.05 By the morning of 8th November, the water level in the reservoir had come down to 490.62 m.

3.06 The Irrigation Secretary visited the site on 9th November and after inspections and holding discussions with the project authorities as well as the representatives of M/s. TSP, following decisions were taken:

(i) In order to minimise the damaged spillway gate, lowering of hay-straw bundles with clay lumps by using fish-net sacks on the upstream and downstream of the damaged bulk head, may be undertaken immediately. This work should start immediately and completed within a week's time.

(ii) In the meanwhile, M/s. TSP shall start strengthening the radial gate by using gusset plates wherever it is found necessary including trunnion axis and the cross members which are bent due to heavy stresses. This work will be started on 12th November.

(iii) Simultaneously, the gantry crane shall be repaired and made operative by M/s. TSP before 14th November and the same shall be moved to the additional spillway portion by 21st November so as to enable the removal of stop-log elements of the emergency gates.

(iv) It should be ensured by the project authorities that the rails from the central spillway to the additional spillway are rectified before 14th November.

(v) As and when the water level recedes, the stop-log elements shall be lifted out from the gate element grooves and kept outside for necessary inspection. The rollers and lining may be fixed to the stop-log gate if not provided already. If strengthening is necessary, the same may be attended to by M/s. TSP. This process should be completed by January 1993.

(vi) Immediate action shall also be taken by M/s. TSP to manufacture the radial gate and connected structural elements and keep them ready by the end of February 1993.

(vii) The design and drawing of the radial gate may be verified by the Chief Engineer (Designs) for correctness.

(viii) The damaged bulk head elements shall be removed from 30th January 1993 onwards by cannibalizing when the water level recedes.

(ix) The whole repair work should be done on war footing basis so that the Rabi crops are not affected and the gates become operational from April 1993 onwards.

3.07 As a matter of fact, soon after the damage on 03.11.1992, efforts had actually been made to arrest the leakage by using gunny bags, cotton wastes, tarpaulin bundles, etc without disturbing the stability of both the radial gate and the bulk head. But this action had to be discontinued on the advice of M/s. TSP experts who had apprehended that any disturbance in the existing equilibrium might further worsen the situation. No further attempts in this direction were therefore made till the 9th November. Consequent on the decision taken on 9th November during the visit of Irrigation Secretary, the plugging was resumed on 10th November by lowering of big bundles of hay-straw with clay lumps, sand bags, etc on the upstream of the bulk head. But these were washed away and the work of plugging was not encouraging. Apprehending the possibility of
disturbance to the damaged gate, this process was suspended until some appreciable progress in the strengthening work was achieved by M/s. TSP Limited.

3.08 The repair team of M/s. TSP rectified the gantry crane and moved it to the additional spillway portion by 10th November. Thereafter, the team commenced the strengthening work on 12th November by providing additional stiffners, gusset plates, tie angles, etc to the effected portion of both the bulk head and the radial gate. This strengthening work continued very briskly round the clock and was more or less accomplished by 28th November.

4.0 **Quantity of leakage:**

The quantity of leakage through the damaged gate was about 1000 cusecs on 5th November 1992. Due to action taken to plug the leakage by providing gunny bags, cotton wastes, etc the leakage reduced to about 700 cusecs by 13th November and to 600 cusecs by 16th November. Later on the leakage gradually reduced to 500 cusecs.

5.0 **Area notified for rabi irrigation:**

The cropped area notified for Rabi irrigation of 1992 was 70,000 ha (1.75 lakh acres). As per the decision taken in the meeting of the Irrigation Consultative Committee held on 12.10.1992, water was to be released for Rabi crops from 15th October 1992 upto end of February 1993. As per the assessment made by the project authorities, the storage in the reservoir was about 23 TMC and allowing 3 TMC for leakage and other losses, there would still be 20 TMC storage left which was sufficient to irrigate the notified area.

6.0 **Agitation by Ryots:**

On the Afternoon of 19th November, a big mob of Ryots assembled near the office of the Administrator, UKP CADA (who was also the Ex-officio Engineer-in-Chief, O&M) at Bheemarayanagudi and staged demonstration urging for supply of water for Rabi irrigation upto 15th March 1993. Not satisfied with the assurance given to them that water would be supplied till the end of February 1993 as per the Rabi notification, the mob became restless and even manhandled the Administrator. The police had to use lathi charge to control the mob violence.

7.0 **Further course of action taken for the repairs:**

The Irrigation Secretary held a meeting with the project authorities and the representatives of M/s. TSP at Hospet on 21st November and after detailed discussions, the following course of action towards repairs was agreed to:

(i) Providing latching arrangements for housing stop-log elements on pier tops on main and additional spillways.

(ii) Supply of embedded parts with connected "I" Section, etc., shall be completed within 4 weeks.
(iii) M/s. Tungabhadra Steel Products Limited, Hospet shall start the job immediately after finalizing the drawings in consultation with the concerned Executive Engineer.

(iv) The Engineer-in-Chief, O&M, Narayanapur, shall arrange for completion of civil works within another six weeks.

(v) Providing new radial gate leaf and wire rope in place of the damaged gate, excluding trunnion bushes and pins.

(vi) To get the gate leaf and other sections manufactured and erected from M/s. Tungabhadra Steel Products Limited, Hospet.

(vii) M/s. Tungabhadra Steel Products Limited, Hospet shall examine the existing wire rope and if found useful, the same shall be used.

(viii) M/s. Tungabhadra Steel Products Limited, Hospet will arrange for power supply at site by deploying a generator.

(ix) Providing materials and services for strengthening of bulk head and radial gates in vent No.5, dismantling of bulk head and radial gate in vent No.5, removal of bulk head in vent No.4, removal of stop-log gates No.1, 2 and 3 and servicing them by fixing rollers, which were removed earlier and are with M/s. TSP, etc.

(x) M/s. Tungabhadra Steel Products Limited, Hospet shall explore possibility of deploying under-water cutters, for retrieving stop-log gate elements, etc.

8.0 Repair work:-

8.01 Subsequently, directions were issued in Government letter No. ID 62 WUD 92 dated 03.12.1992 to the Administrator & Ex-officio Engineer-in-Chief, O & M, UKP, to go ahead with the emergent repair work in accordance with the decisions taken in the meeting held at Hospet on 21.11.1992.

8.02 After holding series of discussions with the M/s. TSP authorities, the estimate for carrying out the repair work was finalized by the project authorities and the work was entrusted to M/s. TSP. Following is the break-up of cost of works entrusted to M/s. TSP.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of work</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Providing latching arrangements for suspending stop-log elements on pier tops in main and additional spillway.</td>
<td>Rs. 8.10 lakhs</td>
</tr>
<tr>
<td>2.</td>
<td>Fabrication, supply and erection of radial gate leaf (excluding trunnions, bushes &amp; pins) for vent size of 15 m x 12 m including supplying &amp; fixing of wire rope, for vent No.5 of additional spillway.</td>
<td>Rs. 50.00 lakhs</td>
</tr>
<tr>
<td>3.</td>
<td>Providing steel materials and services by M/s. TSP towards strengthening of the damaged bulk head &amp; radial gate of vent No.5, dismantling of bulk heads in vent Nos.4 &amp; 5, dismantling of damaged gate leaf in vent No.5, removing the stop-log elements from vent Nos.1, 2 &amp; 3 of additional spillway and moving them on to the right flank for detailed joint inspection.</td>
<td>Rs. 14.50 lakhs</td>
</tr>
</tbody>
</table>

**Total:** Rs. 72.60 lakhs
Apart from the above, the cost of civil work i.e., raising of piers for providing latching arrangements, was estimated as Rs.27 lakhs.

The repair work was accordingly carried out by M/s. TSP and completed by May 1993.

**9.0 Constitution of a Committee to investigate the reasons for the failure of the bulk head & radial gate:**

In Government Order No.ID 62 WUD 92 dated 08.01.1993 (read with corrigendum dated 25.01.1993), a Committee with the following members was constituted to investigate the causes for damage to the radial crest gate and identify the persons responsible for their lapses, if any:-

1. Shri. S.Venkatesh, IAS (Retired) Bangalore
2. Shri. S.P.Bhat, Retired Special Secretary (Irrigation) Bangalore, and

The Committee was also required to suggest remedial measures to avoid recurrence of such incidents in future and submit its report within 2 months.

Shri. S.Venkatesh, was appointed as the Chairman of the Committee in Government Order No.ID 25 WUD 93 dated 20.03.1993.

The period of submission of the report by the Committee was extended upto 25.06.1993 through G.O. No.ID 62 WUD 92 dated 27.03.1993 and again upto 25.07.1993 through G.O. dated 22.06.1993.

**10.0 Findings and recommendations of the Committee:**

The Committee submitted its report to Government through its letter dated 05.07.1993 (Annexure-1). Its findings and recommendations are summarized in the following paragraphs.

Findings:- The Committee's findings on several issues examined by it are as under:-

(i) Whether the damage to the bulk-head gate (vent No.5 of the additional spillway) at Narayanapur was due to any act of sabotage:

The Committee is of the clear view that the bursting of the bulk-head and the resultant damage to the radial gate was not at all due to any act of sabotage.
(ii) Whether the damaged gate installed in 1982 as a temporary measure could have been removed from its position soon thereafter (as originally envisaged), without allowing the said gate to be in its watery abode for full 10 years (i.e., from 1982 to 1992):

The Committee is of the considered view that the field engineers had evinced adequate interest to get the crane commissioned. However, due to various developments, the crane came to be fully operational, capable of lifting the load of individual members of bulk-head / stop-log gates, only by last end of November 1992, i.e., about 1 month after the incident of 3.11.1992. The Committee has also examined how the gantry crane was a pre-requisite for lifting the said gates. As such, for want of the gantry crane, the field officers just could not remove the bulk-head gate from its temporary abode till November 1992. In other words, the project authorities cannot be held responsible for not removing the temporary bulk-head gate soon after the installation of the radial gate and for allowing it to remain in that position for 10 years (from 1982 to 1992).

(iii) Whether the non-removal of the said temporary bulk-head gate within a reasonable time after installation and subsequent damage to it on 03.11.1992 was due to lapses on the part of any officials and, if so, the concerned persons responsible for such lapses:

The Committee is convinced that the field weld joints were most defective and such weak joints, all located right at mid-span of the gate where there was maximum stress due to thrust of water, were the cause for the failure of the bulk-head gate. The persons responsible for the lapses resulting in damage to the gate have been identified by the Committee separately.

(iv) Whether proper maintenance of the different relevant components was regularly attended to which could have prevented the mishap:

The Committee has come to considered conclusion that, while the routine inspection of the radial gates seems to have been complied with (as could be made out from the prescribed registers), the inspection of the downstream faces of the bulk-head and stop-log gates has not been carried out. Even with regard to the annual inspection done in respect of the radial gates, the procedure followed is not adequate. The need for overhauling the present procedure has been dealt with separately by the Committee.

(v) Determination of the causes for the failure of bulk-head gate No.5 on 03.11.1992:

From design aspects, the structure was sound, and should have safely withstood the design head of 12 metres of water (and even slightly more) without collapsing. However, the fabrication of field joints was so highly defective that the assumed strength of the weld could not be achieved in practice, resulting in the failure of the gate. Though the drawing showed staggering of joints of horizontal girders of the two halves of the bulk-head gate, it was observed at site that many joints of both upstream and downstream were almost in one plane and that too, near the maximum stress zone. During the actual field installation of the bulk-head gate, there is a material departure from the relevant approved drawing, particularly in the relative location of the splice plate vis-à-vis the two horizontal webs of girders being welded together. The splice plate has been, in actual practice, placed on top and the V-groove is at the bottom. As a result, the butt joint is in a overhead welding position where good joint efficiency cannot be expected. This is all the more so, in view of the closeness of the girders, providing very little working space for such overhead welding. Again, the
V-groove edge preparation has not been invariably provided in all cases of such web joints. There are several such defects in field fabrication. The flanges are not edge-prepared, thus preventing full welding at site. Out of a total thickness of 36 mm adopted in the design, hardly 10 mm is available at the joint for resisting the moment due to the impounded water. While in the design, a thickness of 40 mm plate was considered as the flange, the actual available thickness at joint is around 10 mm thick weld only. The downstream flange of the 5th girder from top of the failed bulk-head, comprising two plates of total thickness of 40 mm, has not received any weld at all; nor is there any edge preparation. After careful examination of all aspects, the Committee is fully convinced that the failure of the gate was entirely due to defective field fabrication and very poor and defective field welding done by M/s. TSP at the webs, flanges and other components.

10.03 Recommendations for minimising the chances of recurrence of such mishaps in future (not only at UKP but also at other projects in the State):

The Committee has broadly classified this issue into (1) recommendations for immediate implementation and (2) recommendations for phased implementation.

(1) Recommendations for immediate implementation:

(i) One of the main lessons from the failure of the bulk-head gate at Narayanapur dam is that no gate should be left without periodical inspection, servicing and painting. If this is not possible in the normal course, special efforts should be made, and maintenance carried out to avoid potential danger of unexpected failure. Cracks in defective welds of structures, though not visible initially, do propagate progressively over a period of time due to stress and corrosion, and may end up in failure.

(ii) In view of the past failures of a few tie beams at the trunnions at Narayanapur dam, (and admittedly as the exact situation in respect of other trunnions is clearly not known), it is necessary to get all the crucial parts of the gates etc., thoroughly inspected urgently. It is learnt that the project authorities at Narayanapur intend to get soon inspection done through M/s. TSP. It is strongly urged that this should be followed up expeditiously and the inspection-observations complied with, without much loss of time in routine correspondence.

(iii) To ensure thorough inspection of all crucial parts, certain facilities by way of (a) a suitable "cat walk" providing access to all trunnions, (b) similar access to the joint between arm assembly and horizontal girders, and (c) quick communication between the road and generator room to handle situations arising out of failure of grid power, need to be provided urgently.

(iv) As the radial gates at Narayanapur dam are designed to be always under-water, routine easy-going pre-monsoon inspections and servicing would not hold good. A practicable time-requirement norm should be worked out for the various steps involved in stop-log gate operations. Based thereon, a rigid time schedule for servicing and painting 7-8 radial gates per year will have to be drawn up and adhered to.

(v) Adequate annual budgetary provisions are to be invariably made, for such servicing of radial gates.

(vi) At the same time, the Chief Engineer in charge of the dam should be held accountable for ensuring such proper maintenance of the gates every year.

(vii) As none of the upstream stop-log grooves of main spillway have so far been tested for smooth lowering of stop-log assembly with rollers, there is a possibility of
problems being encountered in some vents, when need arises for lowering of stop-log gates therein. Rectification of defects in the grooves is a time consuming job. Hence this exercise needs to be made at the earliest.

(viii) Latching arrangements for stacking of the removed stop-log elements of the gate over the different piers need to be completed without any loss of time.

(ix) The yearly inspection of individual radial gates needs to be made more systematic. Provisions should be incorporated to indicate separately the state of affairs in case of each radial gate, instead of resorting to vague generalized observations as presently being done. Similar provisions are required to indicate the extent of operation of each gate during flood routing.

(x) Presently, there is a virtual total lack of security arrangements at Narayanapur, in as-much-as the various control switches for operation of individual hoist motors, triple pole switches of main power circuits etc are accessible to any unauthorized person. There is not even a simple locking arrangement. These loopholes should be adequately plugged.

(xi) Besides the main gantry crane, two smaller cranes (of 15 tonne capacity) are provided at Narayanapur dam for handling Head Regulator gates at Left Bank and Right Bank. These were erected about 10 years ago. They should be serviced, checked and kept in operable condition.

(xii) The emergency gates provided for the river sluices at Narayanapur dam have reportedly never been tested, probably because of understandable fear of possible obstructions in the groove. This exercise should not be deferred any longer, especially in the light of the failure of the bulk-head in the additional spillway.

(2) Recommendations for phased implementation:-

(i) In view of the rigid time schedule required for the annual servicing of gates (involving the movement of the several elements of the stop-log gates over almost the entire spillway), the road over Narayanapur dam will necessarily have to be closed to public vehicular traffic for a major part of the year. Alternate communication facilities, by way of a permanent bridge across the river, for the public vehicular traffic will have to be urgently thought of and implemented.

(Incidentally, even for the relatively minor job of removal of 3 stop-log gates from vents 1, 2 & 3 and 2 bulk-head gates from 4 & 5 of the additional spillway in 1992-93, the road over Narayanapur dam was closed to public vehicular traffic for several months).

(ii) Further, to facilitate adherence to the schedule as mentioned in the above para, it is desirable to have two more lowest elements of the stop-log gate, particularly so, as they are not interchangeable with other elements (the question of conversion of the bulk-head gates to stop-log gates does not arise, as the former have been cut to pieces during their recent removal from the groove).

(iii) The uniqueness of the live capacity in Narayanapur dam is already discussed. As the water level in this reservoir will almost always be at or around the FRL (and positively, well above the Minimum Draw Down Level) for purposes of ensuring protection of irrigation below the dam, flood routing in this dam, especially in the years to come, is bound to pose emergent and tricky situations calling for very prompt action, without any loss of time. To meet such situations, the existing net work of flood forewarning system in the various rivers contributing to the flood at Narayanapur will have to be reviewed and updated.
(iv) It would be equally helpful to undertake an in-depth study of arrangements and procedures followed in the selected projects in the country where similar live capacity situations obtain.

(v) In respect of future work orders for radial gates and similar structures, it is desirable that the tender specifications clearly stipulate testing of all vulnerable joints by standard methods, such as, X-Ray / Gamma Ray etc.

(vi) To ensure an objective, independent and thorough inspection of the crucial structures, like radial and other gates, cranes and other mechanical components of any major project, the Committee recommends a fully-equipped State-level agency under the Chief Engineer (C.M.O.), with jurisdiction over all the irrigation projects in the State. While the role of this agency could be limited to annual systematic inspections only, the responsibility for compliance with such inspections would rest with the respective project authorities. Such an arrangement would help overcome the bane of unwarranted complacence presently noticeable on the part of project maintenance authorities.

(vii) It may incidentally be mentioned that, while making postings of technical persons to relatively sophisticated jobs, like gate erection, welding with modern techniques etc, persons with relevant earlier exposures and experiences may be selected. It would pay rich dividends if persons in-charge of maintenance of gates are suitably exposed to greater awareness about problems of fabrication and maintenance of such structures by way of appropriate training courses. Such a step would very much be in the State's overall interests.

11.0 **Action taken on the recommendations of the Committee**

Recommendations of the Committee for providing cat walk for extending access to all trunnions, periodical inspections, servicing, painting, etc, have already been implemented. Another recommendation for banning public vehicular traffic on the Narayanapur dam and alternatively constructing a permanent bridge across the river for public use, has also been implemented. Further, learning lessons from the above incident, for the work of designing, fabricating and erecting the radial crest gates for Alamatti dam, not only an Expert Committee was constituted to oversee the work and advise the project authorities suitably, the recommendations of the above Investigation Committee were also kept in view.
CHAPTER-12*

KRISHNA BHAGYA JALA NIGAM LIMITED

1.0 Background:-

1.01 Considering the financial constraints and other factors contributing to the slow progress of the Upper Krishna and other projects in Krishna Basin, the Government decided in 1992 to constitute an Authority for development of Krishna Basin projects in Karnataka. In this direction, a Bill called "The Karnataka Krishna Basin Development Authority Bill, 1992" was prepared and approved by the Government. This Bill was passed in the both the Houses of Legislature and sent to GOI for obtaining the assent of the President of India. The President's approval was received only in 1996 and thereafter the Act was published by the Government as "The Karnataka Krishna Basin Development Authority Act, 1992" (Karnataka Act No.12 of 1996). However, since the Krishna Bhagya Jala Nigam Limited had in the meanwhile been formed in 1994, the said Act was not implemented.

2.0 Formation of the Krishna Bhagya Jala Nigam Limited:-

2.01 In the meanwhile, considering the delay in obtaining the assent of the President of India for the above said Bill and the urgent need for accelerating the progress of UKP by ensuring the required flow of funds, it was decided in 1994 to constitute a Corporation called the Krishna Bhagya Jala Nigam Limited (KBJNL). Accordingly, necessary orders were issued in G.O. No. ID 25 WBM 92 (P) dated 06.05.1994 (copy enclosed as Annexure-1) giving approval for establishing the above said Corporation under the Indian Companies Act, 1956 with an authorized share capital of Rs. 3,000 crores.

2.02 In the same G.O. dated 06.05.1994, the draft Memorandum and Articles of Association was approved and the first Board of Directors of the Corporation, comprising the following eight directors, was also constituted:-

(a) **Board of Directors:-**

(i) Sri. M. Veerappa Moily, Hon'ble Chief Minister of Karnataka,
(ii) Sri. S.M. Krishna, Hon'ble Deputy Chief Minister and Minister for Major & Medium Irrigation Projects, Karnataka.
(iii) Sri. J.C. Lynn, Chief Secretary, GOK.
(iv) Sri. S.K. Ghoshal, Additional Chief Secretary, GOK.
(v) Sri. B.K. Bhatta Charya, ACS & Principal Secretary, Finance Department, GOK.
(vi) Sri. N.R. Venkatesh Prasad, Secretary to Government, Irrigation Department, GOK.
(vii) Capt. S. Raja Rao, Engineer-in-Chief & Ex-officio Special Secretary, Irrigation Department, Alamatti.
(viii) Sri. S.R. Ujjankop, Administrator, CADA, UKP, Bheemarayanagudi.

(b) Sri. M. Veerappa Moily, Hon'ble Chief Minister and Sri. S.M. Krishna, Hon'ble Deputy Chief Minister were appointed as the Chairman and Vice Chairman of the Board of Directors respectively.

(c) Capt. S.Raja Rao, ECSS, Alamatti was appointed as the Managing Director of the Corporation.

(*)Source of this chapter:-

(1) Note furnished by the AGM (Fin), KBJNL.
(2) Details / documents made available by KBJNL.
2.03 Subsequently, the KBJNL was incorporated under the Companies Act, 1956 and registered with the Registrar of Companies, Karnataka on 19th August 1994 vide Registration No. 03/16101 of 1994. The Company commenced its business on 26th September 1994 vide CO No. 16101 of the Registrar of Companies, Karnataka.

3.0 **Objects of the Company:-**

3.01 Some of the main objects of the Company as incorporated in the Memorandum and Articles of Association are as under:-

(i) To undertake planning, investigation, estimation, execution and O & M of all the irrigation projects coming under UKP upto outlet point keeping in view the award of the Krishna Water Disputes Tribunal and the allocation of water made by GOK. However, the power project at Alamatti Dam site will be executed by the Company in accordance with the requirements of KPCL.

(ii) To implement the externally aided UKP in accordance with the guidelines of the GOI / GOK.

(iii) To undertake the R & R of people affected by the project in accordance with the policies of GOI / GOK.

(iv) To undertake measures for protection and improvement of environment and health including the treatment of catchment areas of the project keeping in view the standards / guidelines prescribed by GOI / GOK, etc.

(v) To promote schemes for flood control in the Krishna River Basin in Karnataka.

3.02 Following are some of the objects incidental and ancillary to the attainment of the main objects:-

(i) Aiding in the establishment of Co-operative Societies and other organizations for the better use of facilities made available by the Corporation.

(ii) The O & M cost of the Corporation will as far as practicable be met from the sale of water by the Corporation to individuals and groups, etc.

(iii) To borrow or raise or secure the payment of money in such manners like issue of debentures or debenture stock, perpetual or otherwise, charged upon all or any of the Company's property including its uncalled capital and to purchase, redeem or pay-off any such securities.

(iv) To enter into any arrangements with any Government or Authorities, Municipal, local or otherwise, or any person or Company in India or abroad, that may seem conducive to the objects of the Company etc.

(v) To sell, improve, manage, develop, exchange, lease, mortgage, dispose of, turn to account or otherwise deal with all or any part of the property and rights of the Company.

(vi) To create any reserve funds, sinking funds, insurance fund, dividend equalization fund or any other special fund, whether for depreciation or repairing, improving, replacing, extending or maintaining any of the property of the Company etc.

(vii) To receive moneys from the State Government and the Central Government or other Authorities for carrying out the functions of the Company.

(viii) Acquiring and holding such movable and immovable property and to lease, sell or otherwise transfer any such property.
(ix) Construction of dams, reservoirs, barrages, power houses, power structures, electrical transmission lines and substations, navigation works, irrigation and drainage canals etc.

4.0 **Transfer of assets and establishment from Irrigation Department to KBJNL:**

4.01 In Government Order No. ID 25 WBM 92 dated 02.03.1995 read with subsequent addendum / corrigendum, all the works of Upper Krishna Project (excluding World Bank aided works) along with the staff of 105 offices which were executing those works, were transferred from Irrigation Department to KBJNL.

4.02 In Government Orders -- (a) No. ID 3 KBN 94 dated 18.08.1995 and (b) No. ID 3 KBN 94 dated 13.03.1997, the assets of Upper Krishna Project valued at Rs.1117.82 crores were transferred from Irrigation Department to KBJNL.

4.03 In Government Order No. ID 247 KBN 97 dated 07.04.1998, consequent on the closure of World Bank Aid for UKP Phase-II in June 1997, all the works of Upper Krishna Project along with staff were transferred from Irrigation Department to KBJNL.

5.0 **Status of the project at the time of taking over by KBJNL in March 1995:**

5.01 The Phase-I project of Stage-I, implemented with World Bank assistance from 1978 to 1986, had been completed by the Irrigation Department. The Phase-II project of Stage-I, which was commenced with World Bank assistance in 1989, was under progress.

5.02 The following statement gives a clear picture of the status of major components of the project at the time of taking over by KBJNL:

(a) In progress / completed:

(i) Narayanapur dam had been completed and was in operation.

(ii) Alamatti dam upto El..500 m had been completed under Phase-I with World Bank assistance and further works from El..500 m to the crest level of 509 m together with the construction of piers for full height, flanks and road bridge, taken up with the World Bank assistance under Phase-II, were in progress.

(iii) NLBC of length 78 KM had been completed with its distributaries.

(iv) Shahapur Branch Canal of 76 KM length along with the first 9 distributaries had been completed under Phase-I. Construction of the remaining distributaries of the canal taken up under Phase-II was in progress.

(v) Construction of Mudbal Branch Canal of 50.8 KM length was in an advanced stage of construction.

(vi) Construction of Indi Branch Canal upto 64 KM was in an advanced stage of construction.

(vii) Initial reaches of Jewargi Branch Canal (upto 18 KM) taken up on Piece Work System were in progress.
Construction of Resettlement Centres for displaced families coming under submersion of Narayanapur reservoir had been completed and the same in respect of Alamatti reservoir were in progress. Rehabilitation of the project affected families in accordance with the policies approved in various Government Orders, the relocation of Bagalkot town and the development of Kudala Sangama Complex, had just taken off.

The Head works of ALBC, ARBC and Mulwad L.I. Scheme in the foreshore of Alamatti reservoir and the Head works of Rampur L.I. Scheme in the foreshore of Narayanapur reservoir, were in progress.

Out of 6.22 lakh ha of CCA contemplated under Stage-I and Stage-II, an irrigation potential of 1.80 lakh ha had been created.

Yet to be taken up:

1. **Stage-I**
   - (i) Indi Branch Canal from KM 64 to KM 172 along with distributaries.
   - (ii) Jewargi Branch Canal from KM 18 to KM 86 along with distributaries.
   - (iii) Alamatti Left Bank Canal – 67 KM length.

2. **Stage-II**
   - (iv) NRBC – 95 KM length.
   - (v) ALBC from KM 68 to KM 91.
   - (vi) ARBC – 67 KM length.
   - (vii) 2\textsuperscript{nd} Jackwell of Mulwad L.I. Scheme along with canal system.
   - (viii) 2\textsuperscript{nd} Jackwell of Rampur L.I. Scheme, lead off canal and the canal system.
   - (ix) Head works and canal system of Indi L.I. Scheme.

3. Land Acquisition, R&R of project affected families and relocation of Bagalkot town.

4. Creation of balance irrigation potential of about 4.42 lakh ha for fully utilising 173 TMC of water under Scheme-A.

5.03 Upto end of March 1995, the total expenditure incurred on the project since inception was about Rs.1342 crores. According to a rough assessment made in 1995, the cost of balance works of UKP was about Rs.6070 crores. However, after working out the project cost and the required cash flows in greater detail, approval of Government was obtained in Government Order No. ID 18 KBN 95 dated 01.07.1995, among other things, to the following:-

(i) To project the total cost of the project as Rs. 5,765 Crores (including escalation and interest capitalization during construction period) which will be financed to the extent of issue of bonds amounting to Rs. 3,050 Crores, budgetary support of Rs. 2,545 Crores and the balance to be met by internal generation of resources.

(ii) To assume realization of water rates as per G.O. No. PWD 89 NPC 85(P-II) dated 31.10.1988 and progressively increase it to the current year i.e., 1994-95. The
water rate thus arrived be adopted for fore-casting the revenues receivable by the Nigam.

(iii) To assume realization of revenues from generation of electricity from Alamatti Power Project i.e., Rs.2/- per unit for the 50% of the power generation being the possible share of the Nigam.

5.04 While determining the project cost of Rs.5765 crores as stated above, the cost of World Bank aided works under execution, CADA works and LI schemes had been excluded.

6.0 Efforts made to find the sources of funding:-

6.01 The Government had incurred an expenditure of Rs.1381.74 crores on UKP before the formation of the Nigam i.e. till May 1995 since inception. Considering the project cost of Rs.5765 crores mentioned in the above said G.O. dated 01.07.1995, the KBJNL had initially proposed to raise Rs.3050 crores through market borrowings.

6.02 The process of raising money for the irrigation sector by corporatising the irrigation projects was a daunting task. There was only one earlier experience of Sardar Sarovar Nigam Limited in Gujarat where such measures were taken and as such this was a new experience for the Government of Karnataka. The decision making had to be fast and required tremendous amount of ground work in the run off to entering the capital market. Effective coordination between the KBJNL and various Government Departments was necessary to work against the strict and rigid deadlines fixed for market borrowings. The rating of the instruments had to be completed and approvals of various regulatory authorities like SEBI had to be speedily obtained.

6.03 In the above direction, a Committee was constituted by KBJNL in September 1994 under the chairmanship of the Additional Chief Secretary, as shown below, to finalise the modalities for raising resources,

(i) Shri.Cicil Naronha,  
Additional Chief Secretary………………………………Chairman
(ii) Shri.B.K.Bhattacharya  
Principal Secretary, Finance Department……………. Member
(iii) Shri.L.V.Nagarajan,  
Secretary (Project Finance)…………………………….Member
(iv) Shri.S.M.Panchagatti  
Secretary, Irrigation Department………………………Member
(v) Capt.S.Raja Rao  
Managing Director, KBJNL…………………………..Member
(vi) Finance Director, KBJNL…………………………Convener

6.04 The Committee held 17 meetings with various Issue intermediaries like the Merchant bankers, the Registrars to the issue, the Rating agencies, Trustees to the Bond holders, Advertising agents, etc.

6.05 The Committee played a productive role in laying down sound guidelines for mobilization of resources from the market. Among other things, the Committee also finalized the structure of the very first private placement of Bonds and the initial public issue. The Committee was also responsible for selecting and appointing the money market intermediaries. Following were some of the important decisions taken by the Committee:-
(i) Appointment of Trustees to the Bond holders.
(ii) Appointment of Registrars to the public Issue of the Nigam.
(iii) Appointment of Lead Managers to the Issue.
(iv) Co-Arrangers to the public Issue.
(v) Issue Advertising Agents for the public Issue and finalizing an advertisement campaign.
(vi) Finalising the prospectus of the private placement and public Issue of Bonds.

6.06 During filing of the prospectus for public Issue with SEBI for the very first public Issue offer, the Committee held several sittings with Merchant bankers, SBI caps and DSP and Bank of Baroda, to finalise the draft documents like the prospectus, the Tripartite agreement with the Trustees, the GOK and the KBJNL. Every document was prepared and finalized by obtaining the opinion / clearance of legal and other experts. These documents have formed a model for other Nigams also viz. KNNL and CNNL.

7.0 **Investors' Confidence Building Measures:-**

7.01 In view of the necessity to raise large resources of funds, the Nigam had to usher in several investors' confidence building measures in the structure of the Bonds. Some of the most important measures taken are as under:-

(a) **Rating of the bonds program:**

The initial rating issued to the Nigam's borrowing program was A (SO) which is an investment grade rating. This is pronounced as A (Structural Obligation). This rating indicates adequate safety. Most often the investor judges a debt instrument by the rating carried by the instrument while the maximum rating carries AAA mark. Any thing above BB is considered as an investment grade rating. In fact, the Nigam's rating has been given on the strength of the State's finances. The Nigam was considered good enough to get an enhancement on its rating A + (SO) which is one notch enhancement above A (SO), in the year 2000, while the rating of other State level undertakings were getting lowered.

(b) **Structured obligation:**

In order to provide adequate comfort to the investors, the Nigam entered into Tripartite agreement with the Government of Karnataka, Trustees to Bond holders and the Nigam, according to which the Nigam has to open an ESCROW account into which all the revenues to be received from sale of water let out for irrigation and generation of electricity would be transferred and held in ESCROW for the purpose of payment of bond holders' obligations. The agreement also provides for a mechanism of monitoring the ESCROW account by the Trustees. Any shortfall in the ESCROW account for the purpose of meeting the payment of interest and principal will have to be made good by the Government of Karnataka. Thus, the Tripartite agreement protects the interest of the Bond holders.

(c) **Securitisation of the borrowings:**

The bonds, interest, Trustees remuneration and all other monies relating there to shall be secured by:

(i) The Mortgage and charge on such of the Company's properties as may be agreed to in concurrence with the Trustees subject to minimum asset cover of 1.25 times in such form and manner as may be agreed to by and between KBJNL and the Trustees.

(ii) First charge on all the monies received / to be received in the Designated Accounts from the Government of Karnataka pursuant to the obligation undertaken by the Government of Karnataka under the Tripartite agreement.
(iii) First charge on all the monies in the Designated Accounts and all monies to be received by the Company from the UKP Phase I and II from sale of water for irrigation.

(iv) Such mortgage and charge will rank pari passu with the mortgagors and charges created / to be created in favour of Trustees for the Bond holders mortgages and charges to be created as security for the future borrowings of the Company for the UKP as may be approved by the Trustees / Lenders.

The Security will be created by the Company as aforesaid in favour of the Trustees with in three months or such extended period as may be permitted by the Company Law Board but not exceeding 12 months from the date of allotment of bonds on such of the assets for which the Company obtained, after all due diligence and efforts, the requisite consent and permissions applicable under the law in accordance with the conditions of holding of such assets to create the above mentioned mortgage. The implementation by the Company of this provision shall be sufficient compliance of Company's obligations to create security. In case the Company is not able to create any security within 12 months as previously mentioned, the Company shall be liable to pay penal interest as described by the Competent Authority, if so decided by it. If the Security is not created even after 18 months, a meeting of the Bond Holders will be called within 21 days to explain the reasons there of and the date by which the security will be created.

(d) **Government Guarantee:**

In addition to the above, the Government of Karnataka has guaranteed the repayment of principal amount and payment of interest thereon on the due date.

(e) **Appointment of Trustees to protect the interest of the investors:**

The Trustees to the Bond Holder(s) and the Company will enter into Trust agreement *inte-alia*, specifying the powers, authorities and obligations of the Trustees and the Company. The Bond Holder(s) shall, without further act or deed, be deemed to have irrevocably given their consent to the Trustees or any of their agents or authorized official to do such act, deeds, matters and things in respect, or relating to the security to be created for the bonds being offered, including the right to substitute or release any property charged in their favour and or to be created a charge on additional properties in their favour including the right of the Trustees to release / or substitute relevant title deed in respect thereof. All the rights and remedies of the bondholders shall vest and shall be exercised by the Trustees without reference to the bondholders.

**8.0 Increase in scope and cost of the project:**

8.01 While transferring the works of UKP from Irrigation Department to KBJNL in G.O. No. ID 25 WBM 92 dated 02.03.1995, all the works under execution with World Bank Assistance had been excluded.

8.02 As seen from the preamble to G.O. No. ID 18 KBN 95 dated 01.07.1995, while determining the scope and cost of the project, the cost of CADA works like FICs, Ayacut roads & drainage arrangements and LI schemes were also excluded from the project cost.

8.03 Consequent to closure of World Bank Assistance for the phase-II project in June 1997 and issue of G.O. No. ID 247 KBN 97 dated 07.04.1998 transferring all the works of UKP from Irrigation Department to KBJNL, it became necessary to revise the estimated cost of the project to be executed by the Nigam. Accordingly, the KBJNL Board agreed in its 26th meeting held on 25.07.1998 to enhance the project cost to
Rs. 8,271.55 crores. Correspondingly, the means of financing the project was revised as follows:

**Means of financing:-**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Source</th>
<th>Amount (Rs. crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Market borrowings</td>
<td>6,710.42</td>
</tr>
<tr>
<td>2.</td>
<td>Equity from Government of Karnataka including AIBP, Assets transfer &amp; budgetary support.</td>
<td>1,336.48</td>
</tr>
<tr>
<td>3.</td>
<td>Internal accruals</td>
<td>224.65</td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong></td>
<td><strong>8,271.55</strong></td>
</tr>
</tbody>
</table>

9.0 **Important amendments to the Memorandum of Association, relating to Main objects and authorized share capital:**

9.01 In the 6th and 7th annual general meetings of the Company held on 29.12.2000 and 29.9.2001 respectively, certain amendments to the Memorandum of the Association were approved, some of which are as stated below:

(i) Bring in the works of UKP, CADA like FICs, Ayacut roads and other engineering works under the purview of KBJNL (AGM dated 29.12.2000).

(ii) Bringing in the construction of barrages and such other related works across river Bhima under the purview of KBJNL (AGM dated 29.09.2001).

(iii) To increase the authorized share capital of the Company to Rs.5000 crores (AGM dated 29.09.2001).

9.02 Again, in the 9th AGM held on 29.09.2003, the authorized share capital was further enhanced to Rs.7000 crores.

10.0 **Mobilisation of resources for the project:**

10.01 By issue of Bonds and Term Loans from banks & financial institutions:

(i) The Nigam has an excellent track record of having raised funds through the issue of Bonds and loans from banks & financial institutions for implementation of Upper Krishna Project. The amount so raised since 1995 is shown in detail in the statement enclosed as Annexure-2. Yearwise funds raised are shown as under:

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount in Rs. crores</th>
<th>Rate of interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995-96</td>
<td>180.00</td>
<td>17.50%</td>
</tr>
<tr>
<td>1996-97</td>
<td>567.30</td>
<td>17.50% to 21.00%</td>
</tr>
<tr>
<td>1997-98</td>
<td>1009.58</td>
<td>15.75% to 16.50%</td>
</tr>
<tr>
<td>1998-99</td>
<td>646.61</td>
<td>14.25% to 14.75%</td>
</tr>
<tr>
<td>1999-2000</td>
<td>531.71</td>
<td>12.00% to 13.40%</td>
</tr>
<tr>
<td>2000-2001</td>
<td>1301.68</td>
<td>11.85% to 13.15%</td>
</tr>
<tr>
<td>2001-2002</td>
<td>838.73</td>
<td>8.50% to 12.60%</td>
</tr>
<tr>
<td>2002-2003</td>
<td>1209.01</td>
<td>8.50% to 12.00%</td>
</tr>
<tr>
<td>2003-2004</td>
<td>430.50</td>
<td>8.20% to 9.00%</td>
</tr>
</tbody>
</table>

**Total:** 6719.12

(ii) In the initial years, the interest on the funds raised was very high in tune with the market rates prevailing during those days. However, due to pro-active role of
the Central Government in ushering in the low interest regime, the Nigam has been able to capitalize on the falling interest scenario keeping in tune with the market conditions. Further, the Nigam has been able to replace some of its high cost borrowings by re-structuring the existing debts.

(iii) As per the terms of Bonds issue, the Nigam and the Bondholders can exercise early Call and Put option of Bonds at the end of 5 years from the date of allotment of Bonds. The Nigam took advantage of the falling interest rates and restructured the debts on the call option dates by exercising the call option during the tendency of these Bonds. The details of savings in interest on account of restructuring the debts, amounting to Rs.76.75 crores, is as follows:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Date of allotment</th>
<th>Period</th>
<th>Rate of interest</th>
<th>Bond amount (Rs.crores)</th>
<th>Date of redemption</th>
<th>Savings in interest (Rs.crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Series-I</td>
<td>15.10.1995</td>
<td>7 years</td>
<td>17.50%</td>
<td>180.00</td>
<td>15.10.2000</td>
<td>15.75</td>
</tr>
<tr>
<td>2.</td>
<td>Series-VIA</td>
<td>31.03.1998</td>
<td>7 years</td>
<td>15.75%</td>
<td>108.74</td>
<td>31.03.2003</td>
<td>34.00</td>
</tr>
<tr>
<td></td>
<td>Series-VIB</td>
<td>31.03.1998</td>
<td>7 years</td>
<td>15.75%</td>
<td>298.86</td>
<td>31.03.2003</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Series-VIIA</td>
<td>31.07.1998</td>
<td>7 years</td>
<td>14.25%</td>
<td>320.20</td>
<td>31.03.2003</td>
<td>27.00</td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>76.75</strong></td>
</tr>
</tbody>
</table>

(iv) The Nigam has programmed to exercise the call options in all cases wherever the issue terms provide for making early exit so that substantial interest savings could be effected.

10.02 Central loan assistance under the Accelerated Irrigation Benefit Programme (AIBP.):-

(i) In addition to the issue of Bonds, the components of Stage-I Phase-III and Stage-II of UKP are eligible for Central loan assistance as per a new scheme announced by the Central Government during 1996-97. The yearwise amounts so received under AIBP for UKP works are shown below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount in Rs.crores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996-97</td>
<td>57.00</td>
</tr>
<tr>
<td>1997-98</td>
<td>50.00</td>
</tr>
<tr>
<td>1998-99</td>
<td>50.00</td>
</tr>
<tr>
<td>1999-2000</td>
<td>100.00</td>
</tr>
<tr>
<td>2000-2001</td>
<td>100.00</td>
</tr>
<tr>
<td>2001-2002</td>
<td>450.00</td>
</tr>
<tr>
<td>2002-2003</td>
<td>456.05</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>1263.05</strong></td>
</tr>
</tbody>
</table>

(ii) There has been some delay in the Nigam receiving the money from the State Government resulting in the Nigam relying heavily on external borrowing.

11.0 Project progress after the advent of KBJNL:-

11.01 After the formation of the Nigam, the progress of UKP has picked up tremendously. A total expenditure of Rs.9194.11 crores has been incurred by the KBJNL from 1995-96 to 2002-2003. The statement showing the zonewise expenditures is enclosed as Annexure-3. However, the total expenditure incurred on the project since
inception up to end of October 2003 is Rs.11,780.32 crores (including repayment of interest on borrowed funds amounting to Rs.2,680.25 crores and repayment of principal amount of Rs.1,703 crores) as against Rs.1342 crores spent from 1963 up to end of March 1995. This means, after the advent of KBJNL an amount of Rs.10,438.32 crores has been spent in a period of about 8 ½ years. The total irrigation potential created up to end of October 2003 is 4.39 lakh ha which means about 2.59 lakh ha have been created in a period of about 8 ½ years after the advent of the Nigam.

12.0 **Formation of Technical Sub-Committee and Finance & Audit Sub-Committee:-**

12.01 In the meanwhile, as per the resolutions passed in the 5th Board meeting of KBJNL held on 24/25.08.1995, a Finance & Audit Sub-Committee was constituted in KBJNL and eventually the Committee that had earlier been constituted under the Chairmanship of Additional Chief Secretary for finalising the modalities for issue of bonds was discontinued. The Finance and Audit Sub-Committee was headed by Shri.B.K.Battacharya, Additional Chief Secretary and Principal Secretary, Finance Department. This Committee is the policy making body on all resource mobilization matters.

12.02 In accordance with the decisions taken in the 6th Board meeting of KBJNL held on 23.09.1995, a Technical Sub-Committee under the chairmanship of Shri.K.C.Reddy, Chairman, TAC, Irrigation Projects, was constituted to discuss and take decisions on all matters relating to technical aspects like estimates, tenders, claims, technical problems etc. Subsequently, three experts were added to the Committee as permanent invitees, which was ratified by the Board in its 7th meeting held on 18.11.1995.

13.0 **Present composition of the Board of Directors and the Standing Committees (Technical Sub-Committee, and Finance and Audit Committees):-**

13.01 **Board of Directors:-**

(1) Shri. S.M.Krishna, Hon'ble Chief Minister ........................................ Chairman
(2) Shri. H.K.Patil, Hon'ble Minister for Water Resources............................ Vice-Chairman
(3) Shri. B.S.Patil, IAS, Chief Secretary to Government................................. Director
(4) Shri K.Jairaj, IAS, Principal Secretary to Chief Minister......................... Director
(5) Shri B.K.Das, IAS, Principal Secretary, Finance Department.................. Director
(6) Dr.S.Subramanya, IAS, Managing Director, KNNL................................. Director
(7) Shri. S.J.Channabasappa, Secretary, Water Resources Dept................... Director
(8) Shri B.C.Angadi, Retd. Spl.Secretary, PWD(Irrigation)........................... Director
(9) Shri. K.C.Reddy, Chairman TAC, Irrigation Projects............................... Director
(10) Shri. G.S.Paramashivaiah, Chairman, Nethravathy River Water Committee.. Director
(11) Shri. R.S.Pashupathi, Finance Director, KBJNL.................................... Director(Finance)
(12) Shri R.B.Agawane, IAS, ....................................................................... Managing Director

The Board has so far held 52 meetings. 9 Annual General meetings of KBJNL have also been held.
13.02 Technical Sub-Committee of the Board:

(1) Shri. K.C. Reddy, Director, KBJNL……………………………. Chairman
(2) Shri. K. Jairaj, Director, KBJNL……………………………… Member
(3) Shri. S. J. Channabasappa, Director, KBJNL………... Member
(4) Shri. R. S. Pashupathi, Director (Finance)………………... Member
(5) Shri. B. M. Ramegowda, Jt. Director (Retd) CWPRS, Pune…… Member
(6) Shri. R. B. Agawane, Managing Director, KBJNL…………… Member-Secretary

Permanent Invitees:

(7) Dr. A. Sridharan, Former Adviser, Indian Institute of Science, Bangalore
(8) Shri. H. S. Bhat, Retired Chief Engineer
(9) Shri. H. S. Chiniwal, Retired Engineer-in-Chief.

The Technical Sub-Committee has so far held 95 meetings.

13.03 Finance and Audit Sub-Committee:

The Finance and Audit Sub-Committee which was headed by the ACS, Finance Department, after holding 41 meetings, was bifurcated into two separate Committees viz., the Audit Committee and Finance Committee. The present composition of these two Committees is shown below.

13.04 Audit Committee of the Board:

(1) Sri. B. S. Patil, Chief Secretary, Director, KBJNL…………………… Chairman
(2) Sri. K. Jairaj, Principal Secretary to CM, Director, KBJNL………… Member
(3) Sri. S. J. Channabasappa, Secretary, WRD, Director, KBJNL….. Member
(4) Sri. R. B. Agawane, Managing Director, KBJNL………………… Member
(5) Sri. R. S. Pashupathi, Director (Finance), KBJNL………………… Member-Secretary

The Audit Committee has so far held 7 meetings.

13.05 Finance Committee of the Board:

(1) Sri. B. K. Das, Principal Secretary, Fin. Dept, Director, KBJNL……. Chairman
(2) Sri. K. Jairaj, Principal Secretary to CM, Director, KBJNL………… Member
(3) Sri. S. J. Channabasappa, Secretary, WRD, Director, KBJNL……. Member
(4) Sri. R. B. Agawane, Managing Director, KBJNL………………… Member
(5) Sri. R. S. Pashupathi, Director (Finance), KBJNL………………… Member-Secretary

The Finance Committee has so far held 16 meetings.

14.0 Incumbency of the Managing Directors since inception:

<table>
<thead>
<tr>
<th>Name of the Managing Director</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capt. S. Raja Rao, Engineer-in-Chief..</td>
<td>03.09.1994 to 08.11.1995</td>
</tr>
<tr>
<td>Shri. J. M. Rathna Naik, Engineer-in-Chief</td>
<td>08.11.1995 to 08.05.1997</td>
</tr>
<tr>
<td>Shri. M. B. Prakash, IAS..</td>
<td>08.05.1997 to 24.02.1999</td>
</tr>
<tr>
<td>Shri. K. N. Srivasthava, IAS.</td>
<td>01.03.1999 to 18.12.2000</td>
</tr>
<tr>
<td>Shri. B. Parthasarathy, IAS.</td>
<td>25.01.2001 to 30.03.2002</td>
</tr>
<tr>
<td>Shri. R. B. Agawane, IAS..</td>
<td>11.04.2002 to till date.</td>
</tr>
</tbody>
</table>
15.0 Organisational Set-up:

15.01 The Registered office of KBJNL is at Bangalore and the Corporate office is at Alamatti. There are five major zones working in KBJNL under Managing Director. These zones have undergone some changes from time to time and the organizational structure of these zones as at present, is as under:

1. **Dam Zone, Alamatti:**
   - This zone is headed by a Chief Engineer and has one Circle, 6 Divisions and 21 Sub-Divisions attached to it. One Deputy Conservator of Forests along with 3 Asst. Conservators of Forests and one Senior Health Officer together with 4 Health Officers & 6 Medical Officers are also working under this Zone.

2. **Canal Zone No.1, Bheemarayanagudi:**
   - The zone is headed by a Chief Engineer with 2 Circles, 13 Divisions and 52 Sub-Divisions attached to it.

3. **Canal Zone No.2, Kembhavi:**
   - The zone is headed by a Chief Engineer with 2 Circles, 8 Divisions and 29 Sub-Divisions attached to it.

4. **O&M Zone, Narayanapur:**
   - The zone is headed by a Chief Engineer with one Circle, 3 Divisions and 9 Sub-Divisions attached to it.

5. **Quality Control & Inspection Wing, Bheemarayanagudi:**
   - The Wing is headed by a Superintending Engineer with 6 Executive Engineers (including 3 Divisions) and 10 Sub-Divisions attached to it. This Wing is directly reporting to the Managing Director.

15.02 Apart from the above Engineering Zones / Wing, there is a separate Land Acquisition and R&R Wing headed by a Commissioner with headquarters at Bagalkot.

15.03 There is a statutory Body called "Bagalkot Town Development Authority" with headquarters at Bagalkot. There is also a Board called "Kudala Sangama Development Board" with headquarters at Kudala Sangama.

==="
1.0 **Origin**:

Before the re-organisation of States in 1956, the erstwhile Bombay State had contemplated a L.I. scheme from Krishna river for irrigating parts of Bijapur district. A scheme in this direction had also been prepared in 1950 and it was called the Bijapur Lift Irrigation Scheme (subsequently called as the Mulwad Lift Irrigation Scheme). Later on, after the re-organisation of States, the scope of Upper Krishna Project (UKP), which had earlier been investigated by the erstwhile Hyderabad State, was re-examined by the Mysore Government and the project took a shape in 1963. As per the project report of 1963 for UKP Phase-I, the project had been contemplated for execution in three stages for an ultimate utilisation of 340 TMC of water. The Phase-I project envisaged a utilisation of 103 TMC of water for irrigating 6 lakh acres at an estimated cost of Rs.58.20 crores. No clear picture is available from this report to ascertain as to whether any L.I. schemes had been contemplated under UKP. It is only in the project report of 1970 for UKP Stage-I, a clear picture about the L.I. schemes is available. As per this project report, following L.I. schemes had been envisaged under UKP:-

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Scheme</th>
<th>Irrigable area in lakh acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>NLBC lift (Indi lift)</td>
<td>1.00</td>
</tr>
<tr>
<td>2.</td>
<td>ALBC (flow cum lift)</td>
<td>0.50</td>
</tr>
<tr>
<td>3.</td>
<td>ARBC (flow cum lift)</td>
<td>0.70</td>
</tr>
<tr>
<td>4.</td>
<td>Alamatti reservoir lift</td>
<td>1.70</td>
</tr>
<tr>
<td>5.</td>
<td>Narayanapur reservoir lift</td>
<td>0.70</td>
</tr>
</tbody>
</table>

1.2 These L.I. schemes continued to find provision in all the subsequent project reports for UKP though the Alamatti reservoir lift came to called as Mulwad L.I. Scheme and the Narayanapur reservoir lift came to be called as the Rampur L.I. scheme. Though these L.I. schemes were included in the 2nd Stage of UKP (except ALBC which was included in the 1st Stage), the Head works of the L.I. schemes and a portion of ALBC were included in the 1st Stage of UKP for the reason their Head works could not be constructed in the 2nd Stage as water would have been impounded in the reservoirs in the 1st Stage. Two more L.I. schemes from Alamatti reservoir viz. Herkal Lift (right side) and Herkal Lift (left side) had been provided for in the 1987 project report of UKP 1st Stage (cleared by Planning Commission in 1990) but they were subsequently deleted. However, a scheme called as Herkal Lift Irrigation Scheme is again under consideration for being taken up as a part of UKP and it is still in the planning stage.

1.03 In the latest project report of 2000 for UKP 2nd Stage (cleared by Planning Commission in December 2000), provision has been made for -- (a) Indi lift canal; (b) Extension of ALBC (ALBC is included in the 1st Stage); (c) ARBC; (d) Mulwad lift canals; and (e) Rampur lift canals.

2.0 **Concept of UKP and Alamatti dam**:

2.01 The 1st Stage of UKP provided for, apart from completion of Narayanapur dam, construction of Alamatti dam to enable storage upto FRL 512.2 m, the crest level being 509 m. The 2nd Stage provides for raising the storage of Alamatti dam upto FRL 519.60 m.

(*) Source of this chapter:  
(1) Note dt.19.06.2003 of the Chairman, Pumps Committee.  
(2) Notes furnished by CEs of KBJNL.
2.02 The contemplated CCA in the 1\textsuperscript{st} Stage is 4.25 lakh ha (119 TMC utilisation) and that in the 2\textsuperscript{nd} Stage is 1.97 lakh ha (54 TMC utilisation). Thus the total CCA under both the Stages of UKP to utilise 173 TMC of water under Scheme ‘A’ will be 6.22 lakh ha. The districts benefitted by the project are Bijapur, Gulbarga and Raichur.

2.03 Though the crest gates of Alamatti dam are now erected upto RL 519.60 m, the dam as such has been designed and constructed to accommodate storage upto RL 524.256 m keeping in view the availability of Krishna waters to the project under Scheme ‘B’.

3.0 **Need to extend irrigation facility to Bijapur district**:

Normally, canal systems emanate from the dam to provide irrigation facilities to the lands downstream of the dam on either side of the river course, as is actually the case in respect of Narayanapur dam. However, the terrain adjacent to the Alamatti dam does not permit development of irrigation in this manner. The Alamatti reservoir submerges an area of nearly 49,000 ha in the 2\textsuperscript{nd} Stage, a major portion of this area being situated in Bijapur district. Thousands of farmers in Bijapur district were thus deprived of their lands by this reservoir. Moreover, Bijapur district is known to always suffer badly due to constant scarcity conditions. With a view to render justice and minimise the regional imbalance, the Government decided to bring more areas in the district of Bijapur under irrigation by lifting water from the Alamatti reservoir. It is a well-known fact that not only considerable investment is required to establish these Lift Irrigation Schemes (L.I.S) but also substantial recurring expenditure towards the electricity consumed to run these pumpsets. Still, this expenditure is considered as fully justified to compensate the loss of land and homes by the people of Bijapur district.

4.0 **Location of Lift Irrigation Schemes**:

Initially, three sites were identified for the implementation of the Lift Irrigation Schemes to lift the water from the Alamatti reservoir. Two are located, one on either side of the dam and these are called Alamatti Left Bank Canal (ALBC) scheme and Alamatti Right Bank Canal (ARBC) scheme. The third scheme is located near Baluthi, a village which is situated 23 KM upstream of the reservoir. This scheme is called Baluthi L.I.S (B.L.I.S), but is also called as Mulwad scheme as the last and final lift under this scheme is proposed to be located near a village called Mulwad. At about the same time, another L.I. scheme was also approved to be taken up on the right bank of Narayanapur reservoir near a village called Navali (called as Rampur L.I. Scheme) for the benefit of the farmers in Hungund and Lingasugar taluks whose lands could not be fed from the main canals, emanating from Narayanapur dam. It was also proposed to have a lift irrigation scheme (called as Indi L.I. scheme) near Kembhavi, by lifting water from 74\textsuperscript{th} KM of NLBC to irrigate lands in Indi taluk.

5.0 **Estimates**:

5.01 Provision made for the L.I. schemes in the estimates of 1\textsuperscript{st} and 2\textsuperscript{nd} Stages of UKP, is as shown in the following Table:
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Lift Irrigation Scheme</th>
<th>Provision in the 1987 project report for 1st Stage of UKP. (Rs. in crores)</th>
<th>Provision in the 2000 project report for 2nd Stage of UKP. (Rs. in crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ALBC (flow cum lift)</td>
<td>39.43</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>ALBC extension</td>
<td>-</td>
<td>35.23</td>
</tr>
<tr>
<td>3.</td>
<td>Cost of common Head works (ALBC &amp; Chimmalgi) attributable to Chimmalgi.</td>
<td>4.70</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>ARBC</td>
<td>0.91 (for Head works)</td>
<td>148.31</td>
</tr>
<tr>
<td>5.</td>
<td>Mulwad L.I. scheme</td>
<td>24.74 (for Baluthi Head work)</td>
<td>358.83</td>
</tr>
<tr>
<td>6.</td>
<td>Rampur Lift</td>
<td>1.14 (for Head works)</td>
<td>127.73</td>
</tr>
<tr>
<td>7.</td>
<td>Indi Lift</td>
<td>-</td>
<td>345.44</td>
</tr>
</tbody>
</table>

5.02 As per the pre-feasibility report prepared by the consultants M/s. CES, New Delhi, at the instance of World Bank, the layout plan of the Lift Irrigation schemes of UKP, in a nutshell, was as under:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Scheme</th>
<th>Under Scheme 'A' (173 TMC)</th>
<th></th>
<th>Under Scheme 'B' (302 TMC including Scheme 'A')</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. &amp; Name of Head work</td>
<td>Irrigable area</td>
<td>Utilisation</td>
<td>No. &amp; Name of Head work</td>
<td>Irrigable area</td>
</tr>
<tr>
<td>1.</td>
<td>Mulwad L.I.S</td>
<td>1st HW near Baluthi. 2nd HW near Hanumapur</td>
<td>-</td>
<td>-</td>
<td>3rd HW near Kudligi Rly. Station. 4th HW near Mulwad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30850 ha</td>
<td>8.25 TMC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>ALBC</td>
<td>1st HW near Alamatti</td>
<td>16200 ha + 4035 ha (Extn.) 20235 ha</td>
<td>4.80 TMC 0.85 TMC 5.65TMC</td>
<td>1st HW near Alamatti. 2nd HW for Chimmalagi Lift</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8.52 TMC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>ARBC</td>
<td>1st HW in Alamatti foreshore (just u/s of Alamatti dam in Right Bank)</td>
<td>16100 ha</td>
<td>4.52 TMC</td>
<td>2nd HW near Thimmapur</td>
</tr>
<tr>
<td>4.</td>
<td>Rampur (Navali) L.I.S</td>
<td>1st HW in Narayanapar foreshore Right Bank 2nd HW near Ane Hosur.</td>
<td>4500 ha</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>15700 ha 20200 ha</td>
<td></td>
<td>5.65 TMC</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Indi L.I.S</td>
<td>1st HW in 74th KM of NLBC</td>
<td>41900 ha</td>
<td>11.40 TMC</td>
<td>-</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td>129285 ha</td>
<td>35.47 TMC</td>
<td></td>
<td>436675 ha</td>
</tr>
</tbody>
</table>

(Ref: History report of Mulwad Lift Irrigation Scheme prepared by KBJNL)
5.03 The project reports prepared for these L.I. schemes were revised in the year 2000, the details of which are given in the following Table.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name</th>
<th>Estimated cost (revised) (Rs. in crores)</th>
<th>Date of approval</th>
<th>Irrigation potential (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Under Scheme 'A' (173 TMC)</td>
</tr>
<tr>
<td>1.</td>
<td>Mulwad L.I.S</td>
<td>270.13</td>
<td>13.12.2000</td>
<td>30,850</td>
</tr>
<tr>
<td>3.</td>
<td>ARBC L.I.S</td>
<td>89.17</td>
<td>13.12.2000</td>
<td>16,100</td>
</tr>
<tr>
<td>5.</td>
<td>Indi L.I.S</td>
<td>160.00</td>
<td>13.12.2000</td>
<td>41,900</td>
</tr>
</tbody>
</table>

(Ref: Report dated 19.06.2003 of the Chairman, Pumps Committee)

(*) Consequent on limiting the length of ARBC to Malaprabha river, the CCA has come down to 9,900 ha.

6.0 **Formation of Pumps Committee and appointment of consultants:**

6.01 Soon after taking up the civil works of the L.I. Schemes for execution, it was felt, considering the magnitude of the schemes, size of the intake structures and capacity of the pumps & Motors, that their design, construction and commissioning involved multi-disciplinary exercises such as – (a) optimal selection of the pumps to obtain maximum efficiency over the range of operations; (b) selection of supply voltage from KPTCL; (c) Design of sub-station & Switchgear, etc., taking into account the reliability and economy. To oversee all such exercises and advise the project authorities suitably, an Expert Committee (generally called as the Pumps Committee) was constituted in August 1999 by the Managing Director, KBJNL, comprising the following:-

(i) Shri B.G.Rudrappa,......................... Chairman
Former Chairman, KEB, Bangalore.

(ii) Shri S.M.Zafulla......................... Member
Chief Engineer, KPCL, Bangalore.

(iii) Shri.K.K.Shivalingaiah.................. Member
Dy.General Manager, NGEF, Bangalore.

(iv) The Chief Engineer,..................... Member-Convener
KBJNL, UKP Dam Zone, Alamatti.

6.02 The Pumps Committee was reconstituted as and when required and its constitution as it stood in April 2003 was as follows:-

(i) Shri B.G.Rudrappa,......................... Chairman
Former Chairman, KEB, Bangalore.

(ii) Shri S.M.Zafulla......................... Member
Chief Engineer, KPCL, Bangalore.

(iii) Shri.M.C. Rangarajan,.................... Member
Executive Director, KPCL, Bangalore.

(iv) Shri. Pashupathi R.S..................... Member
Director-Finance, KBJNL, Bangalore.

(v) The Chief Engineer,..................... Member-Convener
KBJNL, UKP Dam Zone, Alamatti.
6.03 Considering the experience and expertise the KPCL had in establishing similar pump houses for lifting water from the river Krishna for supplying to the Raichur Thermal Power Station for cooling and other purposes, KPCL was appointed in March 2000 as consultants to render advice in electrical, mechanical and hydraulic matters, by the Managing Director, KBJNL. Its task was, *inter alia*, preparation of specifications, analysis of tenders received, inspection & testing of machinery / equipments, etc.

6.04 Simultaneously, after some time, M/s. TORSTEEL Research Foundation India (TRF), who had the expertise in investigations / planning / design of structures, were also appointed as consultants by the Managing Director, KBJNL.

7.0 **Addressing of problems by the Pumps Committee**

7.01 The Pumps Committee, soon after its constitution, addressed itself to the design aspects of the various L.I. schemes, where civil works had already commenced and the dimensions of the buildings were virtually frozen. It was observed at the outset itself, that the schemes that were being constructed on the banks of the reservoirs had some unique problems needing special attention. It is well known that the vertical turbine pumps that were suitable for this application, have the characteristics of working efficiently only within a limited range of head variation and discharge. But in the case of L.I. schemes coming up on the banks of the Alamatti and Narayanapur reservoirs, the head against which water had to be pumped varied to a large extent which depended in turn on the reservoir levels. The water level in the Alamatti reservoir varied from RL 519.60 m just after the cessation of the monsoon, to RL 503 m by March after the water stored during monsoon was released for irrigation purposes to the Narayanapur reservoir and also used for lift irrigation under ALBC, ARBC and Baluthi (Mulwad) Lift Irrigation schemes. The variation in water level in the Narayanapur reservoir was found to be to a lesser extent, from RL 492.25 m to RL 480.00 m. In both the cases, the range of variation could have affected the efficiency of the turbine pumps significantly when operated in the usual manner.

7.02 Another issue to be addressed by the Committee was that the fortnightly discharges also varied by a wide margin which would affect the efficiency of turbine pumps adversely, particularly when the actual discharge was very much lower than the rated capacity. These two factors had to be taken into account while selecting the capacity, number and speed of the pumpsets. Otherwise, operation of the pumpsets under such conditions would have resulted in higher energy consumption and consequently, a heavier electricity bill.

7.03 Therefore, different alternatives were examined by the Pumps Committee in great detail before selecting the size and number of pumpsets for each lift irrigation scheme. One of the factors that needed to be taken into account was that, by the time the dimensions of the pump houses were virtually frozen, the foundation work of the four pump houses had already been completed and the columns raised. Special studies were also needed for the selection of the supply voltage from KPTCL and also the capacity of transformers and associated switchgear in the respective Sub-stations to be set up for supplying power to the pumpsets to ensure reliability, and at the same time keeping the costs to the minimum. Details of the special features incorporated by the Committee, in different L.I. schemes are indicated in the respective paragraphs relating to these schemes. In cases where the civil works had not yet commenced, a review of the civil works was also made with a view to bring down the overall cost of the project. By choosing larger capacity pumps and motors, the size of the buildings could be reduced and this resulted in considerable reduction of cost on civil works and
electromechanical equipment. The Committee also interacted with KPTCL to expedite supply of power to the various projects.

7.04 Another important decision taken by the Committee was to incorporate stringent pre-qualifications in respect of experience and the financial strength for the prospective bidders to eliminate unreliable offers. Heavy penalties were incorporated in the specifications in the case of shortfall in the guaranteed performance in the commissioning of the pumpsets. These measures were taken for ensuring timely implementation of the projects by the contractors.

7.05 Broad features of the L.I. Schemes are highlighted in the following paragraphs.

8.0 Mulwad Lift Irrigation Scheme (Baluthi L.I. Scheme):

8.01 Water utilisation and Irrigable area:-

It is proposed to irrigate 30,850 ha by the Mulwad L.I. scheme (M.L.I.S) by utilising 8.50 TMC of water under Scheme ‘A’ of the Tribunal Award i.e., under the UKP Programme of 173 TMC utilisation. A further area of 1,80,750 ha is contemplated to be brought under irrigation by this L.I. scheme by utilising 56.50 TMC of water under Scheme ‘B’ when surplus waters are allocated (129 TMC of water are expected to be available to UKP under Scheme ‘B’). Details of tentative command area and water utilisation envisaged under M.L.I.S are as shown below:-

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Taluk</th>
<th>Command area under Scheme ‘A’ (in ha.)</th>
<th>Command area under Scheme ‘B’ (in ha.)</th>
<th>Total command area (in ha.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Bijapur District:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) B.Bagewadi</td>
<td>16,659</td>
<td>24,246</td>
<td>40,905</td>
<td></td>
</tr>
<tr>
<td>(ii) Muddebihal</td>
<td>-</td>
<td>35,000</td>
<td>35,000</td>
<td></td>
</tr>
<tr>
<td>(iii) Bijapur</td>
<td>8,330</td>
<td>32,001</td>
<td>40,331</td>
<td></td>
</tr>
<tr>
<td>(iv) Sindagi</td>
<td>-</td>
<td>35,000</td>
<td>35,000</td>
<td></td>
</tr>
<tr>
<td>(v) Indi</td>
<td>-</td>
<td>49,503</td>
<td>49,503</td>
<td></td>
</tr>
<tr>
<td>2. Bagalkot District:</td>
<td></td>
<td>5,861</td>
<td>5,000</td>
<td>10,861</td>
</tr>
<tr>
<td>(i) Jamakhandi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td>30,850 ha</td>
<td>1,80,750 ha</td>
<td>2,11,600 ha</td>
</tr>
<tr>
<td>3. Contemplated utilisation of water under M.L.I.S</td>
<td></td>
<td>8.50 TMC</td>
<td>56.50 TMC</td>
<td>65.00 TMC</td>
</tr>
</tbody>
</table>

8.02 Number of Lifts:-

M.L.I.S consists of 4 lifts as shown below:-

<table>
<thead>
<tr>
<th>Lift</th>
<th>Location of Head work</th>
<th>Head</th>
<th>Lift</th>
<th>Location of Head work</th>
<th>Head</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Baluthi</td>
<td>30 m (RL 500 m to 530 m)</td>
<td>3rd</td>
<td>Kudagi Railway Station</td>
<td>30 m (RL 560 m to 590 m)</td>
</tr>
<tr>
<td>2nd</td>
<td>Hanumapur</td>
<td>40 m (RL 520 m to 560 m)</td>
<td>4th</td>
<td>Mulwad</td>
<td>20 m (RL 590 m to 610 m)</td>
</tr>
</tbody>
</table>

F.N.: Total head will be 110 m (from RL 500 m to 610 m).
8.03 Canal System:-

For the 1st lift from the reservoir, the Head work (or the jackwell) is situated near Baluthi and water is lifted and dropped into a delivery tank. From this delivery tank, a feeder canal of 5.52 KM length is run upto the 2nd jackwell near Hanumapur. There will be no direct irrigation under this Feeder Canal. From the Hanumapur jackwell, water is again lifted to another delivery tank from which two irrigation canals take off, one to the east, another to the west. The east branch runs for a length of 17.40 KM irrigating about 5,000 ha and the west branch runs for a length of about 83 KM irrigating about 25,850 ha. Thus the total CCA under the 2 lifts of M.L.I.S (under Scheme ‘A’) will be 30,850 ha.

8.04 Cropping pattern:-

The irrigation intensity proposed under M.L.I.S is 115%, the break up being as under:-

Khariff………………… 65%
Rabi………………… 35%
Bi-seasonal……….. 15%

The proposed cropping pattern is as shown below:-

<table>
<thead>
<tr>
<th>Kharif</th>
<th>Intensity %</th>
<th>Crop</th>
<th>Intensity %</th>
<th>Crop</th>
<th>Intensity %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid Maize</td>
<td>15</td>
<td>Local Jawar</td>
<td>10</td>
<td>Cotton</td>
<td>5</td>
</tr>
<tr>
<td>Hybrid Jawar</td>
<td>15</td>
<td>Saf flower</td>
<td>5</td>
<td>Vegetable / Red gram</td>
<td>5</td>
</tr>
<tr>
<td>Groundnut</td>
<td>25</td>
<td>Gram</td>
<td>5</td>
<td>Chillies</td>
<td>5</td>
</tr>
<tr>
<td>Sun flower</td>
<td>5</td>
<td>Wheat</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulses</td>
<td>5</td>
<td>Groundnut</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sun flower</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>65</td>
<td>35</td>
<td>15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8.05 Agitation for taking up the work:-

(1) There was a big agitation by the people of Bijapur district in 1992 for taking up the work of this L.I. scheme. The Engineer-in-Chief cum Project Coordinator of UKP visited the site on 09.01.1992. The Irrigation Secretary also visited the site on 02.02.1992. Taking note of the seriousness of agitation and the urgent need to take up the work for construction, the Government decided to start the work and communicated its decision to the project authorities in Government letter No. ID 67 WUD 89(P) dated 24.2.1992. Following were the directions of Government in this regard:-

(i) The intake channel for M.L.I.S shall be planned and executed under the 302 TMC utilisation programme of UKP.

(ii) The excavation for jackwell should also be planned and executed under the 302 TMC utilisation programme of UKP. However, the jackwell proper shall be constructed under the 173 TMC utilisation programme of UKP. The remaining excavated area shall be suitably lined either with masonry or CC upto ground level.

(2) In this direction, an announcement was also made by the Hon’ble Chief Minister that an amount of Rs.3 crores would be spent on M.L.I.S.
8.06 1st Jackwell near Baluthi:-

(a) **Size of the Jackwell:**

The Chief Engineer (Designs), UKP, Bheemarayanagudi, communicated approval to the sections of intake channel and jackwell in his letter dated 19.05.1993. However, after verifying the arrangements of pumps furnished by M/s. Jyothi Limited and M/s. Worthinton Pump Limited, the size of the jackwell was revised from 90 m x 20 m to 112 m x 20 m in letter dated 23.11.1993 of the Chief Engineer (Designs). Subsequently, the section of the approach embankment was also revised and approved by the Chief Engineer (Designs) in his letter dated 24.02.1994.

(b) **Estimates:**

An estimate amounting to Rs.9.75 crores was prepared for construction of concrete structure of the Head works of M.L.I.S (Baluthi jackwell) by the Chief Engineer, UKP, Dam Zone, Alamatti, and technically sanctioned in his No.CER-10/93-94 dated 30.07.1993. Another estimate was also prepared by the Chief Engineer for the excavation portion of the intake channel, jackwell and raising main amounting to Rs.7.47 crores and technically sanctioned by him vide No.CER-15/93-94 dated 19.10.1993.

(c) **Commencement of the work departmentally:**

In the meanwhile, in order to pacify the agitators, action was taken to take up the excavation work departmentally in February 1992 by deploying heavy machinery on hire charges.

(d) **Tenders:**

Meanwhile, the draft tender papers for the concrete structure for the first Jackwell near Baluthi were prepared and got cleared by the Technical Committee in its 3rd meeting held on 13.04.1993. Tenders were floated in August 1993 and the Technical Committee in its meeting held on 23.09.1993 cleared the tenders. The decision of the Technical Committee regarding acceptance of the tender amounting to Rs.643.83 lakhs, which was 11.06% above the amount put to tender, was communicated in Government letter No. ID 32 NPC 93 dated 18.10.1993. The work order was issued to the Agency on 27.11.1993.

(e) **Delay in starting the tendered work:**

Even though the work of excavation for intake channel & Jackwell (for Baluthi Head work) was started departmentally in February 1992, this work could not be completed before issue of work order to the tendered agency for construction of the Jackwell structure due to changes made in the size of the Jackwell. Further, the excavated area had also been flooded. Consequent on directions from Government vide Government letter No. CM/2919/DEP/94 dated 17.12.1994, the Departmental work was closed on 19.12.1994 and the balance work of excavation was entrusted to the tendered agency as an extra item.

(f) **Foundation problems and geological studies done:**

(i) The Superintending Engineer (Designs), Bheemarayanagudi, inspected the site of Baluthi Head work on 17.02.1995 and instructed to get the Geological
mapping of the area done by a Senior Geologist to study the strata. Accordingly, the Geological mapping was prepared by the Geologist in the office of the Chief Engineer, Irrigation (North), Belgaum on 23rd & 24th March 1995 and it was observed that there was a thick shear zone in a major portion of the foundation block extending further towards the location of raising main embankment and that it required suitable rock treatment for improving the rock quality in the weak zone.

(ii) The ECPC, on the basis of the above said Geological Report, further instructed through his letter dated 03.06.1995 to conduct Remote Sensing and Geophysical Survey of the jackwell foundation area to identify the weaker zones and nature of strata at Sub-surface. Accordingly, these surveys were got done through M/s. Geo-Mysore Services, Bangalore from 10th to 17th July 1995.

(iii) From the above studies, the following findings were arrived at:-

1. The Geological formations around the jackwell site were represented by crystalline rocks of composite nature belonging to Archean age, the host rock being Granite gneiss represented by grey or pink varieties, pegmatites and aplite veins.

2. Alteration due to shearing has resulted in chlorite and mica schist. The general trend of these rock formations was N 65° E and dip at an angle of 80° towards south.

3. The joints were closely spaced, open and smoother, the trend and dip of the joints being as follows:
   - N 30° E … S 30° W… Dip 50° E
   - N 10° E … S 10° E … Dip 55° E
   - N 40° E … S 40° W… Dip 80° SE

4. By the nature of these rocks in the rock formation, the rocks were classified as poor rocks as per the classification made on the nature of joints by Beinawski (1969) in Rock Quality Determination (R & D).

(iv) By the application of remote sensing, the presence of weak zone, such as faults, shearing and lineaments that might indicate geologically weak zones, was identified. The study showed two major lineaments which were intersecting in and around the jackwell site as described below:-

1. A major lineament trending in WNW-ESE direction having width more than 500 mtr. found between Krishna river and Ch.1500 on the alignment.

2. The lineament trending in N 10° W - S 10° E direction found to the west of jackwell near Kolhar village.

(v) In order to ascertain the Sub-surface strata condition and also to pick up any other possible weak zones, electrical resistivity investigations were undertaken. Vertical electrical soundings were carried out upto the depth of 50 m 78 times along the alignment between Ch.530 m and Ch.1250 m and following were the findings.

<table>
<thead>
<tr>
<th>Ch: 530 to Ch: 625</th>
<th>Straits fractured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch: 530 to Ch: 590</td>
<td>Rock is fractured &amp; sheared extended upto 50 m.</td>
</tr>
<tr>
<td>Ch: 590 to Ch: 625</td>
<td>Rock is moderately fractured extended upto 50 m.</td>
</tr>
<tr>
<td>Beyond Ch: 630</td>
<td>Highly weathered and altered rock.</td>
</tr>
<tr>
<td>At C/S Ch: 615</td>
<td>Highly fractured and sheared extended upto 75 m.</td>
</tr>
<tr>
<td>Ch: 625 to Ch: 1250</td>
<td>Highly weathered and altered.</td>
</tr>
</tbody>
</table>
(vi) The rock type exposed in the site included -- (a) granite; (b) Amphibolite; (c) clorite schist; (d) mica-schist. These rocks had developed fractures due to shearing. The fractures were close spaced and smooth with the release of epidote. All these fractures were clear indication of shearing.

(vii) The fractured nature of strata and presence of veins & veinlets and schist rocks rendered the rock to become weak and such rocks are incompetent. The chlorite bands are highly susceptible for withering under the influence of water. The load bearing capacity of these rocks is very less. Shear zones are more vulnerable for seismic activity. The selected site for jackwell was on a major fault zone and it was not possible to get foundation condition.

(viii) M/s. Geo-Mysore Services suggested to go for double core bore-holes to get feed back for confirming the results at ch.560 m, 620 m, 5 m east of ch.650 m, ch.1000 m and ch.1250 m. They also suggested for correlation of results of core logging and the resistivity results in order to refining the sub-surface information.

(g) Inspection by Technical Advisory Committee and shifting of site:

(i) Sri.H.S.Chiniwal, Member of Technical Advisory Committee (TAC) inspected the site on 24.07.1995 and suggested for shifting the jackwell site by about 20 m towards the river side i.e., away from the fault zone. He also suggested to take 2 or 3 trial pits and 5 trial bores in the proposed new site.

(ii) The TAC under the Chairmanship of Sri.K.C.Reddy, visited the site on 08.08.1995 and observed that the extreme vertical face of the jackwell in the deep cut portion was of disintegrated rock where slips had already occurred. Looking to the geological map, the Committee was of the opinion that it was not possible to found the jackwell structure at the approved location. The Committee opined that the position of jackwell needed to be shifted by 20 m towards the river side. The Committee also suggested to finalise the shifting after confirmation of the strata by geo-physical surveys and to fill up the excavated original location after constructing a retaining wall.

(iii) Thereafter Dr.C.S.Viswanath of M/s. TORSTEEL Research Foundation India, Bangalore (TRF), was consulted by the project authorities for finding out a solution to the foundation problem of the jackwell. All the details like the layout plan along with the plate load test results, bore log results, geological note, etc., were furnished to Dr.Viswanath.

(iv) After thorough investigation by the experts, the position of jackwell was finally shifted by 91 m towards the river side (from ch.605 m to 514 m).

(v) The retaining wall was then constructed to hold the backfill earth in accordance with the drawings approved by the Chief Engineer (Designs) and the excavated area was refilled with earth.

(h) Structural design of jackwell near Baluthi:

(i) The jackwell near Baluthi consists of 28 pump bays each of width 4 m. Two repair bays on one on either end are provided. They are of width 15.4 m and 6.1 m respectively. The size of the jackwell is 120 m x 20 m whereas the overall dimension of the structure is 135 m x 25 m and height 42 m above intake canal bed level.
(ii) The jackwell structure is a conventional reinforced concrete framed structure. The structure consists of two floors i.e., delivery floor or valve floor and motor floor. Three levels of bracings are provided in between foundation and delivery floor level. R.C.C. walls are provided for full width of jackwell at every 4th bay upto minimum water level. This is to facilitate pumping out water and keep the bays dry for cleaning the inlet valves and for other maintenance. However, for each pump bay, reinforced concrete walls are provided upto minimum water level for length equal to span of pump bay keeping in view pump operation requirements.

(iii) At delivery floor, a Thrust Block is provided within the jackwell and is designed to bear the horizontal thrust of 85 tonnes arising at center line of delivery Tee (resulting from the pump operation and water hammer effects) and transfer it safely to the structure. Butterfly valve and delivery pipes are located on delivery floor. The motor of the vertical turbine pump is positioned at motor floor. The total vertical dynamic load of pump-motor assembly is 127 tonnes. The vertical load acts at motor floor level.

(iv) A reinforced gantry beam is provided at about 8 m height from motor floor to support EOT crane with a lifting capacity of 40 t and span of 10.1 m.

(v) Moving gantry operating at motor floor with suitable supporting system is provided on the bell mouth side to operate trash rack gates and stoplog gates.

(vi) The jackwell structure is provided with structural steel roofing with pre-coated MS sheets.

(vii) **Theoretical Analysis:-**

(1) A 3D analysis of the jackwell structure was carried out using software package STAAD-III (Ver.22.3). The structure was analysed on 3D frame for dead load, imposed load, seismic loads and their combinations. The seismic analysis was carried out as per the guidelines in IS:1893-1984 using response spectrum method of analysis.

(2) The forces and moments obtained from the critical combination of loadings were considered for the design.

<table>
<thead>
<tr>
<th>Loadings</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>At delivery pipe floor level of RL 524.5 m</td>
<td>1.125 t/sq.m.</td>
</tr>
<tr>
<td>At motor floor level of RL 528.25 m</td>
<td>1.825 t/sq.m.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Seismic Loads</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone considered</td>
<td>Zone-III*</td>
</tr>
<tr>
<td>Performance factor</td>
<td>K = 1.6</td>
</tr>
<tr>
<td>Soil foundation characteristics</td>
<td>β = 1.0</td>
</tr>
<tr>
<td>Importance factor</td>
<td>I = 1.5</td>
</tr>
<tr>
<td>Method of analysis</td>
<td>Response spectrum method</td>
</tr>
<tr>
<td>Seismic zone factor for average Acceleration spectra F_o</td>
<td>0.2</td>
</tr>
</tbody>
</table>

(*) As per IS:1893-1984, the jackwell structure lies in Zone-II. However, Zone-III was considered in the analysis as per the draft copy of S:1893-2000 released.

<table>
<thead>
<tr>
<th>Load Cases considered</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The structure was analysed for the following load cases:</td>
<td></td>
</tr>
<tr>
<td>1. DL + Equipment Load + IL + EOT Crane load on Left</td>
<td></td>
</tr>
<tr>
<td>2. DL + Equipment Load + IL + EOT Crane load on Right</td>
<td></td>
</tr>
<tr>
<td>3. Seismic Load in ‘X’ direction with EOT crane on Left</td>
<td></td>
</tr>
<tr>
<td>4. Seismic Load in ‘X’ direction with EOT crane on Right</td>
<td></td>
</tr>
<tr>
<td>5. Horizontal Thrust &amp; Moment</td>
<td></td>
</tr>
</tbody>
</table>
6. \(1.5 \text{(Load Case 1)} + 1.5^* \text{(Load Case 3)} + 1.5 \text{(Load Case 5)}\)

(*) Partial safety factor

7. \(1.5 \text{(Load Case 1)} - 1.5^* \text{(Load Case 3)} + 1.5 \text{(Load Case 5)}\)

8. \(1.5 \text{(Load Case 2)} + 1.5^* \text{(Load Case 4)} + 1.5 \text{(Load Case 5)}\)

9. \(1.5 \text{(Load Case 2)} - 1.5^* \text{(Load Case 4)} + 1.5 \text{(Load Case 5)}\)

10. \(1.5 \text{(Load Case 1)} + 1.5^* \text{(Load Case 5)}\)

11. \(1.5 \text{(Load Case 2)} + 1.5^* \text{(Load Case 5)}\)

(3) Forces from critical combination out of load case 6 to 11 were considered for design. However, for the design of roof trusses, wind loads were considered as per IS:875 (Part-3)-1987 as the same was governing the design of roof truss.

(4) Also, a Dynamic analysis was performed on the jackwell structure. From the analysis, it was found that the difference in natural frequency of the structure and frequency of vibration of pump-motor assembly was more than 25\%. It was concluded that the structure is dynamically safe and resonance condition does not occur.

(j) **Pumpsets & motors and transformer Sub-station:**

(i) A 514 m long intake canal had to be constructed in the bed of the reservoir to allow the water to flow to the intake pond of the pump house, even when the water level in the lake comes down to RL 504. It is relevant to point out in this context that the full level of the Alamatti reservoir (FRL) would be 524.256 m when the originally designed crest gates are in position and this has come down to 519.60 m with the crest gates truncated as per the directions of the Supreme Court. The pumpsets selected are designed to operate efficiently even at level 524.25 m when the actual head is very much lower than the rated head. This is done by replacing the motor with that having a lower speed and lower capacity. Under the 173 TMC utilisation programme of UKP (i.e., Scheme ‘A’) five pumpsets (inclusive of one spare) are installed to lift the water to RL 530. The water so lifted is delivered through 5 Nos. of delivery pipes of length 50 m up to manifold and then from the manifold through two 616 m long mild steel pipes having a diameter of 2.35 m to a canal of capacity 18.6 cumecs. This canal takes the water from B.L.I.S to the intake pond of the second pump house, located at Hanumapur. In other words, water will be available for irrigation only when both the pump houses are in operation. In Baluthi scheme, water has to be lifted to a height (exclusive of losses in the water conductor system) which varies from 24.81 m when the reservoir is the lowest, to 5.74 m when the reservoir is full. In comparison, the Head required at Hanumapur is 34.42 m, exclusive of losses in the water conductor system. The Head remains nearly constant in this pump house, as the level in the intake pond does not change much.

(ii) The single stage turbine pumps that are installed in the Baluthi scheme have each a discharging capacity of 4.33 cumecs or about 152 cusecs. The motors coupled to these pumps have a capacity of 1300 KWs. These motors work at 6600 volts which is the optimum voltage for this size of motors. Some of the pumpsets can be run at lower speed to take care of lower Head or lower discharge or both by coupling to the pump, a smaller capacity motor with a rating of 820 KW and having lower speed of 420 rpm. As mentioned earlier, this arrangement ensures higher efficiency when the Head is very low, that is, when the reservoir is full or when a smaller quantity of water has to be pumped out during certain fortnights of the irrigation season. The design is such that replacement of these motors is easy and takes only a few hours, as the smaller motors can fit into the same base suited for the larger motor. This work has been carried out by M/s. Kirloskar Brothers.
(iii) Under Scheme ‘B’, an additional quantity of 107 cumecs will have to be pumped and the pump house has already been constructed to accommodate the extra pumpsets needed for this purpose. The number of pumpsets in operation after the final stage would be 28, each having a capacity of 4.33 cumecs. The capacity of each motor coupled to the pumps would be 1300 KWs. Besides, there would be three to four motors of 820 KWs which are to be used under the circumstances explained earlier. The ultimate power requirement would be 31,200 KWs.

(iv) A 220 / 6.6 KV Sub-station has been established near the pump house to supply power to the pumpsets with 2 Nos. of mixed cooling type step-drawn power transformers having a capacity of 17.5 MVA. The Sub-station can take care of the power requirements for the ultimate stage. 220 KV supply was chosen considering the quantum of power requirement and this power supply will be from Basavana Bagewadi Station situated about 35 KM from Baluthi. The supply voltage is reduced to 6600 volts at the Sub-station and is supplied to the motors through the necessary switchgear with protection against mal-operations or faults. The Sub-station work has been carried out by M/s. Alstom, which is almost completed and can be commissioned soon after the 220 KV line is drawn from Basavana Bagewadi.

8.07 2nd Jackwall near Hanumapur:-

(a) Geological investigation for foundations:-

(i) As per the suggestions of Chief Engineer (Designs), Bheemarayanagudi, 3 Nos. of trial bore holes viz., B1 to B3 were drilled upto a depth of RL 510.00 m. The Karnataka Power Corporation Limited in their final report, communicated through letter No.512 dated 14.11.1997, stated that the location of 2nd jackwell as proposed by the Field Engineers at ch. 5470 m appears to be more feasible in all respects and that the same may be finalised at this location. On the basis of KPCL report, the Chief Engineer (Designs) approved the location of 2nd jackwell, after which, the general arrangement drawing was issued by the Chief Engineer (Designs), Bheemarayanagudi.

(ii) While clearing the estimate, one of the observations put forth during the 36th Technical Sub-Committee meeting held on 26.11.1999 was that the Geologist’s report on foundation details should be obtained. Accordingly, 4 Nos. of trial bores viz., B4 to B7 were drilled in the first instance. Subsequently, it was felt necessary to drill 7 more trial bores viz., B8 to B14. All the bore holes were drilled up to a depth of 16 m from Ground Level. During exploration, Dr.C.S.Vishwanath of TRF visited the site on 02.08.1999 and felt that one of the trial bores be drilled to a depth of 29 m. While drilling the extra depth in trial bore No.14, schist type of soil was observed between the depth 27-30 m. M/s. TRF suggested on 09.09.1999 to drill bore holes in at least 8 locations to a depth of 10 m below the founding level i.e., 34 m below the ground level to study the stratification and its bearing capacity. Out of 8 Nos. of trial bores suggested, 5 Nos. of bore holes were taken viz., B15 to B19. During exploration of strata, unconformity in the subsurface rock mass at a depth of 28 m was detected. This unconformity was a low velocity layer and occurred below the Basalt Layer extending 4-6 m and as such this was highly undesirable for any foundation design. Below this low velocity layer, there was again good core recovery (Hard rock).

(iii) The matter was referred to the National Institute of Rock Mechanics (NIRM), KGF by the Chief Engineer, vide letter No.4008 dated 01.01.2000 for an in-depth study. The Institute was required to:

(1) Map the substructure upto 35-40 m for detecting regions of unconformity or zones of weakness and
Determine the regional trend of the unconformity and likely projection in the surrounding region by Seismic Refraction Method.

NIRM furnished the report on Seismic Survey during February 2000. Five refraction profiles (identified as A, B, C, D and E) were considered in the refraction survey. The main scope of this survey was:

1. Map the sub surface upto 35-40 m for detecting regions of unconformity or zones of weakness, and
2. Determine the regional trend of the unconformity and their likely projection in the surrounding region.

The seismic refraction method gives the information about the sub-surface in terms of their seismic velocities. The velocity classification used in the NIRM report while interpreting the seismic section of the five lines is shown under:

<table>
<thead>
<tr>
<th>Sub surface strata</th>
<th>Seismic velocities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various types of soils</td>
<td>0.5 to 1.2 Km/Sec.</td>
</tr>
<tr>
<td>Compact soil / soft rock</td>
<td>1.3 to 2.5 Km/Sec.</td>
</tr>
<tr>
<td>Poor rock</td>
<td>2.6 to 3.5 Km/Sec.</td>
</tr>
<tr>
<td>Hard rock</td>
<td>3.6 to 4.5 Km/Sec.</td>
</tr>
<tr>
<td>Very good rock</td>
<td>Above 4.5 Km/Sec.</td>
</tr>
</tbody>
</table>

As said above, there are five refraction profiles on which seismic survey was conducted. The summary of refraction seismic survey conducted along the 5 profiles around the proposed 2nd jackwell is as given below:

<table>
<thead>
<tr>
<th>Profile Lines</th>
<th>Length</th>
<th>Typical features of the area from Seismogram</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-Line</td>
<td>138 m</td>
<td>Thin soil cover. Local unconformity at 24 m depth.</td>
</tr>
<tr>
<td>B-Line</td>
<td>138 m</td>
<td>Soil cover upto 4 m towards the end. Major unconformity at 18-26 m depth from middle point onwards.</td>
</tr>
<tr>
<td>C-Line</td>
<td>138 m</td>
<td>Normal seismic section. No unconformity or adverse features found anywhere.</td>
</tr>
<tr>
<td>D-Line</td>
<td>184 m</td>
<td>Thin soil cover. Unconformity very prominent at a depth of 20-25 m throughout the profile length.</td>
</tr>
<tr>
<td>E-Line</td>
<td>115 m</td>
<td>Soil layer is almost 5 m thick towards the end. Minor local unconformity at 25 m in the center of the profile.</td>
</tr>
</tbody>
</table>

The typical features of the area along 'C' line profile exhibited Normal Seismic Section and no unconformity or adverse features were found anywhere along the said line.

The report as received from NIRM was made available to TRF, for finalising the techno-economical location and to furnish the foundation details vide letter dated 28.02.2000 of the Chief Engineer, KBJNL, Dam Zone, Alamatti. In response to this, M/s. TRF recommended in their letter dated 06.04.2000 for removal of loose soil in the unconformity zone by excavating up to hard rock at RL 508.00 m and filling with plum concrete upto founding level RL 519.119 m. They opined that the above suggestion was economical and workable as compared to other suggestions made in the report. M/s. TRF also opined as follows:

1. The presence of unconformity zone in Scheme ‘B’ region (to irrigate 2,11,600 ha) shall be checked and confirmed by drilling conformity bore holes.
2. In order to avoid the presence of unconformity altogether, the site can be shifted by about 50 m to ‘C’ line location. However, considering the limitations of Geo-
physical investigation, additional bore holes have to be drilled at ‘C’ line to conform the stratification. Any unconformity met with will have to be treated as explained above.

(ix) Accordingly, action was taken to conform the unconformity by drilling additional 4 Nos. of trial bores viz., BHC1 to BHC4 along the ‘C’ line.

(x) Thus, a total of 23 trial bore holes were drilled in the proposed original jackwell site to establish the foundation conditions. The Project Geologist, KPCL, Dandeli, visited the site on 17.06.2000 and examined the cores of the bore holes drilled and came to the conclusion as mentioned below vide his letter dated 19.06.2000:

1. The bore holes established occurrence of fresh and hard Deccan trap (basalt) formation upto a depth of nearly 25 m to 27 m followed by quartzite formation.

2. The Deccan trap formation is seen to be formed by two different lava flows overlying Kaladagi quartzite (consisting of lithomergic clay and boulders mixed with granite soil) which in turn, rest unconformity over the basement granite (Peninsular Gneiss).

3. As the geological conditions are identical in the terrain in and around the original second jackwell position, the original position of the second jackwell may be retained for construction.

(xi) Thereafter, the Technical Sub-Committee visited the location of 2nd jackwell on 30th June 2000 and desired to take additional bore holes at ‘C’ line to conform the stratification. Meanwhile, the Chief Engineer duly enclosing the Project Geologist’s report, requested TRF vide letter No. 1490 dated 17.07.2000 to finalise the location supported by technical memo so as to place before TSC. In response to this, TRF opined that the jackwell can be located at the old location itself to bring down the time and cost of structure. At the same time, TRF wanted to know the Engineering properties of the soil / rock in the weathered quartzite rock layer (unconformity zone) to check the possibility of founding the structure in this zone only. Hence, they recommended to conduct Soil Penetration tests in this layer and to collect the Undisturbed Samples also while drilling 60 m deep bore holes (as recommended by the Project Geologist of M/s. KPCL, Dandeli), to know the characteristics of the layer for arriving at a suitable decision regarding founding level, vide their letter dated July 16, 2000.

(xii) As per the recommendations of the Project Geologist as well as TRF, a deep bore hole to a depth of 69 m viz., BH20 at the original location was drilled and the geological interpretation along with core logging was received from the Project Geologist through his letter dated 26.09.2000. Another deep bore hole BH21 was taken up to 20 m depth at the center of the original Scheme ‘A’ position. The geological details of BH21 were received from the Project Geologist through his letter dated 21.10.2000.

(xiii) Based on the suggestion of TSC during the 56th meeting held on 30.08.2000, the Managing Director, KBJNL, directed to take up the excavation work at the original location and also to take up the geological investigation at about ½ KM on right side from present location vide his letter dated 10.10.2000. Accordingly, the jackwell excavation was started at original location.

(xiv) Further, the TSC during the 60th meeting held on 16.12.2000 decided to excavate the jackwell portion upto RL 515.00 where the level of unconformity was expected to start.
(xv) As directed by TSC on 30.08.2000, one deep hole BH22 was drilled at a distance of 500 m on right side of the original jackwell location. At first instance, the Project Geologist, KPCL, inspected the site when the bore had progressed up to 37 m depth and furnished a geological note through his letter dated 10.01.2001. He concluded that the thickness of unconformity zone was comparatively less near BH20 and that sound basement granite rock foundation was available at a fairly higher level. He expressed the opinion that the site adjacent to Scheme ‘A’ location (BH21) on right side was comparatively economically viable for locating the Scheme ‘B’ structure.

(xvi) On the basis of the above report, the proposal was placed before TSC. The TSC discussed the matter during the 62nd meeting held on 12.02.2001 and the Committee, taking note of the fact that the unconformity zone existed even at a distance of half a KM from present jackwell site, decided to take up the excavation for additional jackwell portion adjacent to the second jackwell near Hanumapur. It was also supported by the Pump Committee Chairman’s opinion that the operational costs would be minimized if they are adjacent. The Project Geologist, KPCL, furnished the geological report along with geological chart of BH22 for full depth of 60 m through his letter dated 07.02.2001.

(b) Estimates:-

(i) In the meanwhile, on the basis of general arrangement drawing issued by the Chief Engineer, Design Organisation, Bheemarayananagudi, an estimate for the work of construction of 2nd jackwell, intake channel and lead off canal from KM 5.00 to KM 5.48 was prepared based on KBJNL Schedule of Rates for the year 1996-97 continued for 1998-99 and placed before the Technical Sub-Committee. The Committee discussed the subject in its 36th meeting held on 26.11.1999 and cleared the estimate for Rs.513.38 lakhs with certain observations. The estimate was technically sanctioned by the Chief Engineer, KBJNL, Dam Zone, Alamatti, vide CER No.25/1998-99 dated 01.01.1999 for Rs.549.41 lakhs.

(ii) The Pumps Committee in its 22nd meeting held on 01.10.1999 suggested that, while constructing the first stage Pump House (for Scheme ‘A’), the foundation for the 2nd Stage (for Scheme ‘B’ utilisation of 302 TMC) should also be completed to avoid blasting.

(iii) Based on the suggestions of the Pumps Committee, a revised estimate, including quantity of excavation for Scheme ‘B’ jackwell portion, was prepared for Rs.902.50 lakhs and placed before the Technical Sub-Committee. The Committee discussed the subject in its 51st meeting held on 03.05.2000 and cleared the estimate. The estimate was technically sanctioned by the Chief Engineer for Rs.902.50 lakhs vide CER No.03/2000-01 dated 01.06.2000. As per the directions of the TSC during 52nd meeting held on 03.06.2000, a revised Schedule ‘B’ as per the revised estimate was also prepared.

(c) Tenders:-

After receipt of tenders for the work, the evaluation report was prepared and placed before the TSC and the Committee in its 52nd meeting held on 03.06.2000 cleared the tender. The KBJNL Board during its 37th meeting held on 19th July 2000 cleared the tender for the negotiated amount of Rs.806.49 lakhs which was 8.729% below. Agreement was executed on 07.08.2000 with the stipulated date of completion as 15.08.2001.
(d) **Structural design of jackwell:**

(i) The jackwell structure is a conventional reinforced concrete framed structure consisting of 22 pump bays of width each 5 m. Two repair bays one on either side are provided. The structure is of size 129.35 m x 15.80 m and consists of two floors i.e., a delivery floor or valve floor and a motor floor. At delivery floor level, a thrust block, designed to bear the horizontal thrust of 78.5 tonnes arising at center line of delivery Tee (resulting from the pump operation and water hammer effects) and transfer it safely to the structure is provided. The motor of the vertical turbine pump is positioned at motor floor. The total vertical dynamic load of pump motor-assembly is 111 tones. The vertical load acts at motor floor level.

(ii) Same procedure of theoretical analysis as followed for the design of 1st jackwell near Baluthi is also followed in the design of 2nd jackwell structure near Hanumapur.

(e) **Pumpsets & motors and transformer Sub-station:**

(i) As the civil works had not yet begun in this case, it was possible to review the originally conceived design of the pump house building and other associated works. Detailed studies were also carried out to choose the optimum size of the pumpsets. As a result of these studies, larger capacity pumpsets than those originally contemplated were decided to be installed. By choosing larger size sets, the cost of civil works, and electrical equipment could be brought down. The revised design resulted in a significant reduction in the overall length of the pump house. The modified scheme envisages installation of only four pumps (inclusive of one spare) each of which has a capacity of 5.197 cumecs or 181.89 cusecs. Though the number of pumps is less than that in Baluthi, these can deliver the same quantity of water over a Head which is more than that encountered in Baluthi by about seven meters. The capacity of each motor is 2150 KWs as compared to 1300 KWs in the case of Baluthi. In brief, the revised design has resulted in the saving of several millions of rupees in capital expenditure and also reduction in recurring expenditure as compared to the original proposal.

(ii) The work of supply, erection and commissioning of the pumpsets has been awarded to M/s. Kirloskar Brothers Limited. Quotations have also been received for the supply, erection and the commissioning of the 220KV/6.6KV, 100 MVA with two transformers each of 50 MVA capacity Sub-station close to the pump house and a decision in this regard will be taken shortly.

(iii) Under the 302 TMC utilisation programme of UKP (under Scheme ‘B’), M.L.I.S. envisages pumping of 103.93 cumecs of water and for this purpose, additional 18 pumpsets each with a capacity of 5.197 cumecs are required to be installed. The ultimate power requirement would be 40,000 KWs. As the ultimate power requirement is large it was decided to take the power supply at 220 KV (220,000 volts) in this case also by tapping the 220 KV line to Baluthi. The station at Hanumapur will have two transformers each having a capacity of 50,000 KVA. The design of this Sub-station is similar to that at Baluthi. Quotations have been received for the supply of equipment, erection and commissioning of the Sub-station.

(iv) It is relevant to point out here, that some delay has occurred in the execution of the 220 KV line work. Initially, KPTCL was reluctant to take up this work on deposit contribution basis. Finally it agreed to carry out this work and asked the KBJNL to deposit in advance the entire cost of the line which was estimated to be about...
Rs.8 crores. KBJNL accepted the proposal but offered to deposit a portion of the cost in advance and the balance in installments in relation to the progress achieved. Since KPTCL was not prepared to accept this condition, KBJNL decided to take up the line work on its own and engaged KPCL as consultants for carrying out this work. KPCL agreed to take up this task as a special case, but as it had to initiate action de novo, which included drawing up the specifications, collection of details of survey work already done, holding pre-bid meetings etc, and as a result, the line work was delayed. The quotations have been received and an order is likely to be placed by KBJNL on the successful bidder soon.

(v) For utilisation of water allocated to M.L.I.S. under both Scheme ‘A’ and Scheme ‘B’, a total of 4 lifts are involved. After the completion of Baluthi & Hanumapur lifts, two more lifts will have to be undertaken, for which the locations are yet to be finalised.

8.08 Salient features:-

(i) The salient features of Baluthi Head work and Hanumapur Head work under Mulwad L.I. Scheme are shown in the Statement at Annexure-1.

(ii) Three taluks viz. Basavana Bagewadi, Jamakhandi and Bijapur will be benefitted by the Mulwad L.I. scheme under Scheme ‘A’.

8.09 Present stage of work:-

(i) Baluthi Head work including intake channel, jackwell with pumps & motors installed, delivery pipes (Raising Main), delivery chambers, transformer Sub-station and EOT crane, is completed and awaiting commissioning.

(ii) Regarding Hanumapur Head work, the lead off canal is completed and the jackwell has come up to the pump floor level.

(iii) The east canal taking off from the second delivery chamber (Hanumapura delivery chamber) runs for a length of 17.40 KM. The work is nearing completion.

(iv) The west canal taking off from the second delivery chamber near Hanumapur runs for a length of 83.30 KM. Works from 0 to 79 KM have been tackled and nearing completion.

8.10 Total power requirement for Mulwad Lift Irrigation Scheme:-

<table>
<thead>
<tr>
<th>Head works</th>
<th>Present requirement (Scheme ‘A’)</th>
<th>Ultimate requirement (Scheme ‘B’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baluthi L.I. Scheme</td>
<td>5.50 MVA</td>
<td>37 MVA</td>
</tr>
<tr>
<td>Hanumapur L.I. Scheme</td>
<td>7.50 MVA</td>
<td>49 MVA</td>
</tr>
</tbody>
</table>

9.0 Alamatti Left Bank Canal:-

9.01 Water utilisation and irrigable area:-

It is proposed to irrigate 20,235 ha under Alamatti Left Bank Canal (ALBC) by utilising 5.60 TMC of water under Scheme ‘A’ of the Tribunal Award i.e., under the UKP programme of 173 TMC utilisation. Out of this area, 16,200 ha will come under
irrigation under UKP Stage-I and the balance 4,035 ha under UKP Stage-II. Under Scheme ‘B’ when surplus waters are available (i.e., under 129 TMC utilization programme) it is contemplated to bring in a further extent of 80,940 ha under Chimmalagi lift which takes off from ALBC by utilizing 22.50 TMC of water.

9.02  Location, number of lifts and layout plan:-

(i) The Head work of ALBC is located in the foreshore of Alamatti reservoir. The Head work consists of an intake channel for a length of 135 m from the reservoir foreshore up to the jackwell of size 48 m x 20.5 m. From the jackwell water is lifted by pumps (vertical turbine) and delivered into the delivery chamber, the length of the raising main being 135 m. The ALBC takes off from this delivery chamber and runs as a combined canal (ALBC and Chimmalagi) for a length of 12.65 KM after which, the canal bifurcates near Hullur into two branches. One canal leads off to the Chimmalagi Head works which will be constructed when Scheme ‘B’ waters are available. The other canal taking off from the bifurcation point is called as “the ALBC” (independent ALBC) and runs upto 91.11 KM (from 0 to 66.28 KM in UKP Stage-I and from 66.28 to 91.11 KM in UKP Stage-II).

(ii) The second lift, called as the Chimmalagi Lift, takes off from the lead off canal coming from the bifurcation point at 12.65 KM of the combined ALBC. This lift is contemplated under Scheme ‘B’. The layout plan for this scheme is yet to be finalised.

9.03  Directions of Government to start the work:-

While communicating the decision of Government to start the Head work at Mulwad LI Scheme in Government letter No. ID 67 WUD 89(P) dated 24.02.1992, it was also directed by the Government in the same letter that the guidelines given for starting the work of Mulwad scheme were also applicable for the other foreshore LI schemes. Subsequently, instructions were also issued by the Minister for Irrigation during the foundation laying ceremony on 25.09.1992 to take up the work of intake channel and jackwell of ALBC immediately on similar lines followed in the case of Mulwad scheme vide instructions confirmed in letter No. M&MI/PS/979/92 dated 15.10.1992.

9.04  Estimates and Tenders:-

(i) The detailed report with cost estimates for ALBC Head works was cleared by the Technical Committee in its third meeting held on 22.07.1992 vide Government letter No.ID 34 NPC 92 dated 05.08.1992.

(ii) Thereafter, the Chief Engineer, UKP, Dam Zone, Alamatti, sanctioned two different estimates in this direction viz. – (1) Estimate for earth work excavation for intake channel, jackwell and earth work for raising main, for the Head work of ALBC near Alamatti technically sanctioned for Rs.252 lakhs vide CER No. 8/93-94 dated 02.07.1993; and (2) Estimate for the concrete structure of the jackwell for the Head work of ALBC technically sanctioned for Rs.490 lakhs vide CER No.9/93-94 dated 02.09.1993.

(iii) The Draft Tender Papers for the Head works were cleared by the Technical Committee on 10.06.1993 and tenders were invited for the ALBC Head work on 26.08.1992. The evaluation report prepared after receipt of tenders was placed before the Technical Committee. The lowest tender was 15.58% above the estimated rate for the year 1992-93. The Technical Committee in its meeting held on 23.09.1993,
while clearing the tender, suggested to conduct negotiations with the bidder to get as much reduction as possible.

(iv) After conducting negotiations, the tender premium was reduced to 13.5% above the estimated rates. The tender was eventually accepted and agreement was entered into on 11.05.1994 and work order was issued on the same day.

9.05 Commencement of work:-

(i) In the meanwhile, as per the instructions issued by the Minister for Irrigation at site on 25.09.1992, the excavation for intake channel and jackwell of ALBC and providing earthen embankment for the raising main, were taken up departmentally on 09.10.1992 by deploying heavy machinery on hire basis. After much correspondence, the Chief Engineer (Designs), communicated approval to the sections of intake channel and jackwell in his letter dated 18.12.1993. Consequent on verification of the arrangement of pumps furnished by M/s. Jyothi Limited and M/s. Worthinton Pumps Limited, the size of jackwell was revised by the Chief Engineer (Designs) who communicated the same in his letter dated 01.12.1995.

(ii) Due to changes in the design of the Head work, the work taken up departmentally could not be completed and the site could not be handed over to the tendered agency in time. Further, there was flooding of the intake channel and the jackwell areas resulting in accumulation of silt. After clearing the site, it was handed over to the tendered agency on 21.10.1994. The balance excavation, that could not be completed departmentally, was entrusted to the tendered agency as an extra item. The first set of approved drawings was issued to the agency by the Executive Engineer on 16.02.1995.

(iii) The Chief Engineer, UKP, Dam Zone, Alamatti, inspected the site on 18.06.1995 and issued instructions to provide drainage arrangements. Accordingly, the work of drilling the drainage holes was entrusted to the tendered agency and after that, 25 mm dia anchor bars were provided as per instructions of the Chief Engineer.

(iv) After completion of the above process, the foundation for the jackwell was approved by the Chief Engineer on 27.05.1995.

9.06 Inspection by the Technical Sub-Committee (TSC):-

(i) The work was inspected by the Technical Sub-Committee (TSC) on 16.01.1997 and it was instructed to follow the specifications and the grade of concrete suggested by the consultants M/s. Torsteel Research Foundation (TRF) for the Mulwad L.I. scheme Head works, in the case of ALBC Head work also. These instructions were confirmed by the Committee in its 13th meeting held on 30.01.1997.

(ii) The drawings for the retaining wall and the repair bay were approved by the Chief Engineer (Designs) on 27.01.1997. The grade of concrete to be used for the retaining wall was selected after working out the economics for various alternatives.

9.07 Examination of the Layout arrangement by the Pumps Committee:-

(i) The Pumps Committee examined the layout arrangement that had been finalised earlier and carried out several alterations not only from the point of view of maintenance and operation, but also for bringing down the costs. One of the assumptions made in the earlier designs was that the pumpsets were to run for eighteen
hours in a day. This assumption necessitated the installation of pumpsets of larger capacity or a larger number of pumpsets. The water conductor system also had to be designed to carry a larger quantity of water, which implied a higher capital expenditure. The design was modified so that the sets are run all the 24 hours in a day as per the standard practice prevalent elsewhere.

(ii) It was also observed by the Pumps Committee, during execution of the Head work, that the columns which had been designed before the procurement of pumpsets did not have the required strength to withstand the horizontal Twist that arises when any pumpset is shut down suddenly. Special anchoring arrangements had to be provided at the delivery and just outside the building to absorb part of the Twist so that the residual force on the columns came within the factor of safety. The original design of the motor floor had space constraint as the span was too narrow to accommodate the control equipment and carry out maintenance. This arrangement also necessitated a higher roof to enable movement of the motor and other components. After a visit to a similar L.I. scheme in Maharashtra by the Pumps Committee, the span of the motor floor was widened. A monorail system was also introduced, instead of the conventional gantry crane, to operate the stop log gates and trash racks, for reducing the cost of the scheme.

9.08 Pumpsets, Motors and Transformer Sub-Station:

(i) The scheme envisages installation of four pumpsets including one as spare under Scheme ‘A’. The problems faced in this project were similar to those faced in the Baluthi LIS, viz., high variation in the head and in the quantum of water to be delivered. Therefore, motors of smaller capacity and lower speed were also procured in this case and these are to be used when the head is low or when the discharge required in one of the pumps is low. This system enables the energy consumption to be kept to the minimum. Each pump has a discharging capacity of 3.95 cumecs under normal operating conditions (the maximum to be supplied in the first stage is 11.84 cumecs) and is coupled to a motor of 1250 KW capacity. When discharge from any pump is to be reduced, or the head comes down, the scheme provides for the substitution of the larger motor by the smaller one with lower speed as indicated earlier.

(ii) Earlier, power supply was contemplated to be obtained at 33 KV. Taking into consideration the ultimate needs of this project as well as that of ARBC, it was found that power supply at 110 KV from the nearby Nidagundi station was necessary. Accordingly, a 25 MVA Sub-station with two 12.5 MVA, 110/6.6 KV transformers was erected close to the pump house. The Sub-station was erected and commissioned on a turn key basis by M/s. NGEF. The capacity of the station has been chosen so as to meet the power requirement of the ultimate stages of both ALBC and ARBC L.I. schemes. The pumpsets for ALBC were supplied, installed and commissioned by M/s. Kirloskar Brothers. In all these contracts, including Baluthi, the order stipulates that the station and the pumpsets have to be maintained and operated for a period of one year from the date of formal commissioning, to facilitate the staff of KBJNL to get trained as they are not acquainted with this type of work. The guarantee operates for one year after this period.

(iii) Water pumped in Scheme ‘B’ can be utilised by commissioning another large LI scheme (called as the Chimmalagi LI scheme) at a place called Hullur situated at about 13 KM from ALBC. 41.31 cumecs of water is proposed to be lifted to a height of 37 m from this scheme which is designed to irrigate 80,940 ha of land in Muddebihal, Basavana Bagewadi, Singdagi, Indi and Bijapur taluks. Eight more pumpsets of 1600 KW capacity are required to be installed at ALBC Head work to supply water to the
Chimmalgi scheme. The power requirement for this project (Chimmalgi) is estimated to be about 18500 KW. The detailed project report is under preparation and will be taken up under Scheme 'B'.

9.09 Present stage of work:-

The Head works including erection of pumpsets and motors are completed. Other works of the Scheme like canals and distributaries are nearing completion. Water is also let into ALBC upto 50 KM covering 14 distributaries and an extent of about 5700 ha is already irrigated.

9.10 Salient features:-

The salient features of ALBC are shown in the statement enclosed as Annexure-2.

10.0 Alamatti Right Bank Canal:-

10.01 Water utilisation and irrigable area:-

It is proposed to irrigate 16,100 ha under Alamatti Right Bank Canal (ARBC) by utilizing 4.50 TMC of water under Scheme ‘A’ of the Tribunal Award i.e., under UKP programme of 173 TMC utilisation. Under Scheme ‘B’ when surplus waters become available, it is contemplated to bring a further extent of 16,900 ha under Thimmapur lift which takes off from ARBC by utilizing 5.50 TMC of water.

10.02 Location, Number of Lifts and Layout Plan:-

(i) The Head work of ARBC is located just upstream of Block No.53 in the right flank of Alamatti dam. This is a partial lift-cum-flow scheme. During the period when the reservoir is full, the scheme operates as a gravity flow scheme and when the water level depletes below RL 519.60 m it operates as a lift scheme. The Head work consists of an intake channel leading to jackwell for a length of 350 m and from the jackwell (size 18.6 m x 18.25 m) water is lifted by pumps (vertical turbine) and delivered into the delivery chamber, the length of the raising main being 16 m. The ARBC takes off from this delivery chamber and runs as a combined canal (ARBC and Thimmapur) for a length of 4.92 KM after which, the ARBC runs as an independent canal. The Thimmapur lift which is contemplated under Scheme ‘B’ takes off at Ch.4.92 KM of ARBC. The total length of ARBC from the delivery chamber upto Malaprabha river is 67 KM.

(ii) The layout plan for the Thimmapur lift contemplated under Scheme 'B' is yet to be finalised.

10.03 Estimates and Tenders:-

(i) The detailed estimate of jackwell, delivery chamber and approach embankment was sanctioned for Rs.3.75 crores by the Chief Engineer vide No. CER-5/1994-95 dated 17.01.1995.

(ii) In the meanwhile, the Draft Tender Papers were cleared by the Technical Committee in its meeting held on 07.12.1993. After receipt of tenders and evaluation of
the bids, the work was awarded to an agency on 17.04.1995, the amount of contract being Rs.3.46 crores which was 1.69% below the estimated rates at SR of 1994-95.

10.04 Commencement of work and completion:-

(i) The work was commenced on 02.05.1995 with the completion period stipulated in the agreement as 18 months.

(ii) Since the jackwell structure was close to the dam, the recommendations of the CWPRS, Pune, were adopted during controlled blasting for excavation in hard rock and the vibrations were monitored during execution.

(iii) The design and drawings for Head work were got approved by the Chief Engineer (Designs). The excavation was completed during December 1996 and foundation was approved by the Chief Engineer.

(iv) The drawings were revised after checking all the designs by M/s. Torsteel Research Foundation (TRF).

(v) The works of intake channel, jackwell, delivery chamber and approach embankment, have since been completed in all respects.

10.05 Pumpsets and Motors:-

(i) In the normal course, the power supply should have been taken directly from KPTCL from close-by Sub-stations. After working out the economics, it was decided by the Pumps Committee to provide electricity required for ARBC from the KBJNL Sub-station installed near ALBC scheme. For this purpose, a double circuit 6600 Volt over head line and cable combination has been laid upto ARBC pump house. The cables were used to take power supply on the dam as it was not advisable to take an over head line on the dam. By this arrangement i.e. taking the power supply from one point, the contract demand could be brought down taking advantage of the diversity in the operation of the pump house.

(ii) Facility has also been provided to control the operation of the pumps from ALBC itself, thus enabling the reduction of the operation staff at ARBC to the bearest minimum.

(iii) As the take off level at ARBC is 517 m, a buffer wall on the delivery side was proposed to be constructed so as to allow water to flow from the reservoir itself under gravity as long as the water level in the reservoir was higher. This arrangement eliminated the necessity of running the pumps when the water level in the reservoir is above RL 517 m, thereby conserving the precious energy.

(iv) In this case also, provision has been made for the use of a lower speed, smaller capacity motor when the quantum of water to be pumped is less or when the net Head is low.

(v) Three pumps including one as spare, each of discharging capacity 5 cumecs, have been installed and these are connected to three dual speed motors of 1050 KW at a rated speed of 490 rpm and 660 KW at a rated speed of 420 rpm.
(vi) This work has been carried out by M/s. Kirloskar Brothers. The pumps were test run during November 2002. Some problems noticed during the test run have since been sorted out.

(vii) The work of supplying, installing and commissioning the switchgear and the distribution system in both ALBC and ARBC has been carried out by M/s. Kirloskar Electricity Company.

(viii) The requirement of water for the Thimmapur lift when Scheme ‘B’ becomes available can be met by installing one more pumpset of the same capacity.

10.06 EOT crane:-

The work of designing, engineering, manufacturing, supplying, erection, commissioning, testing and operation of 32t/5t capacity EOT crane has been completed.

10.07 Canals:-

The combined canal from Ch. 0 to 4.92 KM is completed. The independent ARBC from Ch. 4.92 to 67 KM is nearing completion. As a matter of fact, the Alamatti Right Bank Canal was earlier contemplated for a length of 121 KM to irrigate 16,100 ha under Scheme ‘A’; but due to limiting its length to 67 KM i.e. upto Malaprabha river, the irrigable area has come down to 9,900 ha.

10.08 Salient Features:-

The salient features of ARBC under Scheme ‘A’ are shown in the statement enclosed as Annexure-3.

11.0 Rampur (Navali) Lift Irrigation Scheme:-

11.01 Water utilisation and irrigable area:-

It is proposed to irrigate 20,235 ha under Rampur Lift Irrigation scheme by utilising 5.60 TMC of water under Scheme ‘A’ of the Tribunal Award i.e. under the UKP programme of 173 TMC utilisation. Under Scheme ‘B’ when surplus waters become available it is contemplated to irrigate 12,800 ha by utilising 4.00 TMC.

11.02 Location, Number of lifts and Layout plan:-

(i) The Scheme is located on the Right Bank of Narayanapur reservoir near Rampur village. It is also called as ‘Navali Lift Irrigation Scheme’ as the project is close to Navali village.

(ii) The scheme involves two lifts, the first lift located in the foreshore of the Narayanapur reservoir and the second lift situated near Ane Hosur situated at about 14 KM from the first delivery chamber. The first lift involves an intake channel of about 817 m length with a jackwell of size 17.60 m x 19 m and a lift of 23 m from RL 478.80 m to 501.80 m, whereas the second lift involves a lift of 28 m from RL 497.56 m to 525.00 m.

(iii) The length of lead off canal from the 1st delivery chamber up to the second jackwell (of size 28.35 m x 22 m) near Ane Hosur is about 13.98 KM. Direct irrigation to an extent of 4,131 ha is contemplated under the lead off of canal.
From the second jackwell near Ane Hosur water will be lifted and dropped into the second delivery chamber from where irrigation canals take off.

11.03 Estimates and Tenders:

(i) Administrative approval was accorded to Rampur LI scheme at an estimated cost of Rs.114 crores in Government Order No. ID 62 WUD 90 dated 31.07.1992 subject to certain conditions.

(ii) The estimate for construction of the first Head work amounting to Rs.424 lakhs was sanctioned by the Chief Engineer, UKP, Dam Zone, Alamatti, vide CER No. 21/93-94 dated 04.12.1993. The scope of work according to this estimate included the construction of ring bund, intake channel, jackwell, raising main, delivery chamber and guide wall.

(iii) Tenders were invited for the work and after evaluation of the tenders received, the work was awarded to an agency at a tendered amount of Rs.424 lakhs which was 1.96% above the estimated rates. The agreement was executed on 10.01.1994 and work order was given on the same day.

11.04 Commencement of work and completion:

(i) The mark out was given to the agency on 11.03.1995 and work was commenced on the same day. The stipulated date of completion as per agreement was 10.01.1997.

(ii) During the agreement period, only the intake channel, formation of raising main embankment, ring bund and delivery chamber, could be tackled. As the river experienced high floods during 1995-96 monsoon, the ring bund which was executed according to the sanctioned section collapsed at several places. Settlements and slips also took place resulting in heavy seepage through the body of the ring bund. Due to this incident further work was delayed.

(iii) The Chief Engineer inspected the work and issued instructions through his letter dated 22.01.1996 to restore the ring bund by increasing its section. Accordingly, the ring bund was strengthened by raising & widening and providing additional berms.

(iv) The ring bund once again experienced slips on the downstream side during 1998-99 which necessitated the strengthening of downstream side berm.

(v) During execution of the intake channel, its section was revised by the Chief Engineer (Designs) vide his letter dated 20.02.1995. The specification of the lining was also changed by the Chief Engineer (Designs).

(vi) Tenders had been called based on the quantities as per sanctioned estimate and drawings, which were tentative. The drawings for the jackwell were modified during execution of the work and the modified drawings were approved and communicated by the Chief Engineer (Designs) on 21.04.1995. Based on the modified approved drawings, the work of jackwell was taken up for construction.

(vii) While the jackwell was under construction, the designs were referred to the consultants M/s. TORSTEEL Research Foundation (TRF) on 04.10.1999 for proof
checking as per instructions of the Pumps Committee. M/s. TRF furnished the modified drawings for the first jackwell on 10.02.2000 according to which additional columns had to be provided and crane beam had to be increased. M/s. TRF issued the final set of drawings during July 2001.

(viii) The work of the first Head work near Rampur (Navali) has since been completed in all respects.

11.05 Pumpsets, Motors and Transformer Sub-station:-

(i) The detailed specifications for design, manufacture, supply, erection and commissioning were prepared by the consultants M/s. Karnataka Power Corporation Limited.

(ii) The first lift near Rampur (Navali) provides for installation of three pumpsets (vertical turbine) which includes one stand by pumpset. Each pump is capable of lifting 5.4 cumecs. The pumps are driven by 1125 KW motors having a rated speed of 495 rpm.

(iii) The variation in level of water in the reservoir is less than that in the Alamatti lake, the variation being 4.5 m in Narayanapur reservoir compared to 19.50 m in Alamatti reservoir. Still the calculations justified procurement of an additional motor of smaller capacity (750 KW) with a rated speed of 420 rpm which will be put to use when the discharge during any fortnight is less or when the net Head is low.

(iv) As regards drawing the power line, the KPTCL insisted on taking power at 110 KV from the Lingsugur station which is about 30 KM from Ane Hosur. If this proposal had been accepted, the KBJNL would have incurred an extra expenditure to an extent of several million rupees, not only towards the cost of the line but also towards the stations to be constructed at Navali and Ane Hosur. After protracted correspondence and discussions by the Pumps Committee, the KPTCL agreed to supply power at 33 KV. The Sub-station at Navali will have 2 transformers of 5 MVA capacity and the secondary voltage will be 6.6 KV. With a view to minimizing the voltage dip during starting, soft starters have been procured for starting the motors.

(v) Work of pumpsets & motors was carried out by M/s. BHEL in association with M/s. Voltas and the work of Sub-station was carried out by M/s. Kirloskar. Works have been completed and awaiting commissioning.

11.06 2nd Jackwell near Ane Hosur:-

The work has been entrusted to an Agency in July 2000 at a tendered amount of Rs.404.73 lakhs and the work is nearing completion.

11.07 Pumpsets, Motors and Transformer Sub-station for the Ane Hosur Head work:-

(i) As the design of this scheme had not been finalized, it was possible for the Pumps Committee to study the various alternatives in respect of the size of the pumpsets and the dimensions of the jackwell and select the most economical option. Being a canal type lift scheme, the problem of Head variation was absent. Three pumpsets (including one stand-by) are proposed to be installed under the Scheme 'A' and each set has a discharging capacity of 4.7 cumecs of water over a Head of 30 m. Each pump will be coupled to a 1775 KW motor having a rated speed of 490 rpm. The requirement of water under Scheme 'A' being 9.4 cumecs, two pumps are adequate to
lift this quantity of water and third one will be a stand-by. One more set of similar capacity will be needed for the Scheme 'B'.

(ii) Tenders for the work are called for and a decision to award the work will be taken shortly.

(iii) The Sub-station to supply power will have two transformers, each of capacity 6.3 MVA and the supply voltage is reduced to 6.6 KV to run the motors. The 33 KV line being extended from Lingsugur will be tapped to give power supply to this station. A double circuit line with coyote conductors will be drawn from Lingsugur and only a single circuit line is extended to Navali considering the load at this pump house. This work is being carried out by M/s. Deepak Cables on behalf of KPTCL at a cost of Rs.6.50 crores. For the present, power supply will be given to Rampur Sub-station to enable supply of water to the direct atchkat under the lead off canal between Navali and Ane Hosur. Ane Hosur scheme is scheduled to be commissioned during the third quarter of FY 2004. These two lift systems have to work in tandem.

11.08 Salient features:-

The salient features of Rampur L.I. scheme are shown in the statement enclosed as Annexure-4.

12.0 Indi L.I. Scheme:-

12.01 Water utilization and irrigable area:-

It is proposed to irrigate 41,900 ha under Indi L.I. scheme by utilising 11.90 TMC of water under Scheme 'A' of the Tribunal Award i.e., under the UKP programme of 173 TMC utilization. Under Scheme 'B' when surplus water becomes available, it is contemplated to irrigate 19,000 ha by utilizing 4.50 TMC of water.

12.02 Location and layout plan:-

(i) The proposals for the Head works prepared by the Chief Engineer, Kembhavi were reviewed by the Pumps Committee. The site was also inspected by its Members. Modifications were effected in respect of the intake channel, dimensions of the pump house and location of the delivery chamber which enabled reduction in the capital expenditure to an extent of Rs.4 crores.

(ii) The scheme consists of establishing a pump house near Kembhavi and drawing water from NLBC in the 74th KM. Water will be lifted to a height of 34 m, the requirement of water being 24.85 cumecs under Scheme 'A' and 34.76 cumecs under Scheme 'B'. The length of intake channel from 74th KM of NLBC to the jackwell-cum-pump house is about 1.05 KM. The length of the raising main from the pump house to the delivery chamber is about 34.50 m. The length of the irrigation canal taking off from the delivery chamber is about 97.30 KM. Sindagi & Indi taluks of Bijapur district and Shorapur taluk of Gulbarga district will be benefited (under Scheme 'A') by this L.I. scheme.

12.03 Present stage of works:-

(i) The work of construction of head regulator and the intake channel has been completed.
(ii) Construction of the Head work including the transition, jackwell and delivery chamber, is in progress.

(iii) The work of irrigation canal from 0 to 97.30 KM is in various stages of construction.

12.04 Pumpsets, Motors and Transformer Sub-station:-

(i) As per the initial calculations, six turbine pumpsets (including one stand by), each with a discharging capacity of 4.97 cumecs, are proposed to be installed. These will be driven by motors of 2050 KW capacity with a rated speed of 490 rpm. 5 sets are adequate to lift the quantity of water and the sixth one will be installed as a stand-by.

(ii) Tenders received for supply, erection and commissioning of the pumpsets and motors have been cancelled and fresh tenders have been invited.

(iii) Power supply is proposed to be obtained from the Shahapur Station belonging to KPTCL and a 110/6.6 KV, 30 MVA capacity Sub-station is planned to be installed adjacent to the pump house.

(iv) Tenders for construction of Sub-station are being invited in consultation with the KPTCL authorities. Survey and preparation of estimates for construction of 110 KV transmission line from Shahapur to Indi lift site is in progress by KPTCL authorities.

12.05 Salient features:-

The salient features of Indi L.I. Scheme are shown in the statement enclosed as Annexure-5.
CHAPTER-14*

INVESTIGATING THE CAPABILITY OF NARAYANAPUR LEFT BANK CANAL TO CARRY 10,000 CUSECS.

1.0 **Background**:–

1.01 The Narayanapur Left Bank Canal (NLBC), designed to carry a discharge of 10,000 cusecs, was constructed in two phases. The first phase of the canal from the Head regulator upto KM 35 was constructed in Mid-1970s under the State funds whereas next phase of the canal from KM 35 to KM 78 (Tri-junction) was constructed with World Bank assistance during the period from 1978 to 1986.

1.02 The hydraulic particulars of NLBC at Head reach [approved by the Chief Engineer, Irrigation (North), Belgaum], are as under:-

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed width</td>
<td>16.45 m</td>
</tr>
<tr>
<td>Bed fall</td>
<td>1 in 7400</td>
</tr>
<tr>
<td>Canal inner slope</td>
<td>2:1 in banks</td>
</tr>
<tr>
<td>Side lining in cutting reaches</td>
<td>UCRS masonry</td>
</tr>
<tr>
<td>Side lining in embankment reaches</td>
<td>PCC lining</td>
</tr>
<tr>
<td>Outer slope of embankment reaches</td>
<td>1½ :1</td>
</tr>
<tr>
<td>Top width of bank on SR side</td>
<td>6.10 m</td>
</tr>
<tr>
<td>Top width of bank on IP side</td>
<td>3.05 m</td>
</tr>
<tr>
<td>Full supply depth</td>
<td>6.10 m</td>
</tr>
<tr>
<td>Free Board</td>
<td>1.20 m</td>
</tr>
<tr>
<td>Height of unlined free board</td>
<td>0.90 m</td>
</tr>
</tbody>
</table>

1.03 After several years of operation, especially during the 1990s, several slope failures and slips occurred at many places of the canal. A rough assessment revealed that an amount of about Rs.121 lakhs was spent on restoration of the slipped portions. The matter therefore required immediate attention so that the problems could be correctly identified and solutions found out thereon more so because almost the entire CCA contemplated under UKP Stage-I (4.09 lakh ha out of 4.25 lakh acres contemplated under Stage-I) was coming under NLBC and any major failure in the system could result in a great catastrophe.

2.0 **Appointment of Sub-Committee for addressing the problems**:-

2.01 Considering the several deficiencies in the embankment reaches of NLBC, particularly from KM 0 to KM 17 where the embankment sections were found, on verification, to be not stable and not conforming to the designed sections, the Engineer-in-Chief and Ex-officio Special Secretary, UKP, Alamatti, (ECSS) constituted a Sub-Committee in his order dated 30.12.1993, consisting of the Chief Engineers of UKP, for locating the deficiencies and suggesting improvements to the canal.

2.02 The Sub-Committee held its first meeting on 29.03.1994 and reviewed the available data. The Sub-Committee conducted its subsequent meetings on 17.08.1994 and 22.09.1994 and undertook an inspection of NLBC on 24.09.1994.

(*) Source of this chapter: 1) Records of the Office of Technical Advisory Committee, Irrigation Projects. 2) Proceedings of meetings of Technical Sub-Committee of KBJNL. 3) Reports of studies of Indian Institute of Science, Bangalore. 4) Notes of Chief Engineer, UKP, O&M Zone, Narayanapur.
2.03 The Sub-Committee observed the following features during its inspection on 24.09.1994:-

(i) The existing water prism upto KM 45.93 is as per the requirement of design.

(ii) From KM 46.02 to 53.81, the canal bed level is higher by 15.20 to 22.00 cms.

(iii) Beyond KM 53.81 upto Tri-junction in KM 78, the canal bed level is at variance from the designed level in the range of (minus) 0.30 cms to (plus) 197.90 cms.

(iv) The existing free board in several reaches is found to be much less than the designed 1.2 m.

(v) At several places, the PCC slab lining has sunk resulting in flatter inner slopes and cavitation.

(vi) The top width of the embankment, both on the SR side and IP side at several places, is far less than the designed top width.

(vii) Stagnation of water is seen in several MCPCs.

(viii) In most of the cross regulators and escape regulators, nuts for anchor-girders are not provided.

2.04 While suggesting restoration of the sections of the embankment, both on SR side and IP side, to the sections approved by the Chief Engineer, the Sub-Committee took a stand that it was not necessary to bring the section to World Bank standards just because higher sections as per World Bank standards had been provided beyond KM 35. The Sub-Committee also made several recommendations for rectifying the defects noticed during its inspection.

3.0 Reference to Technical Advisory Committee:-

3.01 Considering the gravity of the situation, the Government referred the matter vide Government Order No. ID 115 KBN 96 (P) dated 20.08.1996 (copy enclosed as Annexure-1) to the Technical Advisory Committee, Irrigation Projects (TAC) for investigation and suggesting remedial measures.

3.02 The terms of reference for the Committee as per the Government Order, included among several other issues, the following:-

(i) To investigate the safety of Narayanapur dam and suggest repairs required, if any.

(ii) There are frequent damages and breaches in the canal system of NLBC from KM 0 to KM 78 which is designed for 10,000 cusecs. But these breaches are happening when the discharge allowed is only 3,000 cusecs. This needs a detailed examination to carry the designed discharge and to suggest the strengthening measures / repair works wherever required.

3.03 The Technical Advisory Committee held preliminary discussions in its 20th meeting on 24.08.1996 and suggested for suitable modification to the Government Order regarding the terms of reference. The Committee was of the view, as there was already a separate Dam Safety Review Panel (DSRP) for UKP, that the issue of investigating the safety of Narayanapur dam was not coming under the purview of TAC and therefore this issue would have to be referred to the DSRP for suitable action.
3.04 Accordingly, modified orders were issued in Government Order No. ID 115 KBN 96 (P) dated 20.09.1996 (copy enclosed as Annexure-2) referring only the issue of investigating the capability of Narayanapur Left Bank Canal to carry 10,000 cusecs to the TAC.

3.05 Inspection by the Technical Advisory Committee:-

(1) The Technical Advisory Committee inspected the Narayanapur Left Bank Canal, Hunsagi Branch Canal, Shahapur Branch Canal and the Mudbal Branch Canal, on 5th & 6th October 1996. Discussions were also held by the Committee with the officers of UKP on 6th October 1996 at Bheemarayanagudi.

(2) Some of the important points observed by the Committee during its inspection, are summarized as follows:-

   (i) Turbulence with high velocity is observed at the downstream of NLBC Head regulator.

   (ii) The top width of the embankment reaches at several places, both on the SR side and the IP side, is less than the approved cross sectional drawing.

   (iii) Many MCPCs are leaking. The exact locations of the leakages are not identified and extent of leakage not measured.

   (iv) Lining of inner slopes has been disturbed at many places, perhaps due to insufficient CNS layer in BC soil reaches.

   (v) There is no water cushion provided for the cross walls to absorb the energy caused due to falling water.

   (vi) At some places, where the canal runs in partial cutting and partial embankment, slips have occurred.

   (vii) There is seepage through the embankment at some places. The extent of seepage has not been measured.

   (viii) Stagnated water is found in the command area adjoining the canal at some places. It could not be ascertained whether this was due to leaking or due to rains.

   (ix) Silt and debris accumulated inside the Gundalgera tunnel are yet to be cleared.

   (x) Cross regulators constructed at several places have not been operated on the plea that the disputes of the contractor are in arbitration. If the regulator gets jammed or struck up for being not in operation for a long time, it is a matter of serious concern as it may result in major catastrophe for the canal.

   (xi) The adjoining hillock at 62.15 KM of NLBC had started slipping long back, the treatment for which is under examination separately by the Technical Sub-Committee of Krishna Bhagya Jala Nigam Limited (KBJNL). The concerned Executive Engineer informed that no further movement of the hillock has been observed in recent past.

   (xii) The actual bed level of NLBC at the tri-junction in the 78th KM of NLBC is above the required level. No specific reasons for the same are forthcoming.

   (xiii) Thick jungle growth on the canal slopes in the water prism side of Shahapur Branch Canal has been observed at many places. The canal is in a bad shape due to lack of proper maintenance. Loose boulders are seen at the top edge of the canal and in the event of their falling, the canal is likely to be damaged and flow getting affected.
(xiv) There is still some excavation remaining to be done to reach the bed level at several places of Shahapur Branch Canal.

(3) The Chief Engineers were requested during discussions at Bheemarayanagudi, to furnish all the required details to the Committee expeditiously. Instructions were also given by the Committee to take up the restoration of one MCPC by entrusting the work to M/s. REPCON which had the required expertise in doing such works, on an experimental basis.

(4) A copy of said Inspection Notes of the Technical Advisory Committee is enclosed as Annexure-3.

(5) Thereafter, Dr.A.Sridharan, Professor of IISc and also Member of TAC, was addressed by the Chairman, TAC, in his letter No.TAC/25/96 dated 09.10.1996 (copy enclosed as Annexure-4) requesting the IISc to undertake studies as to -- (i) whether NLBC was capable of carrying 10,000 cusecs and (ii) whether NLBC would be stable when 10,000 cusecs discharge is allowed, and also to make necessary recommendations in this regard.

(6) Dr.A.Sridharan and Sri.H.S.Bhat, Members of the Committee further inspected the canal system on 26.10.1996 and gave a Note on their observations (copy enclosed as Annexure-5). Important observations / suggestions made by the Members are as noted below:

(i) Stilling basin floor of the Head regulator may be inspected by KERS by emptying the standing pool of water.

(ii) The KERS may study the functioning of the Head regulator for different gate openings and discharges and suggest suitable remedial measures including the canal downstream upto ch.600 m where turbulence was observed.

(iii) Depth of flow in the canal for different discharges upto 10,000 cusecs or to the extent possible may be checked by trial run of the canal upto the cross regulator at ch.13.25 KM. The eventual 'n' value realized may also be found out.

(iv) Head loss caused due to obstructions by the CD works on the canal upto the end point should be correctly assessed.

3.06 Examination of details by the Technical Advisory Committee:

(a) 23rd meeting of TAC:-

The Inspection Note dated 26.10.1996 of the Members Dr.A.Sridharan and Shri.H.S.Bhat was discussed in the 23rd meeting of TAC held on 02.11.1996 and the observations made by the above Members were treated as supplementary to the inspection notes dated 5th & 6th October of the Committee. The Managing Director (MD) was requested to issue necessary instructions immediately to the project authorities directing them not to allow disintegrated swelling shale or BC soil / yellow clay (shadu) for use on the embankment or as backing material to the PCC lining in cutting reaches in future canal works of the project, without the express approval of the Chief Engineer (Designs). The MD was also requested to take immediate follow up action on the observations made by the above Members and arrange to furnish all the required details to the Indian Institute of Science, immediately.
(b) **25th meeting of TAC:**

(1) The details furnished by the project authorities were examined by the TAC in its 25th meeting held on 03.12.1996. It was observed by the Committee that the details furnished by the project authorities on several occasions were inconsistent and that no prompt action had been taken on many instructions given by the Committee during its inspection.

(2) During the meeting it was pointed out by the Irrigation Secretary that, though the Head regulator of NLBC and the Head reach of the canal had been designed and constructed for 283.45 cumecs (10,000 cusecs), it had been indicated in the DPR of UKP 2nd Stage Multi-purpose project sent to Central Water Commission, that the NLBC was designed for a Head discharge of 230.81 cumecs (8,155 cusecs). He also brought to the notice of the Committee that, in the Master Plan for O & M of UKP prepared by WAPCOS, it had been mentioned that the NLBC was planned and constructed upto first 19 KM for 283.45 cumecs (10,000 cusecs) considering the requirement of 34.4 cumecs for Indi Lift Canal, and that the refinement of planning had permitted a reduction of capacity in the main canal at KM 19 to 267.68 cumecs (9,443 cusecs). When asked to clarify the correct position, the Chief Engineer, O&M could not throw much light on the issue.

(3) After detailed discussions, the Committee made several observations on the issue and also gave suggestions to the project authorities. Some of the important observations made by the Committee are as noted below:

(i) Model studies should be conducted by KERS for the canal from Ch.0 to 600 m where turbulence with high velocity has been observed.

(ii) All the details required by the Indian Institute of Science should be furnished to the Professors of the Institute immediately for conducting necessary studies.

(iii) The Chief Engineer, O&M should verify from the records as to whether the Head regulator and the Head reach of NLBC are designed and constructed for 10,000 cusecs or not. The basis for the mention made in the report of WAPCOS and that made in the DPR of UKP 2nd Stage Multi-purpose project should also be verified with reference to cropping pattern, water requirement, etc. The facts should be correctly reported by the Chief Engineer to the Committee supported by detailed calculations, approvals given from time to time, variations made during execution, if any, etc.

(iv) It is desirable to have one more agency for executing the restoration works of MCPCs apart from the firm M/s. REPCON.

(v) The Chief Engineer should trace the locations where exactly the seepage has occurred in the embankments and suggest suitable measures for stopping the seepage and furnish the same along with all the details to the Indian Institute of Science.

(vi) Wherever the existing section of the canal embankment is found to be insufficient from the stability point of view, the Chief Engineer (Designs) should suggest suitable measures to improve the stability of the section after making the required stability analysis.

(vii) Wherever slips have already occurred or are vulnerable for occurrence, remedial action may be taken only after studies are done by the Indian Institute of Science.
(viii) Regarding the hillock slide in 83rd KM of NLBC, the Chief Engineer, O&M should work out the costs of various alternatives and furnish the same to the Member Dr. A. Sridharan, and after his examination, the subject may be brought before the Technical Sub-Committee of KBJNL.

(c) 28th meeting of TAC:

(1) Further details furnished by the Chief Engineer, O&M, in compliance to the various observations made by TAC as well as to the note given by Dr. A. Sridharan and Sri. H. S. Bhat who had inspected the canal on 26.10.1996, were examined by the TAC in its 28th meeting held on 05.03.1997. In this meeting, the Chief Engineer clarified that the discharge required at NLBC Head, as per the project report of UKP 2nd Stage prepared in February 1996, was 8,439 cusecs and that the designed capacity of the canal as well as the designed Head discharge is 10,000 cusecs as per the project report of 1970. He also stated that the canal has accordingly been constructed to carry a discharge of 10,000 cusecs. Considering the reference made by the Government to the Committee i.e., to examine whether the canal as constructed is capable of carrying the designed discharge of 10,000 cusecs and to suggest improvements / repairs required in this direction, Dr. A. Sridharan stated that the investigations have to cover mainly two aspects viz. the hydraulic aspect and the stability aspect. He further stated that the Indian Institute of Science, to whom the issue had been referred, would conduct the necessary studies keeping in view both the above aspects.

(2) The Chief Research Officer in Hydraulics Division, Karnataka Engineering Research Station (KERS), Krishnarajasagara informed that he inspected the canal in November and December 1996 and found that the turbulence at the downstream of the Head regulator was being caused due to unequal opening of the Head regulator gates. According to his findings the turbulence almost ceased to exist when the gates were operated equally. The KERS also made studies in the reach from Ch. KM 0 to KM 13, where there were no obstructions in the canal, to ascertain the 'n' value being realized in the canal. The findings indicated that the 'n' value varied from 0.04732 to 0.0588. The Chief Research Officer also mentioned that there was a cross wall at KM 27 of the canal which resulted in increased flow depths in the upstream even for a lesser discharge of 2,300 cusecs and that the 'n' value would change altogether for "no cross wall" condition. He was of the opinion that the small reach of 13 KM considered for determining the 'n' value might not be sufficient enough for conducting such an important study and therefore it may not be truly representative. He was of the view that a more comprehensive study like mathematical modeling was necessary for that purpose.

(3) Some of the important decisions taken by the Committee in its above said meeting are as under:-

(i) The main issue to be examined shall be whether the canal as constructed is capable of carrying 10,000 cusecs and to identify improvements / repairs necessary in this direction.

(ii) The Chief Engineer, O&M should get a study on hydraulic aspect conducted by KERS during the closure period in the reach upto 13.25 KM where there are no cross walls / obstructions by allowing 5,000 cusecs in the canal. The purpose of this study should be to find out the hydraulic features like whether the theoretical FSD has been realized, performance of the canal for different discharges upto 5,000 cusecs, 'n' value realized, etc.

(iii) The Indian Institute of Science would separately study the hydraulic aspect and the stability aspect of the canal.
(iv) The Chief Engineer (Designs) should also check the canal sections, especially embankment sections, for stability.

(v) Proposals for treatment to the hillock in 63rd KM should be finalized in consultation with Dr. A. Sridharan and brought before the TSC of KBJNL, expeditiously.

(vi) Wherever seepage through embankments is noticed, such instances with all relevant details should be brought to the specific notice of Indian Institute of Science to enable the Institute to suggest suitable remedial measures.

(vii) Re-sectioning of the canal like widening, raising of embankment, etc., should be taken up only after the receipt of the report from IISc. However, wherever slips have occurred or are vulnerable for occurrence, necessary repair works can be taken up on priority.

(viii) A detailed Action Plan should be prepared by the Chief Engineer, O&M identifying the works to be done during the closure period and the works to be done without waiting for canal closure keeping in view the suggestions made by the Committee, in consultation with IISc.

3.07 Interim report of Indian Institute of Science, Bangalore:

(1) The Professors of Indian Institute of Science (IISc), in the meanwhile, inspected the canal on 26.10.1996 and again on 23.02.1997 and took soil samples from different locations. During inspection, the Professors observed that -- (i) cross sections as existing were not conforming to the design cross sections; (ii) there were leakages through embankment on to the downstream toe; and (iii) unsatisfactory performance of lining.

(2) The IISc, after conducting several studies, submitted its interim report for the reach from KM 48 to KM 70 to the project authorities in August 1997. The Institute in its interim report made the following observations / recommendations:

(i) The observations at the failure zones of NLBC have revealed that the soil behind the lining is fully saturated. The soil layers close to the lining have either slaked or close to slaking. Besides, the material used for casing has been a wrong choice.

(ii) Locations wherever slips have taken place, and at locations wherever canal bed heaves have occurred, the following remedial measures are suggested:

(a) Remove all the slipped material, casing material or the material below the lining at the bed as the case is, and make up the slope / the canal profile to the original dimensions with well compacted properly chosen CNS material.

(b) Provide 100 mm thick RCC lining with 0.2% steel both ways for the full canal cross section covering (FSD+FB) with 1 m wide anchorage.

(c) Seal the joints between the RCC lining and the existing lining with bituminous compound.

(d) To start with, the above recommendations may be carried out at all the already identified distress locations. Based on further observations during closure periods, the treatment can be gradually extended.
At all locations of MCPC, the following remedial measures are suggested:

Provide for 20 m length (10 m on either side of centerline of MCPC) RCC lining laid in the same way as mentioned earlier. It is expected that the presently observed leakages will be significantly reduced with this treatment. If unsuccessful, further remedies can be worked out.

These recommendations were carried out by the project authorities.

Further examination by TAC in its 36th meeting:

1. The subject came up for discussions in the TAC during the course of its 36th meeting held on 16.01.1998. The compliance report furnished by the Chief Engineer, O&M to the observations made by the Committee in its 28th meeting, was reviewed by the Committee. It was noticed by the Committee that the studies required to be done by KERS were yet to be taken up as the matter was still under correspondence between the Chief Engineer, O&M and the KERS. As regards the studies to be done by IISc about the stability of the embankment sections, only 5 sections had so far been analysed out of 20 sections referred to the Institute. However, the stability analysis made in 4 sections had given positive results whereas the result in the remaining section was negative. The Committee also observed that no concrete action had been taken to implement the suggestions of the Committee with regards to the treatment to the hillock in 63rd KM of NLBC.

2. After discussions, the Committee directed the project authorities to comply with the observations / suggestions of the Committee expeditiously and also to give a detailed report on the result of actions taken indicating therein whether the performance of the canal is satisfactory, etc.

Report of Karnataka Engineering Research Station:

1. The Karnataka Engineering Research Station (KERS) team visited the site from 10.08.1998 to 13.08.1998 to conduct the hydraulic study of NLBC from KM 0 to KM 14. However, due to practical problems and other technical reasons, the study could not be carried out.

2. The Director, KERS, Krishnarajasagara, furnished a report to TAC through his letter dated 31.08.1998 explaining therein the attempts made to conduct hydraulic studies and the problems encountered therein, which are briefed as stated below:

(i) Due to standing water to the extent of 0.2 to 0.3 m in the canal, the project authorities could not take measurements of cross sections, which was what was really required in the computation of "n" value.

(ii) It was also observed that the calibration curves prepared for the operation of the Head regulator had not been in use at all. It appeared that the project authorities had devised their own procedure to let the discharges into the canal through the regulator gates. How far this tallies with the model devised calibration, would remain a moot point since it is undoubtedly the actual model derived calibration only which are authentic in releasing the requisite quantum and no other method probably would be able to assure the required releases into the canal as accurately as the model derived calibration. To ascertain the gate openings, the project authorities were referring to the practice as
suggested by M/s. TSP Ltd., which essentially relates to the speed of electrical
motor used to hoist the gate. As per the practice in vogue, the gate is supposed
to raise itself at a rate of 0.3 m per minute. Nothing could be more crude than
this.

(iii) Since the project authorities were not aware of any calibration curve already
prepared and furnished by KERS, the flow rates must have been assessed by
them using some empirical formulae. It is an established fact that the use of
such formulae would not enable one to get to know the accurate discharge.

(iv) Normally, the radial gates of the Head regulator in closed position do not seem
to allow much leak to occur through the same. But with the gates raised, very
heavy leaks occur in almost all the gates, which literally raise as a jet in the
interstice between the breast wall and the gate face as to fall from over the gate
on to the basin dissipater below. The quantum of leaks seems much too
substantial to be ignored and of no consequence especially considering the
scope of the study i.e., assessing the value of "n" where the flow rates are of
quite paramount importance. This may be a prime limitation in the study
embarked upon.

(v) When a discharge of about 2,300 cusecs was allowed into the canal, the flow
by-passing over an escape entered a small nala joining the river Don. Villagers
situated at the confluence of the nala with the river Don complained that the
nala waters had entered their village and thus protested and warned against
any increase in the flow rate. The flow rate was therefore reduced by the
project authorities.

(3) Concluding his report, the Director stated that the prospect of attempting a
study afresh appeared bleak.

(4) The subject was discussed by the MD, KBJNL with the Director, KERS on
28.09.1998 when the Engineer-in-Chief, WRDO; Director (Technical), KBJNL; and the
Chief Engineer, O&M were also present. During discussions it was concluded, that due
to practical difficulties, hydraulic tests cannot be conducted. It was, however, agreed to
adopt an alternative method such as carrying out "Theoretical back water analysis
method" for finding the out the discharge carrying capacity of NLBC.

4.0 Discussions in Technical Sub-Committee of K.B.J.N.L.-:

4.01 The subject came up for discussions in the 53rd meeting of the Technical Sub-
Committee of KBJNL held on 27.06.2000 and the report of the Chief Engineer, O&M was
reviewed by the Committee. The Chief Engineer in his report had highlighted yearwise
slips that had occurred in NLBC from KM 40 to 74 and stated that an amount of
Rs.121 lakhs had been spent during the years 1990 to 1996 towards restoration of
slipped portions. The nature of repair mainly carried out was removing slipped earth,
reconstructing the embankment with CNS including filter drains and resetting of PCC
slabs with 30 cm thick CNS back filling. He also stated that the IISc had given its interim
report suggesting the following measures:-

(i) Removal of all slipped material, casing material or the material below the lining at
the bed as the case may be and make up the slope / canal profile to the original
dimensions with well compacted properly chosen CNS material.

(ii) 100 mm thick RCC lining with 0.2 % steel both ways for the full canal cross
section covering FSD + FB may be provided with 1 m wide anchorage and the
joints between RCC lining and the existing lining may be sealed with bituminous
compound.
4.02 The Chief Engineer informed that the restoration work of slipped portions after 1996 had been carried out as per the said interim report of the IISc and that the cost involved was about Rs.525 lakhs.

4.03 In the meanwhile, the issue had also been referred, by the project authorities, to the National Institute of Rock Mechanics (NIRM) who had suggested the following two alternatives to stabilize the failed zone in the SR side.

Alternative No.1:

Stability can be improved by filling the failed zone with BC soil covering a length of 100 m. With this stabilization measure, the slope would become stable from long term point of view as the FS of the slope is greater than 1.5.

Alternative No.2:

Complete soil should be excavated near the failed portion over a length of 100 m and the hearting with BC soil should be provided. After providing hearting, the embankment should be constructed with the C-Q soil proposed for restoration.

4.04 According to the analysis made by the Chief Engineer, O&M, the cost of restoration work per Kilometer as per the interim report of IISc was around Rs.240 lakhs whereas the same as per the recommendations of NIRM was Rs.980 lakhs for Alternative No.1 and Rs.1520 lakhs for Alternative No.2.

4.05 After deliberations, the Committee decided that the issue should be referred to IISc for obtaining final report on the issue. The Committee also decided to visit the spot during its inspection of the project.

4.06 The Technical Sub-Committee of KBJNL inspected the NLBC on 2\(^{nd}\) July 2000 and decided that the BC soil should not be provided for the inner casing area at all and therefore the proposal of M/s. NIRM is technically unsuitable. The Committee was also informed during inspection that in all places wherever stabilization had been carried out in the slipped portion as per the recommendations of the IISc, no further problems of slippage had been observed. The Committee therefore desired that the method suggested by IISc should be adopted and the work should be completed before release of water in the canal by tackling the work in small stretches of 10 m. The Committee also directed that the BC soil, wherever it existed in the inner casing, should be completely removed and that care should be taken to execute the RCC lining in proper sequence. The Committee also suggested to refer any further soil mechanics problems to the IISc only.

5.0 Final Report of Indian Institute of Science:-

5.01 The Professors of Indian Institute of Science (IISc) undertook their third visit to the canal on 10.10.2000 and inspected the entire stretch from KM 43 onwards and also from KM 10 to KM 15. The Professors observed that in 32 reaches from KM 48 to KM 70, where repairs to slipped regions had been carried out during the closure periods of 1998-99, 1999-2000 and 2000-2001 based on the recommendations in the interim report of IISc, the performance of the canal sections had been reported as satisfactory. However, there was one reach from KM 51.52 to 51.56 that had slipped and could not be restored. The stability of the slope was in such a condition that the slipped slope could not be touched as it would keep sliding down. Further, for the reach from KM 51.06 to KM 51.12, the restoration met with some difficulty during 1999-2000 as the slope was
not found very stable to permit the restoration work. It was some how managed by providing a toe wall.

5.02 From the studies done, it was inferred by the IISc that though there was considerable variation in the compressibility and shear strength values, the canal slopes had adequate safety against rotational slip failures. So if any slope failure had taken place, it was not on account of inadequate shear strength of the material per se, but due to the alternate wetting and drying of the expansive soil. The analysis made from the sample collected at one of the chainages (ch.51.54 KM) brought out that the compacted specimen corresponding to maximum dry density and OMC state loses its shear strength by almost 100% when the soil gets saturated and swollen. However, even this swollen soil shear strength is of considerable magnitude under 100 KPa normal pressure. It had been established elsewhere even under normal pressure, fully swollen expansive soil does have considerable shear strength. Therefore, the real cause of failure was the alternate volume changes that take place during swelling / shrinkage. It is this cause that triggers the mechanism of failure. The swelling tests done on the sample (ch.51.54 KM) showed a swell potential of 6% and swelling pressure of 1.5 Kg / cm² and it is this pressure that causes the volume change disrupting the slope.

5.03 Continuing the recommendations made in the interim report which had already been carried out satisfactorily, the IISc in its final report submitted in January 2001 (copy enclosed as Annexure-6), made the following observations / recommendations for the location from Ch.51.52 to 51.56 KM:-

(i) The casing material at this reach is expansive and so the slope did not permit the implementation of the earlier recommendations.

(ii) Remove the entire slipped material (if need be right upto the core) and replace the same with compacted CNS material.

(iii) If standard CNS material is not available, the available red earth (murrum) should be stabilized with at least 3% cement (by weight). The soil could be mixed thoroughly with 3% cement and then compacted in layers of thickness not exceeding 200 mm. The compaction should be done in layers to achieve the maximum dry density and OMC of red earth (murrum) material. If for some reason this could not be done, then provide soil cement bands as follows:

(a) On each layer of soil spread out to a thickness of 300 mm at OMC (or slightly on the wet side of OMC), spread uniformly 33 Kg of cement over every 3 sq. m of area. Spread another thin layer of soil over the cement, slightly sprinkle the soil and then do the regular roller compaction.

(b) It is desirable to mix the spread cement in the top layer by cross scraping. Typically, for a canal height of 5 meters the compacted soil mass will have about 25 such bands. The soil cement bands will stiffen the soil and reduce the swell potential.

(iv) Provide an RCC toe wall to a depth of 1.25 m integrated with the RCC lining. Thickness of toe wall should be 22.5 cm. Provide 100 mm thick RCC lining with 0.2 % steel both ways for the full canal cross-section covering (FSD+FB). Construction of the lining should be done between the templates from bottom towards top to enhance proper compaction of concrete and continuity. Construction joints along the longitudinal direction should be avoided.

(v) It is reported that the implementation of the earlier recommendations in the reach 51.06 to 51.12 Km was some what difficult, but the job seems to have been done with a provision of toe wall on IP side. If for some reason this reach were to show...
any further damage, then the recommendations as given for chainage 51.52 to 51.56 Km may be implemented for this reach also.

6.0 Distress to embankment in 60th KM of NLBC:

6.01 Background:

(1) The 60th KM of NLBC runs along the side of a hillock situated on the left side. The canal runs in cutting on the left side and embankment on the right side, the maximum height of the Bank being 13.29 m. Construction of this reach was completed in 1984.

(2) Cracks started developing in the canal from 1985 itself. Remedial measures were taken from time to time in accordance with the opinion of Experts who visited the site. As a matter of fact, based on the expert opinion of Prof. B.K. Ramaiah, the stretch of embankment from Ch. 59.36 to 59.45 KM where damages to the canal had been observed, was reconstructed by removing the shale to a depth of 3 to 3.5 m and filling the same with compacted murrum. This reconstruction was completed in 1986.

(3) During 1994, a series of longitudinal cracks on top of the SR from KM 59.65 to 59.68 KM were observed. These cracks were extending from the hearting zone to the outer edge of the embankment top and were initially 0.2 to 0.3 m wide and 0.6 to 2 m deep. At some places, the width of the crack was even upto 1.2 m with associated upheaval of slope. The reconstruction of this stretch was completed in 1994 by replacing the soft shale in the foundation to a depth of 3 to 3.5 m by compacted murrum.

(4) During 1998, cracks along the downstream edge of SR were observed from KM 59 to 59.33 and also upto KM 59.60. The outer casing material on the downstream had settled to about 20 cm. The reconstruction work was carried out by removal of shale to some depth and by flattening the downstream side. This work was completed by October 2001.

(5) Serious distress to embankment from KM 59.49 to 59.649 was observed by the field engineers in December 2001. The cracks had continued all along the left side of the SR edge and slope adjoining the canal. Further, cracks were also observed from KM 59.600 to KM 59.620 and this was crossing the service road in an inclined manner from one edge to the other edge. The width of crack was ranging from 4 cm to 8 cm.

(6) The site was inspected by the Managing Director on 26.12.2001 who decided to refer this issue to the IISc.

6.02 Preliminary study by the Professors of Indian Institute of Science:

(1) The Professors of Indian Institute of Science visited the site on 18.01.2002 and on 13.02.2002. The Professors observed the following during their visits:

(i) From Ch. 59.51 to 59.60 KM, the typical slip circle failure has occurred with the crest slumping by about 1 m and the downstream toe region heaving heavily.
(ii) Between Ch.59.60 to 59.66 KM, there is a clear collapse of the embankment starting from the center line of the crest towards downstream, the maximum depth of subsidence on the crest being almost 2 m.

(iii) The cause of the distress in the slipped portion is due to the absence / improper functioning of the hearting material, accumulation of pore water pressures in the foundation of the embankment, improper functioning / absence of toe drains.

(iv) Cause of subsidence is due to poor compaction and lack of adequate drainage facilitating the saturation of embankment material.

(2) The Professors of IISc suggested the following remedial measures for immediate compliance:

(i) Toe drain to be fully established and the continuous discharge in the toe drain needs to be ensured.

(ii) Relief wells of 200 mm dia at the toe at 10 m c.c. to a depth of 5 to 8 m need to be installed.

(iii) Bore holes need to be drilled from the top of the berm to a depth of about 10 m going right upto the foundation. These bore holes will facilitate lowering down the phreatic line.

(iv) All the cracks which have opened up at the crest level need to be filled with bentonite – sand mixture slurry.

(v) Monitoring of the distress by way of horizontal and vertical movements at frequent intervals is a must.

(vi) Depending upon the performance of the embankment to the above treatment, further remedial measures will be suggested, if need be.

(vii) Only after the embankment is declared stable, the settled crest portion be made upto the original level.

6.03 Examination by the TSC of KBJNL in its 78th Meeting:

(1) The subject came up for discussion in the 78th meeting of TSC of KBJNL held on 23.03.2002. It was brought to the notice of the Committee that the remedial measures suggested by the Professors of IISc at the site were not being undertaken as per their advice and due care, which was noted by the Committee with concern.

(2) It was also brought to the notice of the Committee that there was an alternative proposal under consideration by the Chief Engineer as a permanent remedy. This proposal involved an alternate alignment towards the hillock where there would be only cutting and no embankment, the approximate estimated cost of the proposal being about Rs.15 crores.

(3) After discussions, the Committee decided that the remedial measures suggested by the Professors should be taken up expeditiously and that the progress should be closely monitored by the Managing Director. It was also decided that the
proposed alternative alignment should not be explored in view of taking up the remedial measures recommended by the Professors of IISc.

6.04 Report of Indian Institute of Science:-

(1) Visits:-

The Professors of IISc made further visits to the site on 01.03.2002, 07.06.2002, 09.07.2002 and 01.09.2002. They also held discussions and meetings with the connected senior engineers.

(2) Nature of distress and observations:-

The Professors, after field inspections / discussions / meetings, made the following observations:-

(i) From KM 59.51 to 59.60, the crest has slumped by about a meter and the downstream toe region shows a corresponding upward movement. The cracks could be observed over the downstream slope face also indicating failure very similar to that of a rotation slip.

(ii) From Ch.59.60 to 59.66 KM, there is a clear collapse of the embankment starting from the center line of the crest towards downstream, the maximum depth of subsidence on the crest being almost 2 m.

(iii) The canal in this reach of KM 60 has had serious problems right from the end of construction to-date. As the problems developed in different stretches at different times in 1984, 1994 and 1998, the reconstruction has not been done uniformly. It can be said that the features of what was done during the first construction were maintained in the subsequent reconstructions. But, the existing and reconstructed drawings at all locations could not be obtained.

(iv) The material that has been used as casing on the downstream slope is said to be "all in" filled material. Though the drawing shows a rock toe, this was not visible.

6.05 Studies & observations made by IISc:-

(1) As there was thick vegetation on the slope and in the downstream region, it was decided as a first step, to remove all the vegetation and to immediately provide some relief wells at the toe of the embankment. It was also thought that if need be, the downstream toe may have to be contained against lateral spread by driving casurina poles. In order to pull down the phreatic line and to intercept the seepage, it was also thought to drill holes through the embankment at the downstream berm.

(2) The provision of relief wells on a war footing at the toe provided the immediate relief. Water started flowing out and the development of cracks and the movements, which had earlier been reported, ceased. The holes on the berm could not be drilled as all-in fill material was encountered and therefore it was abandoned. The seepage discharge was still unsatisfactory and the original toe drain was found to be fully choked. In order to provide a permanent solution to the problem, it was decided to provide new set of large size relief wells of 900 mm dia taken to a depth of about 5 m below the toe and to make a thorough net work of drainage. As the embankment had developed movements and cracks, it was very important to close them effectively. Bentonite sand mixture slurry was suggested and used to fill all the cracks, holes and crevices. The total consumption of bentonite was about 500 bags. Together with sand
and water, the total volume that went into embankment was of the order of 3% of the total downstream embankment volume. Not only the bentonite did seal the crack and increase the stability, it also significantly reduced the seepage.

(3) The relief wells of 900 mm dia were installed during the period May to September 2002. The blockages near the toe were also removed in the stretch from KM 59.5 to 59.7. As the net work of drainage got established and smooth flow in the toe drain ensured, the improvement in the total discharge was quite visible. Thereafter, water level was increased to 5.2 m during September-October 2002 and held for a week. The Head was later gradually reduced and it was found that the total discharge in the drainage net work increased substantially. It was also observed that when the canal was dry, the discharge through the relief wells dropped remarkably.

(4) The above factors established that the seepage taking place within the embankment quite freely, was largely due to the nature of casing material and the repairs done to the drainage system.

(5) Even when the canal was running with 3 to 5 m Head, and for more than two months, the embankment did not show any sign of distress whatsoever. It was therefore concluded that the problem with the embankment was essentially the blockage of seepage water through and underneath the embankment, as a result of which, high pore pressures were getting generated with consequent drop in the shear strength. If it were to be a shear failure between Ch.59.51 to 59.60 KM as was originally thought, the embankment would not have behaved as observed at present. The cracks were essentially a result of slumping and upheavals at toe as a result of loading under undrained conditions.

(6) During March to August 2002, all the efforts were in establishing the cause of failure and in successfully treating the same and therefore, the quantity of seepage itself could not be reduced. There was no sufficient time to redo the canal bed and to seal all the joints in the canal sides. This operation was contemplated to be undertaken at the immediate next opportunity. Then the embankment would become doubly safe. As very insignificant water would seep through the canal into the embankment, there would be no in-stability problem. Even if some water seeps through, no damage will occur, as long as the drainage net work operates effectively.

6.06 The IISc submitted its Technical Report in October 2002 (copy enclosed as Annexure-7) on the remedial measures so carried out at 60th KM of NLBC. In its report, the IISc made the following concluding remarks:-

(i) With the new drainage system established, the performance of the embankment has been satisfactory, even with the canal water flowing at 5.2 m level. The efficiency of the drainage system should be maintained with periodical cleaning and maintenance.

(ii) At the immediate opportunity when the canal is dry, the canal bed and both the sides need to be redone so as to seal the seepage through bed and lining.

(iii) Proper maintenance of records of discharge measurements and respective canal water level need to be kept.

(iv) The top of the bund can be made upto the original level with proper layered compaction of good red murrum material.
7.0 Further slips observed in NLBC and discussions in TSC of KBJNL:

7.01 It was brought to the notice of the TSC of KBJNL during the course of its 86th meeting held on 24.10.2002 by the Chief Engineer, O&M that further slips had occurred at KM 22, 50, 52, 53 and 68 of NLBC. The Committee noted that frequent slips were occurring in NLBC particularly from KM 40 to 78 and that remedial measures were being taken as per the recommendations of the IISc. The Committee also noted that, even the TAC of GOK had made a detailed study of the problem.

7.02 In order to find out a permanent remedial solution to avoid any future slips in other reaches, it was decided to form the following Committee of Experts to inspect the entire NLBC for finding out the reasons for frequent slips and for suggesting permanent remedial measures.

1. Prof. A.Sridharan, Chairman
   Former Adviser, IISc, Bangalore.

2. Prof. K.S.Subba Rao, Member
   IISc, Bangalore.

3. Shri.H.S.Chiniwal, Member
   Engineer-in-Chief (retired), Hubli.

4. Shri.B.M.Rame Gowda, Member
   Joint Director (retired), CWPRS, Pune.

5. Shri.S.S.Magdal, Member
   Chief Engineer (retired), Bagalkot.

6. The Chief Engineer, Member
   UKP, Canal Zone No.1, Bheemarayanagudi.

7. The Chief Engineer, Convener
   UKP, O & M Zone, Narayanapur.

8.0 Observations by M/s. Hiremath Engineering Consultants:

8.01 It was brought to the notice of the TSC of KBJNL during the course of its 87th meeting held on 30.11.2002 that Shri.Hiremath, Principal, M/s. Hiremath Engineering Consultants, had met the Managing Director on 26.10.2002 to discuss the Irrigation Projects in Karnataka and that the Managing Director advised him to visit NLBC and to suggest remedial measures for the slips that were occurring.

8.02 Shri.Hiremath, visited the NLBC on 13.11.2002 along with the Chief Engineer, O&M and furnished a report on the remedial measures, as summarized below:

(i) The Indian Institute of Science has suggested heavy RCC lining covering both banks and the bed in the affected length. This makes lining more rigid to counter the slippage.

(ii) M/s. Hiremath Engineering Consultants will prefer to provide flexible lining instead of rigid lining as proposed by IISc. Flexible lining will have advantage that it will counter the thrust but will not be subjected to cracking even in case of
uneven settlement or loading. Moreover, the repair job can be done faster and at much lesser costs.

(iii) M/s. Hiremath Engineering Consultants have identified that ‘gabians’ would be an appropriate solution for this slippage problem. Wherever the slip occurs only that length of the canal will be excavated to remove loose material. The section will be replaced by cohesive non-swelling (CNS) soils well compacted in-situ. LDPE film about 100 (at least 200 gauge) gauge will be spread over the well prepared surface. On this 50 cm thick gabian boxes will be provided over the existing sloping surface at 2:1 slope and this is filled by 3" to 6" hand broken rubble filled in non-corrosive wire mesh boxes. The line and level will be maintained. The gabian will provide about 1 Ton / Sqm load and will be strong and heavy and will resist the thrust by its own weight. Moreover, it will be flexible and can withstand uneven loading or settlement. It will be keyed at bottom in the bed. This is easy for repairs and quick.

8.03 Sri. Hiremath, along with Kum. Minimol Korulla of M/s. MACCA FERRI also made a computer presentation to the Committee for explaining advantages of providing gabians instead of regular concrete lining.

8.04 After discussions, the TSC suggested that gabians as an alternative to regular concrete lining can be tried in a stretch of 100 m on an experimental basis and then come back to the Committee after studying its functioning.

8.05 However, after analyzing the suggestion of Sri. Hiremath carefully, the proposal of providing gabians was given up since it required that the canal had to be kept free for more than three months for carrying out the work.

9.0 Further distress in 60th KM of NLBC and formation of Expert Committee to suggest measures for treatment:

9.01 During August 2003 when the discharge in the canal was increased to about 7,000 cusecs, serious distress was once again observed in the embankment at 60th KM forcing the project authorities to immediately reduce the discharge to about 4,500 cusecs. If the high embankment in this reach had breached, it would have resulted in a major catastrophe as the entire irrigation under NLBC would have come to a grinding halt resulting in a crop loss of about Rs. 400 to 500 crores.

9.02 Considering the frequent slope failures occurring in NLBC since 1990, especially in the high embankment reaches of 60th KM, the Managing Director of KBJNL constituted an Expert Committee in September 2003 for suggesting suitable treatment measures in this regard. The Managing Director through his letter dated 29.09.2003 (copy enclosed as Annexure-8) addressed to all the Members of the Committee, requested them to undertake an early inspection of the canal and make its recommendations.

10.0 Inspection of the canal by the Committee and preliminary meeting at Narayanapur:-

10.01 The Committee inspected the canal on 14.10.2003 and held discussions in its 1st meeting at Narayanapur on the same day.

10.02 During the course of the meeting at Narayanapur, the Managing Director of KBJNL stated that slips / slope failures started occurring in NLBC in 1990 and that, since then several experts / Committees have studied the problems and suggested remedial measures. He pointed out that the measures taken so far were only piece meal and that
no permanent solution to the recurring problem had been found, so much so slips were still occurring in different chainages though no further distress had been observed in the places which were already treated according to the recommendations of I.I.Sc. He particularly mentioned about the distress to the embankment in one of the reaches in 60th KM which had occurred in August 2003 causing great anxiety to the Engineers as well as to the farmers. Expressing deep concern about almost the entire atchkat of about 4.5 lakh ha under NLBC and its branches / distributaries coming to a grinding halt in the event of any major slope / embankment failure, the Managing Director stated that the canal may have to be closed for irrigation for about 6 to 8 months to carry out the repairs, which might result in crop loss of about Rs.400 to 500 crores. He therefore requested the Committee to suggest -- (a) permanent and comprehensive measures to ensure safety of the entire length of 78 KM of NLBC even when the maximum designed discharge of 10,000 cusecs is allowed in the canal, and (b) immediate measures for repairing the distressed embankment in 60th KM.

10.03 In the meeting, it was decided to address the following issues before finalizing the solutions to the problems:-

(a) To what capacity (discharge) the NLBC has been designed and constructed.

(b) Whether the top widths of the embankment, as existing, are according to the design requirements.

(c) Whether sufficient free board has been provided over the designed FSL in the canal sections.

(d) Whether any regrading of canal bed is required since the actual CBL is found to be higher in a few reaches.

(e) What are the treatment measures where expansive material is used for casing in the embankment and where slips have occurred;

(f) Whether the cross walls, constructed at several places in the main canal for creating sufficient head to ensure the required discharge in the distributaries, should be dismantled.

(g) Whether the canal section, especially in the embankment reaches, should be strengthened / improved to carry the required discharge.

(h) Whether alternative alignment proposed for the canal in the 60th KM is required.

(i) Whether a more effective lining is required for protection of slopes in the water prism.

10.04 The above issues were deliberated in detail in the meeting and recommendations were made by the Committee subject to further detailed discussions in the next meeting. A copy of the Minutes of the meeting held at Narayanapur on 14.10.2003 is enclosed herewith as Annexure-9.

11.0 Discussions with Professors of I.I.Sc:-

11.01 Various issues addressed in the first meeting of the Committee held at Narayanpur on 14.10.2003, were discussed by the Chairman with Dr.A.Sridharan and Prof. Subba Rao, of IISc, on 29.10.2003. They gave valuable advice on several issues which are explained in the enclosed note (vide Annexure-10).
11.02 Regarding improving / widening the embankment sections based on stability analysis, the Professors of IISc were of the opinion that all existing embankments are quite stable and no stability analysis is required as the slope failures / settlements that have now taken place in several reaches of NLBC are not due to instability of the embankment sections but they are due to other reasons like saturation of the embankment, using all-in-fill material for the embankment, inadequate drainage arrangements, non-existence of impervious core etc. They however suggested that the increasing of sections on the downstream side may be necessary for restoring the original / designed slopes.

11.03 As regards providing a loading berm on the downstream side of the distressed reach in 60th KM as a temporary measure to last till the end of the irrigation season, the Professors of IISc, were of the opinion that utmost care should be taken while doing this work of loading berm to see that the existing filter drain at the downstream toe is not disturbed in anyway as otherwise the existing drainage system would get clogged / choked resulting in saturation of the embankment. With this limitation in view, the Professors were of the opinion that only rock fill material should be used for loading the berm, it should be limited only upto the toe drain and no loading should be done on top of the toe drain. They also suggested that the rock fill should not extend beyond the existing toe drain.

11.04 Regarding lining for protection of slopes in the water prism, the Professors of IISc expressed the following opinion:-

(i) the sand filter blanket now proposed over the CNS layer for lining the water prism is not required as it has no role to play;
(ii) there is no need to provide Hessian cloth over the sand filter blanket;
(iii) the machine lining using pavers may be proposed only in such places where the canal slope is 2:1 and other methods of lining like manual, slip-form etc., may be proposed in slopes where it is less than 2:1;
(iv) only M 20 concrete should be used for lining as per the latest IS specifications;
(v) RCC lining should be proposed for the entire length of the canal including cutting reaches and the new lining should be suitably integrated, to maintain the intended structural action, with the old RCC lining wherever they are provided as per the recommendations of IISc; and
(vi) the workability of machine lining for the proposed thickness with reinforcement may be examined keeping in view that the Narmada specifications have allowed RCC lining with greater thickness only in reaches adjacent to CD works.

11.05 The Professors of IISc also gave valuable suggestions regarding the packages for tendering, scope of work to be included in the packages etc.

11.06 It was decided to discuss all the above points in the meeting to be held on 10.11.2003.

12.0 Final meeting and recommendations of the Committee:

12.01 All the issues addressed by the Committee in its first meeting held at Narayanapur on 14.10.2003 and the outcome of discussions held by the Chairman with Dr. A. Sridharan and Prof. K.S. Subba Rao, of IISc on 29.10.2003, were discussed in detail in the second & final meeting held at Bangalore on 10.11.2003. The suggestions
made by Capt. S.Raja Rao, Member of the Committee, in his Note sent to the MD, KBJNL through his letter dated 23.10.2003, were also discussed in the meeting.

12.02 After considerable discussions, the Committee, with a view to providing a long term and lasting solution to the problems of NLBC, made the following unanimous recommendations (a copy of the proceedings of the meeting held on 10.11.2003 is enclosed as **Annexure - 11**) on all the issues connected with the subject:-

(a) **Discharging capacity of the NLBC:**

The carrying capacity of NLBC at head may be adopted as 10,000 cusecs upto 35 KM (i.e., Rajankollur tunnel) and 8,155 cusecs beyond the tunnel for purposes of strengthening / improving the NLBC.

(b) **Top width of the embankments:**

The question as to whether it is necessary to increase the top width of the embankment sections from 4.5 m to 6.1 m in the Head reach from 0 to 35 KM, from the stability point of view, was discussed. As the top width has no bearing on the stability of the embankment sections (it is the slopes and properties of the materials used that govern the stability) and also as the top width of 4.5 m, adopted as per State norms upto 35 KM, is stated to be enough even from service requirements, it was decided to adopt a top width of 4.5 m from 0 to 35 KM and 6.1 m beyond the Rajankollur tunnel upto 78 KM. The top widths should be increased suitably wherever they are found to be short of the above requirements and correspondingly the outer slopes should to be restored to their original designed slopes wherever required.

(c) **Free board:**

(1) It was decided to ensure a minimum free board of 1.2 m above the FSL obtained by computing the back water elevation. The top level of the canal section should be fixed accordingly.

(2) The back water elevation should be worked out for the entire length of the canal duly taking into consideration the ground conditions as existing like – canal bed levels, CD works, tunnels, transitions, etc.

(3) As regards the suggestions of – (i) providing an additional free board by another meter in order to store water on line, (ii) providing cross regulators at closure intervals, and (iii) consequent re-construction of the CD works, it was decided that no additional free board and cross walls are necessary in view of the fact that the NLBC has already been designed and constructed for a higher head discharge (10,000 cusecs) as against the required head discharge of 8,300 cusecs (as per the Planning Commission's clearance given for Stage-I project in April 1990). Moreover, introduction of additional cross regulators in the canal would create more silting problems.

(d) **Re-grading of canal bed:**

It was decided that no re-grading of the canal is required, more so because the back water elevations will be determined for actual ground conditions and the top level of the canal section will be fixed based on the computed FSL+FB.
(e) Treatment measures where expansive material is used for casing in the embankment and where slips have occurred:

(1) It was decided to carry out the treatment measures as per the recommendations of IISc in all places where similar slope failures have occurred. These measures will be only until such time the permanent measures are taken up for execution.

(2) Whether fibre reinforced concrete could be used instead of the conventional steel reinforcement, came up for discussions. Dr. A. Sridharan and Prof. K.S. Subba Rao, of IISc stated that the objective of providing CNS layer below the RCC lining is to absorb most of the swell pressures and volume changes developed by expansive soils. They also stated that, even though the fibre reinforced concrete has a higher modulus of rupture, it has no moment redistribution capability. In view of highly uncertain loading conditions and bending moment patterns, it was felt desirable to retain the conventional RCC lining. If the fibre reinforced concrete cracks, repair work will not be possible and the entire integrity of the monolithic structure will be lost, whereas the RCC maintains its integrity.

(f) Dismantling of the existing cross walls:

All the existing cross walls shall be removed and instead the distributary outlets may be provided with additional vent way to ensure the required discharges in the distributaries with one foot minimum driving head even when the discharge in the main canal is minimum.

(g) Strengthening / improving the canal sections, especially in the embankment reaches:

All high embankment sections should be checked for stability and after making such analysis, improving / widening of the embankment sections on the downstream side including drainage arrangements, may be considered so as to restore the original / designed slopes of the sections.

(h) Alternative alignment proposed for the canal in the 60th KM:

(1) The Committee was informed that two alternatives had been worked out for shifting the canal in this reach towards the hillock on the left side. The length of the canal for these two alternatives will be about 850 m and 1100 m and the depth of cut will be more than 25 m. The approximate cost of the alternative canal is worked out as about Rs.40 to 50 crores. In view of existence of soft shale in the hillock dipping towards the canal, the Committee envisaged many technical difficulties in the construction. However, this needs to be investigated in detail.

(2) After discussions, it was decided to provide a loading berm on the downstream side of the distressed reach in 60th KM as a temporary measure to last till the permanent measures for the canal are implemented. Atmost care should be taken while doing this work of loading berm to see that the existing filter drain at the downstream toe is not disturbed in any way as otherwise the existing drainage system would get clogged / choked resulting in saturation of the embankment. With this limitation in view, only rock fill material should be used for loading the berm and it should be limited only upto the toe drain. No loading should be done on top of the drain and it should also not extend beyond the existing toe drain.
During the closure period, all treatment measures suggested by the Professors of IISc should be implemented.

Simultaneously detailed investigations for providing alternative alignment should be carried out and estimates prepared after finalizing the designs.

Providing more effective lining for protection of slopes in the water prism:

After discussions, it was decided as follows:

(i) RCC lining (with 0.2% reinforcement both ways) should be proposed in the water prism for the full canal cross section covering FSD + FB for all the embankment reaches of the canal and including cutting reaches in expansive soils.

(ii) The thickness of RCC lining shall be 10 cm for the bed and sides with necessary RCC toe walls integrated with the RCC lining as recommended by IISc.

(iii) Only M-20 concrete shall be used for lining as per the latest IS specifications. It should be specified that the curing of concrete shall be effected by using the curing compound only.

(iv) Wherever expansive soils are met with, a well compacted CNS layer should be provided as base for the RCC lining.

(v) RCC lining should be done by paver machines wherever it is possible to use such machines. In other places where it is not possible to use paver machines, slip form / acrow machine may be used.

(vi) The methodology of laying RCC for lining like providing the templates, construction of lining between the templates from bottom towards top, etc., should be as recommended by the IISc. Along the cross section, construction should be monolithic and one time.

(vii) The new RCC lining should be suitably integrated, to maintain the intended structural action, with the old RCC lining wherever they are provided as per the recommendations of the Professors of IISc.

Whether it is necessary to introduce geo-synthetic fabric below the RCC lining, was also discussed. Normally geo-synthetic fabric is recommended in such situations where the canal runs in non-expansive soils and plain concrete is adopted for lining. Since in the present case, RCC lining is being provided in the non-expansive reaches and the same is being provided with CNS layer in expansive reaches, the Committee felt that there is no need for providing geo-synthetic fabric.

Observing the discharge:

The actual discharges realized in the tunnels (Rajankollur and Gundalgera) and major aqueducts (Don aqueduct) should be observed / studied by the Chief Engineer (O & M) to know whether the designed discharge is achieved or not.
Tendering:

(1) Detailed estimates should be prepared expeditiously based on the above decisions after conducting detailed investigations and finalizing the designs, and got sanctioned by following all the procedures.

(2) The work should be split up into three convenient packages for purposes of tendering.

(3) All the works coming in the respective reaches, like lining, increasing the canal sections to meet the requirements of freeboard, design slopes etc., should be included in the concerned package.

(4) Strict pre-qualification criteria should be stipulated and tender documents shall be issued only to the pre-qualified agencies.

(5) General guidelines as shown below may be followed while stipulating the pre-qualification criteria:

   (i) The agency should have executed concrete lining work of canals to an extent of atleast Rs. 25 Crores under a single tender during the last 5 years.

   (ii) The work shall be awarded only to the agency with proven performance / track record in terms of time, cost and quality.

   (iii) The agency should possess the required machinery and equipments for executing the work.

   (iv) The agency should possess the required technical personnel for executing the work.

   (v) The agency should possess the required financial resources for executing the work. For this purpose, the required financial turn over in the last 5 years should be suitably fixed.

(6) Detailed specifications should be carefully drawn while preparing the DTP in order to achieve the desired quality during execution.

(7) Defects liability period and maintenance period after completion of the work, may be shown as 24 months in the DTP.

(8) Supervision and quality control shall be by private consultants / agencies.

(9) The period for carrying out the works may be prescribed as about 8 months during which period the canal may have to be closed for irrigation for atleast one season i.e., rabi.

12.03 The Chairman was authorized by the Committee to finalize the report and send it to the MD, KBJNL.

12.04 In accordance with the decisions taken in the above meeting, a report containing all the above recommendations of the Committee was sent by the Chairman to the MD, KBJNL on 12.11.2003 for taking further needful action in the matter.

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1.0 Items of pier anchorages included in the Tender for dam construction:-

Alamatti Dam which is the main storage reservoir of UKP, the spillway with its crest at RL 509.60 m., has been provided with 26 Radial Gates of size 15 m. x 15.24 m. Sizewise these gates are the largest Radial Gates provided in any Dam in Karnataka. For the first time in the State hydraulic hoisting system has been provided for the operation of crest gates. All constituent components of the crest gates including pier anchorages have to be designed, fabricated and erected by one agency only as a single responsibility. In case of Alamatti Dam, an exception had to be made under the circumstances then prevailing, where the items of pier anchorages were included in the Tender for construction of the concrete Dam to ensure continuity and uninterrupted progress of civil work. Five items viz., Yoke Girder, Anchor Girder, Tie flats, Rest beam and Thrust block were included in the Tender for Dam construction. A condition was included in the Tender to the effect that, designs of these components have to be done to suit the full height of the gates with respect to load corresponding to FRL and operation of Gates. However due to certain reasons, construction of Dam was delayed and works of construction of Dam and providing of crest gates were in progress concurrently. In fact, the work of fabrication of various components of Gates was carried out and completed during the course of Dam construction.

2.0 Entrustment of gates work:-

In order to get the work of providing crest gates faster, the whole work was split into two packages and entrusted to two independent agencies on 3rd February 1995. One agency was entrusted with the work of providing crest gates for the first 14 spans the amount of contract being Rs.20.469 crores and other agency was entrusted with the work of providing crest gates in 12 spans and the three sets of stoplog gates with travelling gantry crane for operating these stoplogs in all 26 spans the contract amount being Rs.20.36 crores. The scheduled date of completion as per agreements was 2nd February 1997. For the first time in the State, remote control operation of all 26 crest gates and a CCTV system have been provided. This work was included in the Tender of the first agency. In the tenders for the crest gates as well as Dam construction, the requirement of embedded parts comprising of Sill Beam, Guide, Track, Side seal seat etc., for spillway stoplogs and wall plates for service gates were not included in the scope. Later these items were entrusted to the two gate agencies as additional items for respective spans.

3.0 Formation of Gates Expert Committee:-

3.01 The first set of designs, entrusted to the two gate agencies, were forwarded to the Chief Engineer (Designs), Bheemarayanagudi by Chief Engineer, KBJNL Dam Zone, Alamatti. Scrutiny of the designs was abnormally delayed. The delay in communicating approval to the designs delayed commencement of work as it was necessary for the gates agencies to plan procurement of various sizes of steel, casting of trunions and

The delay was noticed by Government and in the interest of speedy execution of the work of crest gates, the Government in its Order No. ID 42 WUD 94, Bangalore dated: 03.08.1995 (vide Annexure-1) constituted an Expert Committee, consisting of following members:-

(i) Sri. D.N.Desai   … Chairman
    Secretary to Government (Retd.),
    PWD, Bangalore.

(ii) Sri. V.J.Patil  … Member
    Director (Retd.),
    Gates Designs Directorate, CWC, New Delhi.

(iii) Sri. D.S.Ramamurthy  … Member
    Chief Engineer (Retd.),
    Central Water Commission, New Delhi.

(iv) Sri. K.S.Ramaswamy  … Member
    Chief Engineer (Retd.),
    Bangalore Development Authority, Bangalore.

(v) Sri. P.K.Rupangudi  … Member
    Executive Engineer (Designs),
    Karnataka Power Corporation Limited, Bangalore.

(vi) Chief Engineer,
    KBJNL, Dam Zone,
    Alamatti  … Member-Convener.

3.02 The terms of reference for the Expert Committee were to scrutinize the designs, supervise the fabrication, erection and commissioning of the crest gates and the stoplog gates. This Committee conducted 64 Nos. of meetings. The designs in many cases furnished by the agencies were scrutinized and approval was recommended after discussions with the agencies. In many other cases, the designs furnished by the agencies were scrutinised and got re-done and then only recommended for approval. The Committee at the initial stage met two times in a month till the designs were cleared and fabrication was in advanced stage. As the fabrication work was in progress, the Committee considered it necessary to have a Mechanical Engineer to advise on the fabrication in general and welding in particular. Another member, Sri.R.S.Raghunath, a retired Chief Engineer (Mechanical) was included in the Expert Committee vide Government Order No. ID 19 WUD 96 Bangalore, dated 05.07.1996 (vide Annexure-2).

3.03 The work of design, fabrication, and erection of anchorages was included in the Tender for the construction of concrete Dam. However in the two tenders for the crest gates, an item was included for scrutiny of the designs of anchorages to match with the design of crest gates. The agency for construction of the Dam submitted the design of anchorages. In turn, these were forwarded by Chief Engineer to the gate agencies for scrutiny. The two gate agencies, it appears, felt embarrassed to scrutinize and make observations in the designs proposed by other agency. Therefore, the two gate agencies reluctantly made some observations. It is at this stage that the Expert Committee took over the further work of scrutinizing the designs of the anchorages. The designs of yoke girder, anchor girder were scrutinized as per IS Standards and also the tender specifications and recommended to Chief Engineer for approval.
4.0 **Furnishing of designs by Gates Agencies:**

In general, designs of almost all the components were prepared by the agencies, as per IS specifications. As the designs, which are common for both agencies, were being prepared by each agency independently and approval was being sought likewise, the Committee advised the Chief Engineer and the agencies that, such of the designs which were common should be submitted jointly under signature of both agencies. This not only ensured uniformity but also speedy approval to the designs. Because of the speedy clearance of the designs, the work of fabrication of gates overtook the construction of the Dam. In fact, the two gate agencies, had to wait to take up the erection even after completing the entire fabrication. The work of erection of crest gates was also delayed because of the litigation in the Supreme Court.

5.0 **Stress relieving:**

As the fabrication of yoke and anchor girders involved large amount of welding besides heavier sections of steel plates, stress relieving was necessary before embedment in the Dam as per specifications and provisions in IS Standards. The agency who fabricated these girders at the Site of work had no facilities for stress relieving. The agency proposed to get this job done through M/s.CMTI, a Government of India undertaking. M/s.CMTI proposed a method of stress relieving through vibrations. Literature on this methodology and the list of works on which such methodology was used were placed before the Expert Committee. After detailed examination of the literature and after a presentation by the representative of CMTI, the Committee recommended that the methodology suggested and tried elsewhere could be adopted. While the work of stress relieving work was in progress, the Expert Committee witnessed the same and was convinced that this is an alternative to the conventional method of stress relieving. As per the advice of Expert Committee, all yoke and anchor girders were got stress relieved by this method.

6.0 **Economical design of Thrust Block:**

To resist the horizontal thrust component of water load parallel to the axis of the Dam, either a thrust block or a trunion tie is to be provided. The gap available between two yoke girders on each pier was so small that the concrete volume in this space was inadequate to resist the horizontal thrust. The Expert Committee did not favour a Trunion tie as the span and the size of the gate was large and in view of likely deflection under self-weight of required section of trunion tie, this alternative was not acceptable. The agency proposed a thrust block with number of anchorages in the pier concrete. The Expert Committee did not agree to this proposal as the arrangement was posing problems in placement of concrete itself and bond strength of anchors could not be ensured. The Expert Committee, after considerable thought, suggested to the agency to evolve a design of thrust block integrated with the rest beam. A design of thrust block as suggested, was got prepared and placed before Expert Committee. After a detailed examination, the design of thrust block, integrated with the rest beam, was recommended for approval. Thus the design of thrust block has been simplified and made economical.

7.0 **Load test on prototype assembly:**

The Expert Committee suggested that the agency who designed and fabricated the anchorages should arrange for load test on a prototype assembly in shop prior to
embedment of assemblies erected on piers. Also, it was insisted that load carrying anchor ties, which are each in 9 m. length, should not have more than one joint. The Agency made special arrangement to get the anchor tie flats under special order in full length without involving any joint. Arrangement was also made in shop for load test of prototype assembly. This assembly was subjected to load through a series of hydraulic jacks where increase in load was gradual in multiples of 100 tonnes at one-hour intervals. The constituent components namely anchor and yoke girders with tie flats and welding in particular were closely inspected every time for any visible failure or deformation. The load was finally increased to 1163 tonnes which is 125% of designed load on each assembly. The prototype assembly was kept under this load for about 4 hours and the behavior under load was closely inspected at the interval of one hour. The release of load was also done in the same sequence with close and detailed inspection. The performance of prototype assembly was found satisfactory during load test and the parameters in assembly and welding work as per prototype assembly were to be strictly followed and adhered to during erection of these assemblies on piers.

8.0 **Casting and testing of Trunion hub & bracket:**

Trunion assembly is a very important component for the gate and the work of erection of the crest gates begins with the placement of this assembly at the designated location. The material specified for the trunion proper i.e., trunion hub is cast steel and the bracket is fabricated in structural steel. After the design is prepared by the agency and got approved, it has to be specially cast in a workshop. As suggested by the MD, KBJNL the Expert Committee visited workshops of the two agencies at Ahmedabad and Kota, to see the facilities available. The Committee was satisfied with the facilities available and gave a green signal to proceed with the castings. In the workshops not only facilities and expertise for casting were available but also for analyzing the chemical composition of the castings. The tests carried out for each component confirmed the castings to be as per IS Specifications. Similarly the Expert Committee insisted for testing the trunion pins for the materials and chemical composition.

9.0 **Fabrication of skin plates and gates:**

9.01 Skin Plates were fabricated in a fabrication yard specially erected at the site of work. Each agency laid out a jig, made for the full size and exact shape of the gate. The steel plates and the stiffeners were bent to the shape of the radial gates on respective bending machines. These were then laid out on the jig, matched with the adjacent ones and then tack welded. Once all the elements were matched and tack welded, final welding was taken up. Prior to welding, each skin plate and vertical stiffener were appropriately supported and clamped to ensure that there is no distortion during welding. Before commencing welding, the dimensions of gate and profile were checked for accuracy as per specified tolerance in IS Standards. The Expert Committee, while clearing the fabrication drawings, insisted that steel plates as large as possible and as long as possible should be procured. Similarly for the stiffeners also largest available length was asked to be procured. With the plates as well as structurals procured in long lengths, it was possible to ensure that individual skin plate segments are fabricated without any joints. Also for vertical stiffeners which are in over 17 m. length, not more than two joints were permitted. The Expert Committee made sure that all critical welding is performed in shop only while the gate and components are on the jig and fixtures and number of field joints are reduced to bare minimum. Care in this regard was taken while clearing fabrication drawings and hence only three vertical joints with one horizontal joint or six vertical joints without any horizontal joint were approved. Staggering of shop joints
as well as field joints was also ensured in the drawings as well as fabrication and erection.

9.02 After all the elements of the skin plates are matched, final welding of each Gate is done. Because of the large size of the gates and close spacing of the vertical stiffeners, the welding in each gate was quite large. There are a number of butt welds, splice weld and fillet weld joints. Along with the designs of skin plates, the thickness of all welds were also designed. During the process of welding, close supervision had to be done to ensure that welds conform to the designed thickness and the IS specifications. For this purpose, services of an exclusive mechanical sub-division with number of subordinates were requisitioned. For proper and efficient supervision of the fabrication, particularly the welding portion of it, the Expert Committee introduced what is called “O.K. Card System”. In this system, no welded joint escaped the attention of the supervising staff. After the fabrication of one gate was cleared by the Executive Engineer, it was taken out from the jig and individually kept on levelled ground with skin plate in vertical direction or stacked on supports which corresponds to the profile of the Gates to ensure that no deformation takes place while it is stored prior to erection.

9.03 In spite of the best planning, certain field joints cannot be avoided. These field joints are structural and non-structural. The joints between the trunion and inclined arms, arms and horizontal girders, and horizontal girders to skin plates, are all critical structural joints and therefore have to be as strong as the material in the member itself. These weld joints have therefore been designed and performed accordingly. At the erection site, close supervision of these joints is not possible. Also the quality of welding which can be achieved in fabrication shop cannot be achieved at erection site. The locations of field joints to be performed at erection site are also not easily accessible. The Expert Committee therefore, while clearing the fabrication drawings, restricted the field joints to the minimum possible extent.

9.04 Prior to clearance for welding, the requirement as per IS Standards in evolving welding procedures and qualification of welders was scrupulously followed. The welders were permitted on the job only after going through welder qualification tests as per IS Standards. It was ensured that welding plants are of correct ratings and welding electrodes conform to the required specifications as per IS Standards. Radiographic tests were carried out for all full strength butt weld joints as insisted upon by the Expert Committee. All fillet welds were checked 100% by Dye Penetration tests. Ultrasonic tests for all steel plates used in fabrication of radial gates were also conducted. With these precautions and suggestions made by the Expert Committee, fabrication of gates has been done satisfactorily and as per IS Specifications.

10.0 Manufacture and testing of hydraulic cylinders:

10.01 For operation of the crest gates, hydraulic hoisting system, comprising of two cylinders, power pack and interconnecting hydraulic piping, is provided. The Expert Committee approved hoist capacity of 230 T. for operating the gate with 20% reserve capacity. The capacity required for each cylinder therefore is of 115 T. having operating stroke of 9.6 m. Such long cylinders with equally long stems or piston rods were required for operation of these large size gates. These cylinders are made from seamless tubes of required section based on capacity required. These seamless tubes are drawn from solid steel rod / bar through drawing process after boring a hole of size which may correspond to the final bore size of seamless tube. The material of rod and consequently the cylinder is required of exact specifications which is suitable for
operating hydraulic pressure of 200 bar and test pressure of 300 bar for 9.6 m. stroke length. The main requirement is of absolute concentric boring with almost zero tolerance throughout long length providing operating stroke of 9.6 m. and withstand hydraulic pressure or 300 bar (test pressure). For this, the seamless hydraulic tube manufactured as above and machined as required has to go through a final Honing process which is performed at one stretch from one end to other ensuring the required tolerance due to very application of the process giving accuracy in micro millimeters. The two agencies after exploring the indigenous capability found that facilities for manufacture of such large size cylinders were not available in India. Therefore, the gate agencies approached KBJNL to permit them to import the hydraulic cylinders from manufacturers in Germany. After obtaining clearance, orders for design, fabrication and testing of hydraulic cylinders were placed by the gate agencies on M/s.Mannesman Rexroth of Germany. A subsidiary of their firm viz., M/s.Hydraudyne was entrusted with the design and fabrication of hydraulic cylinders. The total number of cylinders were 52 at the rate of two cylinders for each gate.

10.02 As per Tender specifications, the hydraulic cylinders are to conform to the IS Specifications. The firm Mannesman Rexroth of Germany, on whom the orders were placed, offered the cylinders as per DIN Specifications adopted in their country. The two gate agencies, therefore, approached the Chief Engineer to permit them to get the hydraulic cylinders manufactured as per DIN Specifications prevalent in Germany. The request of the firms was placed before the Expert Committee with a copy of DIN Specifications and its translation in English. The Expert Committee examined and compared the specifications and also reviewed the same in the context of USBR (US Bureau of Reclamation) guidelines. The Committee, after examining in detail, approved the specifications with condition that cylinders shall be tested to 150% of the operative pressure prior to shipment with stipulations of load test as stated. It was ensured that all requirements as per IS Specifications are fully satisfied while adopting DIN Standards in manufacture of cylinders.

10.03 As per specifications in the Tender, the stems of hydraulic cylinders of carbon steel had to be provided with chromium plating. The agency for manufacture of hydraulic cylinders suggested to the gate agencies that they have developed a better coating material and that in all their manufacture, this coating is being provided. This was called as “Ceramax Coating”. The local representative of the manufacturer arranged a presentation by an expert who visited from Germany. After study of the literature on the material and the presentation, the Expert Committee was convinced that the “Ceramax coating” was much superior and long lasting than what the specifications provided and therefore recommended adoption of the same. For the stem of all the hydraulic cylinders of Alamatti Dam, “Ceramax coating” has been provided.

10.04 As per the request of KBJNL, the hydraulic cylinders had to be inspected and tested before shipment. The Expert Committee formed two groups consisting of members of Expert Committee and officials for inspection of the hydraulic cylinders ordered by the two gate agencies. The hydraulic cylinders were manufactured by M/s.Hydraudyne at Netherlands, which is an associate company of M/s.Mannesman Rexroth of Germany. The Expert Committee inspected the factory of M/s.Mannesman Rexroth in which the manifolds, which are considered as “Heart of hydraulic hoist control”, were being manufactured. During the complete process of manufacture starting from casing to finishing of the high grade compact manifold castings for the hydraulic hoisting, the Committee witnessed the machining of the manifolds by automatic precision
milling machines and the on line quality control tests for precision and also the pressure test.

10.05 The Expert Committee inspected the facilities at the factory of M/s. Hydraudyne at Boxtel in Netherlands. The Expert Committee witnessed the various stages of manufacture of hydraulic cylinders. It was noticed that each process of machining was carried out on computer programmed machines ensuring the accuracy and acceptable tolerances fed into the programme. The most critical and important Honing operation making the cylinder bore to the exact size was also witnessed. The honing operation was performed on the most sophisticated honing machine which was capable of fine honing of cylinders upto 30 m. length in single stage and unidirectional movement. The entire process of ceramax coating right from preparation of mix to its final application of coating on cylinder stem was witnessed. The process was automatic and computer controlled which ensured exact thickness of ceramic coating which otherwise will result in leakages from the hydraulic circuits. The reports of tests on the longevity of ceramic coating maintained were also perused.

10.06 At random three cylinders manufactured were selected for pressure testing. The cylinders were placed on the specially made jig and connected to the pressure testing control system. The piston rod was completely retrieved into the cylinder and a hydraulic pressure of 300 bars applied on the piston rod side to test the cylinders for pressure and the chevron packing on the piston was continued for a period of 10 minutes and it was observed that there was no rise in the level of the oil in the pilot tube, confirming that there was no leakage. Visual observations were made at the gland, seals of the piston rod and the cylinder head for any leakages. There were no leakages from hydraulic cylinders and the manufacturer satisfied the design requirements. The important dimensions of the cylinders and the stroke length were checked and found to be satisfactory.

10.07 The manufacturers also explained about the provision made in the Hydraulic System about ‘creep’ of 300 mm and automatic restoration of the stem to original position through activation of power pack. It was also explained that provision is made in the hydraulic system for synchronization of two cylinders operated through single power pack. As a result, irrespective of any initial difference between the positions of stem of two cylinders, the gate shall always be operated uniformly.

10.08 The management of M/s. Hydraudyne explained to the team that certain precautions have to be taken when the cylinders have to be stored for some time before installation. It was stated that before shipment, the cylinders are to be emptied of the hydraulic oil. A small quantity of oil mixed with an anti-corrosive chemical is left in the cylinder such that the bore is free from corrosion. The cylinders have to be stored in horizontal position and every three months have to be rotated by 90 degrees. In case the cylinders have to be stored for a period of more than a year, piston has to be pulled for its full length. It was explained that in case cylinders are stored for period longer than one year, the bore and the rod end seals are likely to be damaged and that their warranty does not cover such damages. Precautions required to be taken were noted by the team and brought to the notice of the agencies as there was a likelihood of the cylinders being stored for a longer period.
11.0 **Gate position indicators:-**

The Committee ascertained about the provision for Gate position indicators both local as well as in the remote control room. The manufacturers explained that detailed engineering and drawings are furnished to the gate agencies for the mechanical local gate position indicator. It was explained that the required gear box for this purpose is being supplied by M/s. Mannesman Rexroth. For gate position indication in the remote control room, the manufacturers have offered ‘selsyn’ signal generating mechanism which is to be coupled to the mechanical gate position indication system. The ‘selsyn’ signal generating is through TGSE unit which is exclusively for giving the electronic signal of the gate position which can be received in the remote control panel for digital display of gate position. The Committee was fully satisfied with the tests and manufacturing process as well as details explained in respect of all required features. Accordingly, clearance for dispatch was given.

12.0 **Power pack:-**

12.01 The unit which operates the hydraulic cylinder is Power Pack. It comprises of 2 Nos. of electric motors, Hydraulic pumps, flow control valves and piping in accordance with approved design of Hydraulic circuit. These are mounted on an oil reservoir tank of 1500 litres capacity which is more than two times the capacity of oil in each cylinder. Hand operation pump for manual operation, drainage valve and oil position indicator are also provided. The pressure gauges indicate the oil pressure in the system while it is in operation. The power pack is operated by an electrical control panel which has meters for voltage and current as well. The control panel is microprocessor based with master cards. Provision is made in the system for automatic shut off when the gate while in operation reaches the fully closed position i.e. when it touches the bottom sill or when it is fully open with bottom of gate attaining the designated level of gate in fully open position.

12.02 The power packs are designed, fabricated and supplied by M/s.Rexroth India, Bombay which is the India counterpart of M/s. Mannesmann Rexroth of Germany. Here also, as per agreement, testing and inspection of power pack was to be carried out at manufacturer’s workshop prior to dispatch to site. KBJNL, therefore, sought the assistance of the Expert Committee for inspection and testing. Power packs ordered by both gate agencies were fabricated and kept ready. The Expert Committee selected two units at random for testing from each lot. The Engineers of M/s.Rexroth India explained the working of the power packs and the various valves provided for regulating the flow of the oil from the tank to the Cylinders and other regulating functions. The performance of power pack during testing was found satisfactory and the testing arrangement was well designed.

12.03 The size of the power pack is to be so designed that it can handle only two cylinders at a time. Discussions were held by the Expert Committee to explore the possibility of providing a power pack to handle a group of cylinders so that the number of power packs could be reduced. M/s.Rexroth India explained that the size of the tank has to be designed to contain oil required for additional number of cylinders. It was further explained that the size of the tank would be so large that it cannot be accommodated within the space available on pier tops. Another disadvantage in this arrangement would be that in case of some problem with the power pack, all the cylinders requiring support from this would be rendered out of operation. Possibility of accommodating two power packs on the pier was also examined. Even this idea had to be given up for want of...
space on top of the pier. It was also explained that the valves provided in the power pack are accentuated by sophisticated electronic devices which require very careful handling. The most important precaution to be taken is to watch the level of the oil in the tank very carefully by observing the indicators provided. To caution the operator about any fault in the hydraulic hoisting system, a hooter has been provided in the power pack such that power supply is shut off immediately. It was explained by M/s.Rexroth India that power packs should not be exposed to sun and wind and need to be installed in well protected covering. In the covering to be provided, it was informed that it should not contain metal sheets. Covering has been designed accordingly and provided.

13.0 Stoplog gates and moving gantry crane:

13.01 The Tender provides for design, fabrication, transportation and erection of stoplog gates in three sets for all 26 spans and a moving gantry to cover the spillway and overflow & non-overflow blocks of the Dam. Each set of stoplog gate is made up of ten elements. The height of the elements was adjusted to suit the overall of service gates. The bottom unit of each stoplog is non-interchangeable which is provided with supports on U/S face of the Dam where seats are embedded. The other nine units are interchangeable and of identical size in terms of height. Each set when installed corresponds to full height of service gate. A travelling gantry crane for operation of the stoplog gate elements was also designed and fabricated. The designs of stoplog gate elements and the gantry were done as per IS specifications. It was brought to the notice of the Expert Committee that in the absence of clear specifications of the Gantry Crane for the operation of the stoplog gates, the agency requested approval to certain parameters like Crane rail gauge, wheel base and various speeds in addition to the hoisting capacity. The specification for the Gantry Crane as per Tender is that, when the crane is on long travel with lifted stoplog tier, the tier shall be within leg span of the Gantry. If this condition is to be satisfied, the wheel base of the gantry crane will have to be more than the length of the stoplog gate element which is 15 Meters. The Committee felt that the design of the gantry crane for this condition will be highly unstable as no bracing can be given on the upstream face of the gantry. Instead, the Committee was of the opinion that the tier of the stoplog gate can be moved over stoplog gate grooves right across the spillway. For any repairs or painting required, a sort of repair bay could be created on the upstream face of the non-overflow section on the left bank by providing suitable arrangement. Regarding the Gantry crane, the Committee has agreed to the following parameters as suggested by the Chief Engineer:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail gauge</td>
<td>5.5 M</td>
</tr>
<tr>
<td>Wheel base</td>
<td>7.5 M</td>
</tr>
<tr>
<td>Crane Travel speed</td>
<td>5 M per Minute.</td>
</tr>
<tr>
<td>Hoisting speed</td>
<td>1.5 M per Minute.</td>
</tr>
<tr>
<td>Cross Travel (if required)</td>
<td>3.0 M per Minute.</td>
</tr>
</tbody>
</table>

13.02 The Tender provided for storage of additional stoplog gate elements when not in use at the end of non-overflow blocks of Dam. For this purpose the rails for the movement of the gantry up to the storage location had to be laid on non-overflow blocks. Moreover no suitable place was available for storage of required number of elements. The Expert Committee therefore advised storage of 26 elements of the stoplog gate elements on top of the spillway vents and the balance 4 Nos. on the upstream face of the non-overflow Dam. Further the Expert Committee felt that the span of spillway should be left free. This was considered desirable for the reason that in case of need for operation of stoplog gate elements, the element stored on that span could be shifted to the free span. Subsequently it was brought to the notice of the Expert Committee that, on the
piers which accommodate the hoists for operating river sluices, storage of stoplog elements is not possible. There are six such spans. Therefore these six numbers of Stoplog elements had also be accommodated on the upstream of the non-overflow Dam. Arrangement therefore was necessary to store eleven elements on upstream face of non-overflow blocks of the Dam and the latching of nineteen elements was possible on spillway overflow vents.

14.0 **CCTV and remote control arrangements:**

14.01 The tender of the gate agency includes the item of providing remote control and CCTV arrangements. There were no back up specifications in the Tender. Therefore the Expert Committee felt it desirable to have discussions with the gate agency to know as to what the agency had in view while submitting the Tender. As far as the remote control arrangements were concerned, the agency explained its proposal broadly. The agency was requested to submit the proposal to the Chief Engineer, KBJNL, Dam Zone, Alamatti. The proposal so received was placed before the Expert Committee for consideration. The Expert Committee generally agreed with the proposal and asked the agency to submit detailed specifications of the materials to be used and the drawings. Initially the proposal was to run cables from the remote control operation unit to each power pack unit individually. This would involve laying of large number of cables on top of the Dam. At this stage, an expert from M/s. BHEL, at the request of the M.D., attended the meeting of the Expert Committee. A suggestion was made by the Expert that, to reduce the number of cables from the remote control operation unit to the power packs, PLCs could be introduced. It was explained that by introducing this change, the remote control operation becomes compatible for computerization when needed. With the acceptance of advice of the Expert of M/s. BHEL, the remote control operation unit has been made very compact.

14.02 The Gate agency arranged for demonstration of the CCTV arrangement that was proposed to be provided. It was proposed to use the TV camera for showing the position of the gates with respect to the crest of spillway. Such arrangement was not acceptable to the Expert Committee as a digital indicator of gate position was already available on remote control operation panel. The Expert Committee also observed that, when the crest gate is open, nothing over the crest will be visible because of the high velocity of the jet. The proposal made by the agency was not acceptable to the Expert Committee. For some time the agency did not come out with any proposals. The Expert Committee thought of utilizing this item of work for a detailed inspection of the gate, not only during the operation of the gate but and also during maintenance. The Expert Committee made certain suggestions to the agency and suggested for a demonstration at the site of work. The proposal of the agency to arrange demonstration at one of the crest gates of Narayanapur Dam was agreed. During demonstration, the Expert Committee observed that the TV camera could not be focused from remote and had to be manually handled. The Expert Committee did not agree to this proposal and suggested to the agency that the camera should be able to be tilted and focused from remote through commands from remote control room.

14.03 The agency arranged for another demonstration at Bangalore. During this meeting it was clarified that the only location available for fixing the camera was over the catwalk and with this distance the camera should be able to catch the image of the entire gate and should be able to be focused on a very small area of 0.3 m. x 0.3 m. The Expert Committee made this suggestion keeping in view the inaccessibility of the gate for the purpose of inspection during maintenance. In the opinion of the Expert Committee,
facility to focus on a small area would be of great help during maintenance in general and inspection of critical connections and welds in particular. The camera for focusing on small area required maneuverability, which had to be feasible through commands from remote control room. The agency brought to the notice of the Expert Committee that, remote maneuverability of the camera was possible by the provision of a telemetry system, which could be provided either individually or for a group of cameras. Operation of the telemetry system was also demonstrated. The camera brought for demonstration, though could catch the image of the full gate, was also not capable of being focused on the small area suggested by the Expert Committee. The gate agency requested for some time to explore the possibility of finding a camera to suit the requirement. After exploring all possible sources, the agency brought to the notice of the Expert Committee that, the lens which needs to be imported can focus on an area of 1.5 ft. and x 2 ft. and that, focusing on an area suggested by Expert Committee will not be possible. In the absence of alternative, the Expert Committee recommended adoption of this proposal for implementation.

14.04 The image from the camera has to be exhibited on the monitor of a TV. The Expert Committee suggested that the monitor should exhibit a colour image. The Expert Committee suggested that the size of the monitor should be able to catch the full image of the gate. The size of the monitor was fixed as 21”. The Expert Committee also suggested that the telemetry arrangement should be capable of showing the split image of four gates on the screen of each monitor. The agency arranged a demonstration and exhibited that the arrangement proposed could meet the requirement laid down by the Expert Committee. After witnessing the demonstration, the Expert Committee suggested one monitor for a group of four cameras. CCTV arrangement has been provided to meet this requirement.

14.05 Monitors of CCTV and the remote control operation unit had to be installed in the control room. The Expert Committee examined various locations. Location of control room on top of the Dam was not possible as it would obstruct the roadway. A location at the foot of the Dam on the left bank was not favoured as the spillway would not be visible at this location. Finally the Expert Committee recommended to locate the control room at the end of the training wall on the left side of the stilling basin. The Expert Committee also suggested that an Architect may be consulted for providing a good elevation to the building. A building for housing the remote control operation panel and monitors of the TV cameras has been constructed. To meet the requirement of laying of cable, a false floor has been provided. As per the manufacturer’s remote control and CCTV arrangement, the remote control room needs to be provided with air conditioning. A central air conditioning unit has been provided.

15.0 **Erection of catwalk for inspections and fixing of cameras:**

Erection of crest gates is taken up only after the spillway bridge is completed. As the gate in general and the skin plates in particular are just below the bridge, there is no visibility and inspection of erection and welding of field joints is not possible. In the Tender of the two gate agencies there was no provision for erection of catwalk at the trunion level. The Expert Committee made a very strong recommendation for erection of catwalk, so that during the period erection of gates was in progress, the Expert Committee could have a closer look. Accordingly a catwalk was got erected at the trunion level and it was of great help for a closer inspection of the erection activities. The catwalk was required for another purpose also. For CCTV arrangement a camera each for a gate has to be fixed to catch the images of the gate on the monitor. In all,
26 cameras have been provided. For installation of cameras no other location was possible except the catwalk. The cameras have been fixed on the downstream railing of the catwalk. Besides, catwalk is required for day to day maintenance of trunion assemblies and lubrication thereof. The catwalk also provides ready access to all downstream locations of each gate.

16.0 **Power supply for operation of crest gates:-**

16.01 Power supply is a very important input for operation of the crest gates. In addition to the power supply from KPTCL, alternate power supply arrangement by installing generators was necessary. The question debated by the Expert Committee was as to what should be the extent of auxiliary power required for operation of crest gates during emergency. By this time the Expert Committee had already suggested for preparation of an operation schedule for gates for flood management. In a gate operation schedule, the gates are normally operated one by one. The Expert Committee, taking into consideration the design flood for the spillway of Alamatti Dam, suggested that power, both regular and alternative, should be available to the extent of operation of six gates at a time.

16.02 The arrangement through which power is to be made available at the various load points on the Dam and spillway, was discussed by the Expert Committee. There are several load points on the Dam, such as the crest gate hoists, the moving gantry, pumps in the sump wells, river sluices, stoplog gates and illumination of the Dam. The Expert Committee suggested laying of independent cables for each load point. The work of laying the cables and commissioning was entrusted to M/s.BHEL. In order to avoid large number of cables running on top of Dam, the Expert Committee suggested supporting the cables on the downstream beam of the spillway bridge on trays fixed to it. For the two gate agencies to energise the hydraulic hoists, the Expert Committee suggested supply of power at two locations, i.e., at the beginning of the reach entrusted to each one of them. From these locations the agencies have laid cables for power supply to individual hoisting system.

17.0 **Inspection and servicing of hydraulic cylinders by experts:-**

The maintenance schedule for the hydraulic cylinders prescribed by the manufacturer has been mentioned in an earlier para. In case the cylinders are stored for more than a year, the piston has to be moved to its full stretch. The cylinders were received at the site of work during the later part of the year 1997. At that time even though fabrication of the crest gates was in advance stage, construction of spillway bridge was not even commenced. Before award of work, negotiations were conducted with the two gate agencies who had given an undertaking that they will take up erection of crest gates in the absence of spillway bridge. The Expert Committee desired to know the way agencies proposed to go about. The methodology involved extra cost to KBJNL by way of construction of catwalks. The subject was under discussion with the two gate agencies and the Expert Committee was informed that, till the spillway bridge is completed, the gates cannot be made operational. The Expert Committee advised KBJNL not to take the risk of gates erected and not being operational and instead wait for completion of the spillway bridge. Due to this reason and also due to litigation in the Supreme Court (about the dispute relating to height of Alamatti Dam / height of crest gates, raised by Andhra Pradesh), installation of hoisting system could not be commenced earlier to May 2001. By this time nearly four years had elapsed since the storage of cylinders at the site of work. Since a period of four years had lapsed and
installation of hydraulic hoist cylinders was to be taken up as one time permanent activity, it was imperative to consider inspection and servicing of cylinders by an expert from the manufacturer prior to installation. The agencies were directed accordingly to arrange for inspection and servicing of cylinders by an expert from the manufacturer's plant. The Expert Committee was also informed that the manufacturer of the cylinders did not agree to extend the warranty without a detailed inspection by their expert. During the course of visit of expert from Hydrodyne, Holland, it was insisted by the manufacturer to replace the rod end seals as the four year period had lapsed and the cylinder rods had not been stretched even once. They also promised to afford two years performance guarantee, from the date of commissioning, for the entire plant if the rod end seals are replaced. After careful consideration of the criticality of installation, the replacement was carried out. The Expert Committee, after detailed examination, recommended apportionment of the delay and the cost.

18.0 Cutting of skin plates to limit the gate height / storage to RL 519.60 m:-

The crest gates of Alamatti Dam spillway were designed and fabricated for the full height of 15.24 m. corresponding to FRL 524.256 m. The Supreme Court, however, permitted the storage at Alamatti Dam to RL 519.60 m. only. The TAC of the Planning Commission, while issuing clearance to UKP Stage-II, cleared the height of the crest gates to this level of storage only. The frame of the gate, consisting of inclined arms, horizontal girders and the stiffeners, have been erected as designed and fabricated for the full height. The top horizontal girder, as per design upto full height, is located at about RL 521.0 m. This girder, while modifying the gates for FRL to correspond to RL 519.6 m., was required to be retained in the same position. This was essential for supporting the top radial arms besides supporting the skin plate when erected. The modification, therefore, was carried out in such a manner that only skin plate from the central portion above RL 519.6 m. was cut while retaining the vertical stiffeners upto RL 521.0 m. duly supported on top horizontal girder. Accordingly the vertical stiffeners remain duly extended upto RL 521.0 m. and welded to top horizontal girder which also is now fully supported on the gate frame. The portions of the skin plates cut are such that they could be placed in position and welded whenever Alamatti Dam storage level is to be raised to the full height i.e., upto RL 524.256 m. It is very essential that these portions are stored in such a manner that the shape to which they are fabricated is not distorted. The Expert Committee has advised suitably in this manner.

19.0 Conclusion:-

The work of erection of gates was completed in all respects on 30th June 2001. But for the application and constant advice, supervision and monitoring by the Gates Expert Committee, success could not have been achieved expeditiously and economically.
**CHAPTER-16**

**DISPUTE REGARDING THE HEIGHT OF ALAMATTI DAM**

1.0 **Background:-**

1.01 All the issues relating to Inter-State water disputes have already been highlighted in the chapter "Krishna Water Dispute". The disputes relating to sharing of Krishna waters at 75% dependability (called as Scheme–A) came to a finality with the Award and final order of the Tribunal published in May – 1976. Sharing of surplus waters under the Scheme-B (over and above the 75% dependability) remains to be resolved.

1.02 After the Tribunal Award was published in May 1976, GOK prepared a modified (revised) project for UKP Stage-I in December 1976 and sent it to CWC. The intention of Karnataka, to raise the FRL of the Alamatti reservoir under the 2nd Stage of UKP to 524.256 m, was clearly indicated in the project report 1976. The GOI sought explanation of Karnataka in July 1977 regarding the proposal of constructing the dam to FRL 1720 ft (524.256 m) to utilize 160 TMC of water. GOI also sought the comments of Andhra Pradesh and Maharashtra in January 1978 for the above proposal of Karnataka.

1.03 Since then, a lot of correspondence has taken place between the Party-States and GOI, on various issues like – (i) Implementation of Scheme-B; (ii) unlawful utilization of surplus waters by Andhra Pradesh under its various projects viz Telugu-Ganga Project, Srishailam Right Bank Canal, Srishailam Left Bank Canal, Bhima Lift Irrigation Scheme and Pulichintala Diversion Scheme, by constructing large and permanent structures even though the Tribunal had only given liberty to Andhra Pradesh to use the remaining waters without acquiring any rights; (iii) Exchange of project reports and other related data, etc. Meetings at Chief Ministers’ level were also held to sort out the issues between the basin States in March 1990 at Tirupati, in August 1990 at Mysore and in May 1993 at Mahabaleshwar. In all these meetings, the Karnataka’s offer of implementing Scheme-B drawn up by the Tribunal was not accepted by Andhra Pradesh. In July 1995, another Inter-State meeting of basin States was convened by the Union Ministry of Water Resources to discuss the clearance of Krishna Basin projects including UKP Stage-II of Karnataka and Telugu-Ganga project of Andhra Pradesh. In this meeting, GOI suggested for a resolution of the dispute by implementing Scheme-B drawn up by the Tribunal for sharing of surplus waters. No positive results emerged in this meeting.

2.0 **Public Interest Writ Petition filed in Andhra Pradesh High Court:-**

2.01 One Mr. R.Krishnaiah, President of Andhra Pradesh Backward Class Welfare Society, filed four public interest Writ Petitions (W.P.Nos.12756, 12757, 12758 and 12759) on 01.07.1996 in the Andhra Pradesh High Court with several prayers. The Respondents in this case were – (i) Union of India; (ii) State of Andhra Pradesh; (iii) State of Karnataka; (iv) State of Maharashtra; (v) Central Water Commission, GOI; and (vi) Planning Commission of GOI.

2.02 The main contention of the Petitioner was that Karnataka was increasing the height of Alamatti dam in contravention of the Tribunal Award and in violation of the Central clearance resulting in great adverse effects on Andhra Pradesh.

(*) Source of this Chapter: 1. Records of KBJNL  
2. Records of Krishna Water Disputes Technical Committee.
2.03 The Court heard the Writ Petitions on 24.07.1996 and directed the GOI to instruct GOK for maintaining the status-quo on the construction of Alamatti dam until pendency of the suit.

2.04 Out of 6 Respondents named in the Writ Petitions, only the following 4 Respondents filed their affidavits on 30.07.1996:

(1) State of Andhra Pradesh
(2) Central Water Commission, Government of India.
(3) State of Maharashtra
(4) State of Karnataka

2.05 The contentions of the above said Respondents are explained in brief as below:-

(1) **ANDHRA PRADESH’S CONTENTIONS**:-

(i) The quantum of water allocated to Upper Krishna Project as per the Tribunal Award is 155 TMC (103 TMC for NLBC and 52 TMC for NRBC) excluding Hippargi Barrage.

(ii) The total storage required to utilize this 155 TMC is 66 TMC in Alamatti excluding 38 TMC in the existing Narayanapur Dam.

(iii) For this storage of 66 TMC, the level required in Alamatti is 1690 feet (515.09 m).

(iv) As against 155 TMC allocated to the project, Karnataka is planning to raise the height of Alamatti Dam upto RL.1720 feet (524.46 m) providing an enormous storage capacity of 227 TMC which would enable Karnataka to utilize 400 TMC against the allocation of 155 TMC.

(v) Generation of Hydro-Power with greater storage of Alamatti beyond 155 TMC of water allocated to the Project contravenes the provision of Award.

(vi) As a result, there will be drastic reduction in the flows of Krishna river from Karnataka territory during the months of June, July and August which would mean substantial reduction in power production at Srishailam and Nagarjunasagar during these months and also postponing of agricultural operation in Krishna and Nagarjunasagar commands to months beyond August. This may result in giving up the first crop in average and bad years.

(2) **CWC’S CONTENTIONS**:-

(i) The Tribunal has not imposed projectwise restrictions in its final order and has clarified that water has been allocated to each of the three States enbloc and that subject to the conditions and restrictions placed, each State shall have the right to make beneficial use of water allocated to it in any manner it thinks proper.

(ii) The GOK have accordingly in 1993, made projectwise allocations for 700 TMC allocated by the Tribunal to Karnataka.

(iii) The Upper Krishna Project Stage-I has been allocated 119 TMC and Stage-II has been allocated 54 TMC giving a total utilization of 173 TMC.

(iv) As per Stage-II multi-purpose project prepared by GOK and sent to CWC, raising of FRL at Alamatti is contemplated from the present RL.512.2 m to 524.256 m to enable utilization of 54 TMC for irrigation and other purpose as envisaged in Stage-II. The top of the gate has been kept at 524.256 m and an indication has been made that the additional storage is for power generation.
(v) Storage in Alamatti at 524.256 m will be 226.96 TMC with a total utilization of 173 TMC (for irrigation plus industrial plus drinking water plus evaporations). This project is under examination in CWC.

(vi) Considering the clarifications given by the Tribunal about beneficial uses including uses for producing of hydro-power, Karnataka cannot be denied higher storage of water for power generation purposes.

(vii) Since storage larger than that required for 173 TMC utilization creates a physical capability to utilize more, especially if power generation is shut down, the CWC may agree for an Inter-State monitoring mechanism for the project to ensure utilization as per KWDT Award.

(3) MAHARASHTRA'S CONTENTIONS:

(i) The Petition is not maintainable either under law or facts as it concerns 3 States.

(ii) The facts represented are erroneous and contrary to the Award of Krishna Water Disputes Tribunal.

(iii) Each State has full freedom regarding height of dams, storage capacities; each State is free to use the water allocated to it as it feels fit.

(iv) It is explicitly stated in the order that water stored in any reservoir across any stream shall not itself be reckoned as depletion.

(v) If there is any adverse effect on Andhra Pradesh's agro-economy, it is not because of upper States, but due to Andhra Pradesh expanding its uses beyond 800 TMC without additional storage support and failing to regulate its share properly.

(vi) The Andhra Pradesh which has full knowledge of factual situation has not raised the matter of violation of Krishna Water Disputes Tribunal Order in any Court of Law.

(4) KARNATAKA'S CONTENTIONS:

(i) Karnataka strongly denies the points made out in the Writ Petition.

(ii) At the outset, it is made very clear that whether Andhra Pradesh Government supports the petitioner or otherwise, the High Court has no jurisdiction to adjudicate the public interest writ petition filed by Sri.R.Krishnaiah.

(iii) In Accordance with the liberty given under the Tribunal Award to the States for making readjustments amongst the projects in their basin within the overall quantity allocated in the Award subject to restrictions in certain sub-basins, Karnataka has allocated 173 TMC of water to Upper Krishna Project (119 TMC in 1st Stage and 54 TMC in 2nd Stage) out of Karnataka's share of 700 TMC available under the Tribunal Award plus 34 TMC by way of regeneration. This fact is supported by the CWC in its affidavit also. As such, the point made out in the Writ Petition and endorsed by Andhra Pradesh in its affidavit that the allocation for Upper Krishna is only 155 TMC, is not true.

(iv) Consequent on the above, the statement made in the Writ Petition as well as in the affidavit of Andhra Pradesh that Alamatti Dam should have been constructed only to a height (FRL) of 1690 feet in order to limit its utilization to 155 TMC, cannot also be accepted.

(v) The contention of Andhra Pradesh made in its affidavit that the generation of hydro-power with extra storage at Alamatti Dam beyond 155 TMC allocated for
the project contravenes the provision of the Tribunal Award, is not correct. Andhra Pradesh has made an attempt in its affidavit to interpret the clarification given by the Tribunal in its report about the beneficial uses, to its own convenience. The CWC in its affidavit has categorically stated that the Tribunal has clarified that all beneficial uses including uses for production of hydro-power are permitted to the extent specified in Clause-5 and subject to the conditions and restrictions mentioned in the final order and where the stored water after generation of electricity is returned to the river, the hydro-electricity use is considered as non-consumptive except for the loss in the water conductor system and storages. The CWC has accepted that the GOK cannot be denied a higher storage for power generation purpose. It may be pointed out here that the evaporation loss resulting out of creating an additional storage (between RL 519.6 m and 524.25 m) has been accounted for in the allocation of 173 TMC of water made to the project under Scheme-A of the Award. As the water stored for power generation is not for consumptive use except for lake losses and also as the water flows back to the river after generation of power, the contention of Andhra Pradesh that "construction of Alamatti dam to higher storage is illegal" is not borne out of facts.

(vi) The contention of the Writ Petitioner as well as of Andhra Pradesh is that the power production at Srishailam and Nagarjunasagar gets substantially reduced due to higher storage at Alamatti resulting in drastic reduction in the flows of Krishna river from Karnataka territory during the months of June, July and August. It is also made out therein that the agricultural operations in Krishna and Nagarjunasagar command areas get postponed to beyond August due to the above reasons and such a situation may land up in dispensing with the first crop in average and bad years. This statement of Writ Petitioner and Andhra Pradesh is not totally correct. No doubt, there may be a slight change in the pattern of flows in the river due to construction of storage reservoir at Alamatti irrespective of its height but nothing can hold Karnataka in having the contemplated storage capacity at Alamatti so long as the utilization for irrigation purpose does not exceed the quantity allocated to the project under Scheme-A of the Award, which is strictly in accordance with the Tribunal Award only. This aspect has been supported by CWC also in its affidavit. As regards the alleged statement about drastic reduction in the inflows from June to August resulting in reduction in power generation in A.P. and postponement of agricultural operation etc., Andhra Pradesh should come out with facts and figures supported by data as to what is the extent of reduction in power generation and how the agricultural operation gets postponed by 3 months. Another point to be noted here is that, Karnataka is not contemplating power generation only after the FRL 524.25 m is reached at Alamatti. Power generation is contemplated even with storages below FRL 524.25 m and the water so used for power generation, irrespective of the storage level, flows back to the river through the turbines. An integrated reservoir operation table has been scientifically worked out to determine the extent of release from Alamatti Reservoir for power generation and irrigation. While working out the reservoir operation tables, preference has been given to releases for irrigation within the waters allocated to the project under Scheme-A of the Award. In these circumstances, the apprehension of the Andhra Pradesh are unfounded.

(vii) The Petitioner has stated that Karnataka has not obtained the required clearance from GOI for increased height of Dam. It may be mentioned here that Karnataka has not contemplated, at any point of time, to increase the height of Alamatti Dam more than what was projected before the Tribunal. The project report presented to the Tribunal contemplated construction of Alamatti Dam to FRL 524.256 m and top of dam as 528.756 m. These levels have been persistently maintained in the Project Reports sent by GOK to CWC form time to time. Since the project is under implementation in Stages, the FRL in 1st Stage had been restricted to 512 m which is already approved by Planning Commission. In the 2nd Stage, the FRL in Alamatti would be raised to 524.25 m. The storage upto RL 519.6 m will be used for utilising 173 TMC for irrigation and storage between 519.6 m and 524.25 m will be used for power
generation till such time Karnataka gets its share of surplus water under Scheme-B. The Scheme-B allocation to Upper Krishna Project will also be used for irrigation utilising storage upto RL 524.25 m. As regards clearance of GOI for the height of Dam contemplated by GOK, it may be pointed out that the CWC has already given its technical clearance for construction of the Dam upto RL 527.25 m and for construction of piers with embedded parts for 15.2 m height which is the ultimate height of the radial crest gates. Since GOK had projected only the Stage-I project to utilize 119 TMC, the CWC limited the height of crest gates to 3.2 m (above the crest level of 509 m) in order to achieve the FRL of 512.2 m in Alamatti reservoir which had already been approved by Planning Commission. The Stage-II contemplating erection of 15.2 m high radial gates has now been submitted to CWC which is under consideration there. The 2nd Stage project contemplates utilization of the balance 54 TMC for irrigation purpose and the extra storage for power generation. In view of what is stated above, the contention of the Petitioner that the Alamatti Dam height is being raised for which there is no clearance of GOI, is not correct.

3.0 Orders of High Court of Andhra Pradesh:-

3.01 Order dated 30.07.1996:-

The Court, after hearing the writ petitions, passed its orders on 30.07.1996 as follows:-

The Respondents, except 1 to 6, have filed their Counter Affidavits. Heard on such issues which, if parties agreed, could dispose of the writ petitions without entering into the questions as to the bar upon the jurisdiction of the Court under Articles 131 and 262 of the Constitution of India as well as, as respect the cause of action within the jurisdiction of this Court for purposes of petition under Articles 226 of the Constitution. It is clear from the stands revealed through respective Counter-Affidavits that parties have agreed that they are bound by the Award and that they have intentions to go beyond the Award dated 31.05.1976 of Krishna Water Disputes Tribunal, popularly known as Bachwavath Commission, and that the Central Government has to play a very important and positive role in ensuring that no State is denied its due share under the Award.

Certain proposals have been mooted at the hearing of the petitions and if they find approval of the Government of State of Andhra Pradesh and the Government of State of Karnataka, there shall be no need for any proceedings in the Court and the States can settle their difference amicably and if necessary, with the intervention of the Central Government and appointment of a Krishna Valley Authority either as indicated in the Award or under section 6A of the Inter-State Water Disputes Act, 1956.

As prayed for on behalf of the State of Karnataka, put up on 21.08.1996 for further hearing, if necessary. It shall be open, however, for the parties to mention the matter earlier if any consensus has been arrived at or if there is any agreement between the parties on any of the proposals mooted at the hearing of the petition.

The Court had earlier issued directions to the Central Government to issue necessary instructions to the States to abide by the Awards and not to unilaterally do anything which has the effect of causing apprehensions that any of the party is violating the award. In the course of the hearing, it has transpired however that there is clearance for Stage – I of the Upper Krishna Project (Almatti Dam). There is controversy whether there is clearance by the Central Government for Stage – II of such project. It is clarified that the Court’s direction dated 24.07.1996 shall not be applied to the Stage – I of the project and shall be applicable to Stage – II until clearance is given by the Central Government. Directions of the Court, however, shall in no manner affect the jurisdiction of the Central Government to take necessary steps or any action in accordance with law.
3.02 Judgement dated 11.09.1996:-

Subsequently, additional counter affidavits were filed by Andhra Pradesh in the High Court on 16th August and 20th August 1996 in support of its contentions. The Divisional Bench of High Court passed judgement in the above said four Writ Petitions on 11.09.1996, disposing off the Writ Petitions holding that:-

(a) Writ Petitions are maintainable.

(b) The Divisional Bench noted the contentions of State of Andhra Pradesh that it was actively prosecuting the interest of State and its inhabitants and the Division Bench concluded as follows:

" For the reasons as above, we hold that the present controversy has to be resolved mainly between the State of Andhra Pradesh and the State of Karnataka. The petitioner's interest shall not be in jeopardy as the State of Andhra Pradesh has taken up the cause of the people of the State of Andhra Pradesh and a categorical statement has been made before us on behalf of the Central Government that it shall not let down people of either State. We hold accordingly that the court in such a situation shall exercise the refrain of not entertaining the Writ Petition at the instance of the petitioner at this stage. The petitions are accordingly disposed of. "

4.0 Meeting of the Chief Secretaries of Party-States held on 05.08.1996:-

4.01 Subsequent to the above said order dated 30.07.1996 of the Andhra Pradesh High Court, a meeting of the Chief Secretaries of all the Party States was convened by the Union Ministry of Water Resources on 05.08.1996 at Delhi. All the issues arising out of the said Court order were discussed in the said meeting under the Chairmanship of the Secretary, Ministry of Water Resources, GOI. Representatives from the Central Water Commission, Government of India; Government of Karnataka; Government of Andhra Pradesh and Government of Maharashtra attended the meeting. As the States stuck to their stands, no positive result emerged from the meeting.

5.0 Meeting convened by the Prime Minister on 10.08.1996:-

5.01 The Hon'ble Chief Minister of Andhra Pradesh submitted a Memorandum to the Hon'ble Prime Minister of India on 09.08.1996 highlighting all the contentious issues arising out of the proposal of Karnataka to increase the height of Almatti dam upto FRL 524.256 m. Following are the gist of the apprehensions expressed by Andhra Pradesh in its memorandum:-

(i) The over sized capacity of Alamatti reservoir will delay the release of water into Andhra Pradesh disrupting its agricultural system and power generation.

(ii) A copy of the latest project report of UKP should be made available to examine its effect on Andhra Pradesh.

(iii) Unmindful of the limitation that has been imposed by KWDT, of restricting irrigated area to 5.8 lakh ha, the GOK has gone ahead and taken concrete steps for the physical implementation of the plan to irrigate 7.5 lakh ha.

(iv) No irrigation under Alamatti dam had been considered by KWDT, even though the dam was under construction. It was meant only to supply water to Narayananpur reservoir. Infact, it had been specifically stated by KWDT that it does not allow any demand for water in respect of Alamatti dam. Nevertheless Karnataka has plans to irrigate 1.67 lakh ha under Alamatti.
(v) The KWDT allocated 155 TMC for Narayanapur reservoir only, to irrigate 5.83 lakh ha. Karnataka's statement is that it would use 173 TMC to irrigate 5.09 lakh ha. Where will the water for the additional 2.4 lakh ha come from so that 7.5 lakh ha can be irrigated?

(vi) As per the UKP project approved by GOI in 1978, the total reservoir capacity of Alamatti (42.2 TMC) and Narayanapur (37.6 TMC) was 79.8 TMC to irrigate 4.85 lakh ha by utilising 119 TMC of water. The present scenario is that, the total capacity of the two reservoirs will be 251.2 TMC of live storage (227 TMC at Alamatti and 24.2 TMC at Narayanapur) to irrigate 7.49 ha by utilising 173 TMC of water. With this increase in the capacity and the irrigated area, about 400 TMC of water will be available for utilisation which can irrigate over 14 lakh ha, under UKP alone. By adding 545 TMC of utilisation under other projects in Karnataka, the utilization of the Karnataka projects will be 945 TMC or even more. Such high storage will be in gross violation of the KWDT Award and will result in drastic reduction of even the dependable water available to Andhra Pradesh.

5.02 The Hon'ble Prime Minister held a meeting of Chief Ministers of Party-States on 10.08.1996 at Delhi in an attempt to resolve the dispute.

5.03 The Hon'ble Chief Minister of Karnataka also presented a Memorandum to the Prime Minister on 10.08.1996, highlighting therein the actions of Andhra Pradesh in going ahead with the execution of projects like Srisailam Right Bank Canal, Srisailam Left Bank Canal, Telugu-Ganga, Bhima LIS and Pulichintala Diversion Scheme and that they were designed to utilise water far in excess of the allocation made by the Tribunal to Andhra Pradesh and also that it was making huge investments on these projects. Raising the height of Jurala dam undertaken by Andhra Pradesh was also brought out in the Memorandum. As regards the objection of Andhra Pradesh for erecting 15.2 m height crest gates at Alamatti, Karnataka's position was made clear in the Memorandum. It was made clear that as long as Karnataka's utilization was within the overall limit of 734 TMC of water use in Krishna basin projects, there would be no objection from any part. It was also indicated in the Memorandum that, when the level of full utilization in Karnataka is achieved, if there is any apprehension on the part of Andhra Pradesh about the utilization in Karnataka getting likely to exceed the allocations, the matter could be taken up for more detailed discussions and that it would be open to Andhra Pradesh to raise the issue only at that stage. The need for implementing the Scheme-B formulated by the Tribunal and expediting clearance to the Godavari Diversion Scheme, were also stressed in the said Memorandum.

5.04 No fruitful results emerged from the above said meeting.

6.0 Studies on impact of Alamatti storage on Andhra Pradesh:

6.01 In order to provide a more scientific and effective base to counter the contentions of Andhra Pradesh, simulation studies were got conducted in August 1996 through M/s Chamundi Power Corporation (who had been entrusted with the Alamatti Power Project) and the Indian Institute of Science in close association with Karnataka Power Corporation Limited by making use of all available data, to know the quantum of impact on Andhra Pradesh State’s irrigation needs and power generation for different storage levels at Alamatti reservoir. Rule curves were developed for operation of Alamatti reservoir for maximising the power generation without sacrificing the main objective of maximising the irrigation benefits by utilising 173 TMC of water under Scheme-A.
6.02 It was found from the studies that, by storing water at Alamatti upto 524.256 m, it is Andhra Pradesh that is benefited more by way of increased power generation and that too when the demand for power was more. It was found by a careful analysis that the power generation at Jurala, Srishailam and in Nagarjunasagar in Andhra Pradesh would increase by 1065 MU by storing water at Alamatti upto FRL 524.256 m when compared to the storage at FRL 519.6 m. As regards the effect of storing water at Alamatti upto FRL 524.256 m on the agricultural operations in Andhra Pradesh, it was found that the inflows in Andhra Pradesh would still be more than its irrigation needs even when the storage at Alamatti was upto 524.256 m. The following Table gives a clear picture of the irrigation needs of Andhra Pradesh and the inflows into Andhra Pradesh when Alamatti levels are at 519.6 m and 524.256 m.

<table>
<thead>
<tr>
<th>Period</th>
<th>Andhra Pradesh’s irrigation need in TMC (Cumulative)</th>
<th>Inflows in Andhra Pradesh with Alamatti FRL of 519.6 m (in TMC)</th>
<th>Inflows in Andhra Pradesh with Alamatti FRL of 524.256 m (in TMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>By 15 August</td>
<td>106</td>
<td>252</td>
<td>209</td>
</tr>
<tr>
<td>By end August</td>
<td>157</td>
<td>410</td>
<td>344</td>
</tr>
<tr>
<td>By end September</td>
<td>227</td>
<td>487</td>
<td>418</td>
</tr>
</tbody>
</table>

6.03 As regards the impact of Alamatti storage on power generation in Andhra Pradesh projects, the following Table gives a clear picture of the incremental power generation at Alamatti as well as at Andhra Pradesh projects by having a storage upto 524.256 m at Alamatti vis-a-vis the storage at 519.6 m.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Alamatti storage at 519.6 m</th>
<th>Alamatti storage at 524.25 m</th>
<th>Increase in power generation</th>
<th>Yearly value of increase at Rs.3/- per Kwh.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Power generation at Alamatti</td>
<td>522 MU</td>
<td>680 MU</td>
<td>158 MU</td>
<td>Rs.47 crores</td>
</tr>
<tr>
<td>2.</td>
<td>Power generation at Narayanapur cascades</td>
<td>1559 MU</td>
<td>2125 MU</td>
<td>566 MU</td>
<td>Rs.170 crores</td>
</tr>
<tr>
<td></td>
<td><strong>Total – Karnataka:</strong></td>
<td><strong>2081 MU</strong></td>
<td><strong>2805 MU</strong></td>
<td><strong>724 MU</strong></td>
<td><strong>Rs.217 crores</strong></td>
</tr>
<tr>
<td>3.</td>
<td>Power generation in Andhra Pradesh</td>
<td>3794 MU</td>
<td>4859 MU</td>
<td>1065 MU</td>
<td>Rs.319 crores</td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong></td>
<td><strong>5875 MU</strong></td>
<td><strong>7664 MU</strong></td>
<td><strong>1789 MU</strong></td>
<td><strong>Rs.536 crores</strong></td>
</tr>
</tbody>
</table>

7.0 Further efforts made to resolve the dispute regarding sharing of Scheme-B waters:

7.01 The Chief Ministers of West Bengal, Tamil Nadu, Bihar and Assam, who were Members of the Steering Committee of the then United Front Government at the Centre, met on 12.08.1996 in an effort to finding an amicable solution for the water dispute between Karnataka and Andhra Pradesh. The Chief Ministers of these States decided to appoint a Technical Committee of Experts from the above States including an Expert each from Central Water Commission and Planning Commission of Government of India, which should look into all the projects in Krishna Basin so as to resolve the differences and allay the apprehensions of Andhra Pradesh regarding Alamatti Dam. This proposal was welcomed by the Prime Minister and accepted by the Chief Minister of Andhra Pradesh.

7.02 The Chief Secretary of GOK wrote to his counterparts in Andhra Pradesh and Maharashtra with a request to give consent for adoption of Scheme-B as envisaged in the Report of Krishna Water Disputes Tribunal (KWDT). This was followed up by a letter
from the Chief Minister of Karnataka to the Chief Minister of Andhra Pradesh on 20.08.1996.

7.03 The Chief Secretary to Government of Andhra Pradesh sent his reply on 21.08.1996 stating as follows:-

"The State of Andhra Pradesh had not accepted Scheme-B due to valid apprehensions. Operation of Scheme-A as awarded by KWDT is a settled issue. Our experiences in Tungabhadra canals irrigation and Rajolibanda Diversion Scheme have only strengthened our apprehensions. Therefore, we would like to reiterate that we do not repeat nor propose to consider reopening of a settled issue viz., the operation of Scheme-A."

7.04 The Chief Secretary to Government of Maharashtra in his reply dated 05.10.1996, stated as follows:-

"In Scheme-A, which has been incorporated by the Tribunal in its final operative order, the 75% dependable flow of Krishna as could be ascertained at that time was distributed. In Scheme-B, the average river flow (50% dependable flow) which is a theoretical upper limit of the utilisable river supply that can be developed by storages and regulation is to be distributed. But until a chain of reservoirs having sufficient storage capacities is constructed in the Krishna Basin, it is not possible to utilize or distribute the average river flow to the full extent. Under the present circumstances, the criteria of 75% dependability for river flow is the most suitable for projects in the Krishna Basin.

Under the circumstances, adoption of Scheme-B at this stage will not be in any way beneficial either to Maharashtra or to other riparian States and it is regretted to inform you that your suggestion for adoption of Scheme-B, therefore, cannot be considered by the State of Maharashtra."

8.0 **Special Leave Petition (No.19978-19981 of 1996) filed in Supreme Court:-**

8.01 Consequent on the disposal of the Writ Petitions in the A.P. High Court, the Petitioner in the above said Writ Petition Nos.12756 to 12759 filed Special Leave Petition in the Supreme Court, bearing SLP No.19978-19981 on 19.09.1996. The Special Leave Petition came up for hearing and orders were passed by the Supreme Court on 28.10.1996, as noted below:-

"Mr.F.S.Nariman, learned senior counsel appearing for the State of Karnataka and Mr.K.Parasaran, learned senior counsel appearing for the State of Andhra Pradesh, informed the Court that the issues are under consideration by the two States and the Government of India and some decision is expected to be taken in the near future. Put up in the 1st week of February 1997."

8.02 The State of Karnataka also filed a Special Leave Petition (No.25023 of 1996) in the Supreme Court on 04.11.1996 against the judgement of Andhra Pradesh High Court which had held that the Writ Petitions were maintainable by the inhabitants.

8.03 Both the Special Leave Petitions of the individual and the State of Karnataka came up for hearing on 03.02.1997. Special leave to appeal was granted in both the petitions with no interim order. The order of the Supreme Court was as follows:-

"Applications for impleadment rejected.
Special leave granted. Printing dispensed with. Additional documents if any, may be filed within four weeks. No interim orders."
Thereafter, Karnataka filed a suit (O.S.No.1 of 1997) in the Supreme Court, the details of which are explained in paragraph No.10.0 below.

9.0 Formation of Technical Committee of Experts and its report:-

9.01 In the meanwhile, since all the efforts made to come to an understanding about the implementation of Scheme-B had failed, the Steering Committee of the United Front Government at the Centre, in accordance with an earlier decision taken by the four Chief Ministers on 12.08.1996, constituted a Technical Committee of Experts in November 1996, with composition as noted below:

(i) Sri.P.Neog, Secretary and Chief Engineer (Irrigation), Government of Assam.
(ii) Sri.Gaganprasad, Director, State Hydrology Cell, Government of Bihar.
(iii) Sri.S.C.Sinha, Chief Engineer (Retired), Bihar.
(iv) Sri.P.K.Balakrishnan, Technical Consultant to the Government of Tamil Nadu.
(v) Sri.S.K.Roy, Executive Engineer, I & W Directorate, Government of West Bengal.
(vi) Sri.D.P.Ghoshal, Secretary, I & W Department, Government of West Bengal (also Convener of the Committee).

9.02 The Committee visited the following works / projects from 15th to 18th November 1996:

(i) Tungabhadra dam in Karnataka.
(ii) Hippargi barrage in Karnataka.
(iii) Alamatti and Narayanapur dams in Karnataka.
(iv) Srishailam dam and Srishailam Right Bank Canal (Head reach) in Andhra Pradesh.
(v) Telugu-Ganga Canal (Head reach) in Andhra Pradesh.
(vi) Nagarjunasagar dam in Andhra Pradesh.
(vii) Srishailam Left Bank Canal (Head reach) in Andhra Pradesh.

9.03 The Committee also heard the views of representatives of Government of Karnataka and Government of Andhra Pradesh during its field visits. The Committee held its final meeting with the representatives of both the Governments at Calcutta on 16th & 17th January 1997. Karnataka put forth its views in defense of building Alamatti dam to its final FRL of 524.256 m and also strongly countered all the apprehensions of Andhra Pradesh in the said meeting at Calcutta.

9.04 Later on, the Committee forwarded its Report in January 1997 (copy enclosed as Annexure-1), wherein the issues relating to – (a) Srishailam Right Bank Canal; (b) Telugu-Ganga Project; (c) Srishailam Left Bank Canal; (d) Surplus quantities to be used by Andhra Pradesh; and (e) Alamatti dam, have been briefly discussed. The Committee’s findings and recommendations contained in its report are as shown below:

Using surplus waters by Andhra Pradesh:

(i) Andhra Pradesh utilising surplus waters of the Krishna under the projects mentioned above without acquiring any prescriptive rights appears to be in order. However, this issue of Andhra Pradesh using the surplus waters may come up when the riparian States viz. Maharashtra, Karnataka and Andhra Pradesh, start discussions after 31st May 2000 on sharing the surplus waters of the river Krishna.

Alamatti Dam in Karnataka:

(ii) It is seen that many canals under Upper Krishna Project have been designed and constructed for a larger capacity meant for future increases.
(iii) The proposal of Karnataka to build Alamatti dam to FRL 524.256 m means that only when Scheme-B fructifies there will be a need for large storage at Alamatti. Availability of a quantity of 23 TMC under Polavaram Diversion and 165 TMC from Scheme-B allocation of surplus waters, may not fructify in the immediate future. It is, therefore, not necessary at present to build a bigger storage of 227 TMC at Alamatti dam with top of shutters at 524.256 m. When there is need / justification to raise the FRL on a future date, such a raising of FRL is technically feasible.

(iv) The 75% flow at Alamatti being 319 TMC and allowing the use of 173 TMC at Alamatti and Narayanapur, the balance Krishna water that would flow down to Andhra Pradesh would be around 160 TMC. Also in the 25% of the years, it would be less or much less than this quantity. Extra storage facility at Alamatti, even for a temporary period of three months over and above that required for Karnataka to utilize an annual quantity of 173 TMC at Alamatti and Narayanapur, is causing apprehension in the mind of Andhra Pradesh. They may not get timely supply according to their irrigation and power demand for such temporary hold up in Alamatti reservoir.

(v) It is desirable to proceed with utmost caution in the larger interest of the Nation, to wait and watch the operation and performance of the various Krishna systems upstream and downstream, before embarking on creating a larger storage at Alamatti Dam than what is needed to suit the present conditions.

(vi) The Indian Institute of Science, Bangalore, has arrived at the FRL of Alamatti Dam as 518.7 m required for a utilization of 173 TMC under the project. However, allowing probable loss in storage capacity due to siltation etc, the FRL or the top of shutters may be fixed for the present, at 519.6 m and the gates manufactured and erected accordingly. Alamatti dam with FRL at 519.6 m will provide a storage of about 123 TMC, which along with the storage of 37.8 TMC at Narayanapur, will be quite adequate to take care of the annual requirement of 173 TMC presently envisaged under Upper Krishna Project.

(vii) The Committee feels that the above suggestion to solve the present problem regarding Alamatti Dam is the first step to be taken. There are other issues like those raised by Karnataka for new works taken up by Andhra Pradesh; in addition some more issues may emanate from Andhra Pradesh, Karnataka and Maharashtra. To solve all such issues the Committee suggests that the entire Krishna Basin in Maharashtra, Karnataka and Andhra Pradesh is brought under the management of a single regulatory board with adequate powers to decide on the issues. This will result in the optimum utilization of Krishna Waters. Such a regulatory board is not a new one in our country. We know that the Boards created for D.V.C. and Tungabhadra are doing well in serving the overall interests of the country. Even in the case of international river like the Ganges, issues are sought to be solved by joint gauging, measurement and monitoring. Such a step in the case of the Krishna Basin will serve the interests of all the basin States and allay the fears of one State against another resulting in amicable settlement of all the issues.

9.05 On receipt of the Report of the Expert Committee, the Chief Minister of Karnataka wrote to his counter-part of West Bengal on 25.02.1997 (copy enclosed as Annexure-2) pointing out many deficiencies in the Report of the Expert Committee. It was indicated in the said letter of the Chief Minister of Karnataka that this kind of a report was not what an Expert Group was expected to prepare and submit. The Chief Minister of West Bengal in his reply dated 07.03.1997 suggested a discussion with the Chief Minister of Andhra Pradesh in the first instance after which the matter could be discussed in a full meeting of the Ministers.

9.06 However, consequent on the matter being taken to the Supreme Court on 01.03.1997 in the form of a Suit filed by Karnataka, no further developments took place on the Report of the Expert Committee.
10.0  **O.S. No.1 of 1997 filed by Karnataka before the Supreme Court of India:**

10.01  Consequent on the order dated 03.02.1997 of the Supreme Court in the Special Leave Petitions, Karnataka filed a Suit in the Supreme Court on 01.03.1997 vide O.S. No.1 against Andhra Pradesh, Maharashtra and Union of India, with a prayer for the following reliefs:

1. Decree and declare that the surplus water in the river Krishna, i.e., in excess of 2060 TMC at 75% dependability, must be shared, in accordance with the determination and directions of the Tribunal contained in its report (1973) and further report (1976).

2. Decree and declare that the Defendant No.1 State of Andhra Pradesh is not entitled to insist on its right to use the surplus water i.e., in excess of 2060 TMC at 75% dependability, so long as Scheme B framed by the Tribunal is not duly and fully implemented by the State.

3. Defendant No.3 be directed by a permanent order and injunction including mandatory, decree order and injunction, to notify Scheme B framed by the Tribunal and make provision for establishment of a Krishna Valley Authority and for implementation of the directions of the Tribunal in the Report (1973) and further report (1976), as contemplated under Sec. 6A of the Inter State Water Disputes Act, 1956.

4. For a permanent order and injunction restraining the Defendant No.1 from continuing to execute the following projects viz., Telugu Ganga, Srisailam Right Bank Canal, Srisailam Left Bank Canal, Bheema Lift Irrigation and Pulichintala Projects till the Scheme B framed by the Tribunal is duly and effectively put into operation and implemented.

5. Pending the hearing and final disposal of the suit, the Defendant No.3 be restrained from clearing any new projects of the State of Andhra Pradesh not envisaged in Scheme A.

6. Pending the hearing and final disposal of the suit, the Defendant State of Andhra Pradesh be restrained by order and injunction of this Hon'ble Court from using any portion of surplus waters in excess of 2060 TMC for allowing any of the following projects viz., Telugu Ganga, Srisailam Right Bank Canal, Srisailam Left Bank Canal, Bheema Lift Irrigation and Pulichintala Projects, until implementation of Scheme 'B' framed by the Tribunal.

7. For such other reliefs as the nature of case requires

10.02  Andhra Pradesh filed its written statement on 07.07.1997, stating as follows:

1. …. The Tribunal adopted only Scheme 'A' in its decision and that alone is binding on the parties. The parties having acted upon the Scheme 'A' for the last two decades, the plaintiff-State with ulterior motive addressed a highly belated letter dated 17.08.1996 as a counter blast to the protest lodged by the answering defendant against the plaintiff-State for carrying out a totally illegal project at Alamatti in gross violation of the decision of the Tribunal. It is reiterated that under the decision of the Tribunal, the answering defendant is entitled to the use of the remaining waters and therefore the plaintiff-State cannot have any grievance on that account. The Projects undertaken by the answering defendant are within the rights recognised and declared by the decision of the Tribunal. The allegations of the plaintiff to the contrary are denied, being totally baseless and misconceived.

2. ….Scheme 'B' does not form part of the decision and hence there is no obligation on any of the riparian States to implement Scheme 'B'. Scheme 'B' having been rejected by the Tribunal itself could not be implemented by any party state, of its own accord.
The suit is not maintable as it is based on an imaginary cause of action. It is liable to be rejected as not disclosing a cause of action at all.

10.03 Maharashtra in its Written Statement filed on 11.07.1997, stated as follows:-

(1) With regard to Para 27, the State of Maharashtra submits that before implementation of Scheme 'B' it is absolutely necessary as a first step to construct a chain of carry over reservoirs in the Krishna basin as prescribed by the Tribunal. This first step – i.e., construction of a chain of carry over reservoirs – is being undertaken by the State of Maharashtra in accordance with KWDT's Final Order and the storages are expected to be in place by 31st May 2000 A.D. when the present final and binding KWDT order could come up for review.

(2) Adverting to Para 29 of the Plaint, it is submitted that no cause of action has arisen for the suit. It is denied that cause of action has arisen on 21.08.1996 / 05.10.1996 when defendant Nos.1 and 2 have refused to consent to share the surplus waters in excess of 2060 TMC as alleged. It is denied that the cause of action arose when the defendants refused to consent for implementation of Scheme 'B' as alleged.

(3) Maharashtra agrees with the State of Karnataka so far as the allegation of appropriation of the remaining water of the river Krishna in a permanent way by constructing projects like Telugu-Ganga, Srisailam RBC, Srisailam LBC, Bhima Lift and Pulichintala by Andhra Pradesh.

10.04 The Union of India filed its Written Statement on 11.07.1997, stating as follows:-

(1) ....It is submitted that there is no obligation under the report for the parties to agree to the constitution of the Krishna Valley Authority”.

(2) This defendant does not admit that there is any misuse as the state of Andhra Pradesh has alleged. This defendant says that the award does not give a project wise allocation but gives the gross allocation.

(3) This defendant submits that each of the States is bound to give effect to the Award given by the Tribunal.

(4) Regarding Telugu-Ganga Project constructed by Andhra Pradesh –

"....The project has not been cleared from techno-economic angle by the Advisory Committee of Ministry of Water Resources due to non-resolution of Inter-States issues”.

(5) Regarding Srisailam Right Bank Canal constructed by Andhra Pradesh –

"The project was given investment clearance by the Planning Commission to use flow share of Andhra Pradesh and from savings by modernisation of Kurnool – Cuddapah Canal”.

(6) Regarding Srisailam Left Bank Canal constructed by Andhra Pradesh –

"The Srisailam Left Bank Canal has not been considered by the Advisory Committee of the Ministry of Water Resources and is an unapproved project”.

(7) With reference to Paragraphs 24, this defendant says that the permissions given by the Central Government are as set out hereinabove.

This defendant further states that the said permissions do not entitle any of the parties, including the State of Andhra Pradesh, to transgress directly or indirectly the said water Tribunal's award.
(8) With reference to Paragraph 29, this defendant says that the award does not deal with the Scheme ‘B’ to be made effective by the States concerned.

This defendant submits that in view of the fact that there is a counter suit between the two States, it is advised to make its submission on the report and on the law and then submit to the orders of the Court.

11.0 O.S.No.2 of 1997 filed by Andhra Pradesh before the Supreme Court of India:

11.01 Andhra Pradesh also filed a Suit on 25.03.1997 in the Supreme Court vide O.S.No.2 against Karnataka and Union of India (Maharashtra was a party to O.S.No.2) with a prayer for the following reliefs:

(1) Declare the report / decision dated 24.12.1973 and the further report / decision dated 27.05.1976 of the Krishna Water Disputes Tribunal (KWDT) in their entirety are binding upon the three riparian States of Maharashtra, Karnataka and Andhra Pradesh and also the Union of India.

(2) Declare that the riparian States are duty bound to fully disclose to each other and also to the Union of India all particulars of all projects undertaken or proposed after December 1973 and May 1976, and to direct the defendants to ensure that execution thereof are in conformity with and do not conflict with or violate the decisions of the KWDT and they do not adversely affect the rights of the other riparian States.

(3) Declare that the Party-States are entitled to utilize not more than the quantity of water which is allocated or permitted by the decisions of the KWDT for the respective projects of the respective Party-States before the Tribunal; and that any variation in either storage or utilization of the waters by each such State in respect of each of such projects could only be with the prior consent or concurrence of the other riparian States.

(4) Declare that all the projects executed and / or which are in the process of execution by the State of Karnataka which are not in conformity with and conflict with or violate the decisions of the KWDT, as illegal and unauthorized.

(5) Declare that approvals / sanctions / clearances / in-principle clearances granted by the Union of India on or after KWDT decisions on 24.12.1973 and on 27.05.1976 in respect of schemes / projects proposed / undertaken by the Government of Karnataka are invalid and direct the Union Government to review / reconsider all such schemes / projects proposed / undertaken by Karnataka, afresh, after obtaining the views thereon of the other riparian States.

(6) Declare that the States of Karnataka and Maharashtra shall not be entitled to claim any rights preferential or otherwise in respect of storage, control and use of waters of the Inter-State river Krishna in respect of the schemes / projects not authorized by the decision of the KWDT.

(7) Declare that the Union Government is duty bound to consult all the riparian States of Maharashtra, Karnataka and Andhra Pradesh before according any approvals / sanctions / clearances / in-principle clearances to any schemes / projects proposed / undertaken by any of the riparian States on the inter-State river Krishna and direct the Union Government to act in terms of the said declaration.

(8) Grant a mandatory injunction directing the State of Karnataka to undo all its illegal, unauthorized actions regarding projects / schemes and in particular the following projects executed by it contrary to the decisions of KWDT so as to bring them in conformity with the said decisions:

Alamatti Dam under Upper Krishna Project.
Construction of Canals / Lift Schemes on Alamatti Reservoir.
Upper Krishna Projects in K-2 Sub-Basin.
Hippargi weir / irrigation Scheme.
Construction of Indi and Rampur Lift Schemes on Narayanapur Reservoir and the canals.

(9) Grant a permanent injunction restraining the State of Karnataka from undertaking, continuing or proceeding with any further construction in respect of the following projects:

Alamatti Dam under Upper Krishna Project.
Construction of Canals / Lift Schemes on Alamatti Reservoir.
Upper Krishna Projects in K-2 Sub-Basin.
Hippargi Weir / Irrigation scheme.
Construction of Indi and Rampur Lift Schemes on Narayanapur Reservoir and the canals.

(10) Appoint a team of experts for making a comprehensive techno-economic evaluation and environmental impact analysis in respect of the following projects and, pending orders of this Hon'ble Court on the report of the team of experts, grant an order of injunction restraining the Defendant No.1 – State of Karnataka from proceeding with any further construction in any of the following projects / schemes:

Alamatti Dam under Upper Krishna Project.
Construction of Canals / Lift Schemes of Alamatti Reservoir.
Upper Krishna Projects in K-2 Sub-Basin.
Hippargi Weir / Irrigation Scheme.
Construction of Indi and Rampur Lift Schemes on Narayanapur Reservoir and the canals.

(11) To issue a permanent injunction restraining the Defendant No.1 State of Karnataka from growing or allowing to grow sugarcane or raising other wet crops in the command areas falling under the projects / schemes within the Upper Krishna Project.

(12) Pass a decree in terms of prayers (1) to (11); and

(13) Award costs of the present proceeding in favour of the Plaintiff.

(14) Pass such further decree or decrees or other order or orders as this Hon'ble Court may deem fit in the facts and circumstances of the case.

11.02 In its plaint, Andhra Pradesh indicated, inviting reference to the findings of the Technical Committee of Experts, that it does not accept the entitlement of Karnataka to use 173 TMC under Upper Krishna Project and the height of Alamatti dam at FRL 519.6 m.

11.03 Karnataka filed its written statement on 07.07.1997 denying all the allegations / contentions of Andhra Pradesh made in its O.S. No.2 of 1997. The report of the Expert Committee, constituted by the Steering Committee of the then United Front Government at the Centre, was exhaustively discussed in the written statement. While disagreeing with the findings of the Expert Committee, it was pointed out therein that the Committee had sought official recognition but did not get it and also that the Committee did not have the advantage of any Central Government participation in the deliberations. It was also indicated that the Expert Committee's report was neither conclusive nor even final and that Karnataka had already submitted its objections / comments on the said report. The benefit that Andhra Pradesh would get by way of additional power generation under its projects by having a storage upto 524.256 m at Alamatti vis-a-vis the storage at 519.6 m was also brought out therein. It was further made out by Karnataka that, even though the dam was envisaged to be built to its final height (FRL 524.256 m), the utilization for irrigation under UKP would be limited to 173 TMC.
11.04 The State of Maharashtra filed its written statement on 11th July 1997 fully supporting the stand taken by the State of Karnataka and seeking relief to the dismissal of the suit filed by Andhra Pradesh.

11.05 The Union of India in its written statement filed on 29.09.1997, while generally denying allegations made in the plaint, took the positive stand that the Karnataka’s multi-purpose project Stage-II was still under examination and that the project report provided for hydro-power generation by storing water between RL 519.6 m and RL 524.256 m at Alamatti. The main contentions of the Union of India were:-

1. It has been indicated in the project report that, after generating hydro-power, the tail race water will be let into the river Krishna and the utilization of water under Upper Krishna Project will be within 173 TMC.

2. As per the Award of KWDT, the allocation of water is gross and not projectwise.

3. The State is entitled to utilize the gross amount of water for any such project so long as the utilization by Karnataka is within 173 TMC under Upper Krishna Project and there will be no violation of KWDT Award.

4. There is no obligation on the Central Government to consult the said Party-State while clearing projects of other Party-States of the Krishna Basin when they are within the frame work of KWDT Award.

5. The allegations of Andhra Pradesh that Central Government adopted partisan attitude is denied.

6. Andhra Pradesh has not been able to prove that, by constructing Alamatti dam the State of Karnataka would be utilising more water than allocated by the Tribunal.

12.0 **Proceedings in the Supreme Court:-**

12.01 **Legal counsels and Technical team:-**

(a) The following advocates appeared on behalf of the three Party-States and the Union of India in the above said OS No.1 of 1997 and OS No.2 of 1997:-

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<tr>
<th>Karnataka</th>
<th>Andhra Pradesh</th>
<th>Maharashtra</th>
<th>Union of India</th>
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<tbody>
<tr>
<td>Mr. F.S. Nariman, Sr. adv.</td>
<td>Mr. K. Parasaran, Sr. adv.</td>
<td>Mr. T.R. Andhyarujina, Sr. adv.</td>
<td>Mr.R.N. Trivedi, A.S.G.</td>
</tr>
<tr>
<td>Mr. S.S Javali, Sr. adv.</td>
<td>Mr. A.K. Ganguli, Sr. adv.</td>
<td>Mr. M.S. Nargolkar, Sr. adv.</td>
<td>Mr. Rajeev Sharma, adv.</td>
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<tr>
<td>Mr. K.R. Nagaraja, adv.</td>
<td>Mr. G. Raghuram, Sr. adv.</td>
<td>Mr. Subrat Birla, adv.</td>
<td>Ms. Sushma Suri, adv.</td>
</tr>
<tr>
<td>Mr. Mohan V. Katariki, adv.</td>
<td>Mr. A. Ram Narayan, adv.</td>
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<td>Mr. Vineet Kumar, adv.(NP)</td>
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<td>Mr. Shambhu Prasad Singh, adv.</td>
<td>Mr. Umapathy, adv.</td>
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<td>Mr. Subhash Sharma, adv.</td>
<td>Mr. G. Prabhakar, adv.</td>
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(b) The legal counsels of Karnataka were ably assisted by a Technical team of senior officers / engineers, which included – (i) Sri.D.N.Desai, Chairman of Krishna Water Disputes Technical Committee; (ii) Sri.K.N.Srivastava, MD of KBJNL; (iii) Sri.M.S.Ramaprasad, Chief Engineer, WRDO; (iv) Sri.S.S.Magdal, Chief Engineer, UKP, Alamatti; and (v) Sri.Sriramaiah, Executive Engineer, WRDO.

12.02 **Submission of Karnataka in September 1997:-**

During the proceedings in the Supreme Court, several IAs were filed by both Karnataka and Andhra Pradesh seeking interim reliefs. During the hearing of one of the IAs, Karnataka submitted to the Court in September 1997 that the civil works of Alamatti
dam were still to be completed and that the erection of gates was programmed to be commenced only in October 1998 for completion by March 1999.

12.03 Reference to Constitution Bench:

During the course of deliberations, the Supreme Court ordered on 21.07.1998 for referring the matter, in view of the Article 145(3) of the Constitution, to a Constitution Bench of five judges.

12.04 Contempt Petition filed by Andhra Pradesh and appointment of Expert Commissioner:

In July 1998, Andhra Pradesh filed a contempt petition in Supreme Court (C.P. No.312 of 1998 in O.S.No.2 of 1997) alleging that Karnataka was going ahead expeditiously for completion of Upper Krishna Project. The Court appointed Sri.S.M.Seth, Director, National Institute of Hydrology, Roorkee, as the Expert Commissioner for verification of the facts. The Expert Commissioner visited the Alamatti dam site along with the representatives of Government of Karnataka and Government of Andhra Pradesh on 18.10.1998. His inspection programme comprised as follows:-

(1) Introduction of purpose of the inspection visit by Advocates of Karnataka and Andhra Pradesh Governments.
(2) Inspection of Fabrication Yard of M/s.Precision Technofab & Engineering Pvt. Ltd., Ahmedabad along with representatives of Karnataka and Andhra Pradesh.
(3) Inspection of Fabrication Yard of M/s. Om Metals & Minerals Ltd., New Delhi along with representatives of Karnataka and Andhra Pradesh.
(4) Inspection of Civil works from Left Bank side of the Dam along with representatives of Karnataka and Andhra Pradesh.
(5) Inspection of Fabrication facilities of M/s. Gammon India Ltd., along with representatives of Karnataka and Andhra Pradesh.
(6) Visit to Road Bridge downstream of spillway along with representatives of Karnataka and Andhra Pradesh.
(7) Inspection of Dam top from right bank side along with representatives of Karnataka and Andhra Pradesh.
(8) Discussions with the representatives of Karnataka and Andhra Pradesh in the Conference Room at Alamatti Dam.
(9) Discussions with representatives of contractors.

12.05 Findings of the Expert Commissioner:

The Expert Commissioner, after conducting the inspections according to the above said programme, held discussions with the representatives of both Karnataka & Andhra Pradesh and the contractors who were executing the gate work of Alamatti dam. Thereafter, the Expert Commissioner finalized his report on 26.10.1998 and submitted the same to the Supreme Court, drawing the following inferences in his Report:-

(1) The solid crest level of 509 m at Alamatti dam was achieved in March 1997.
(2) The activities carried out by Karnataka Irrigation Department / Contractors during March 1997 to September 1997 include:
   (a) Civil works for raising of dam above 509 m including raising of piers of spillway.
   (b) Fabrication and placement of embedded parts of radial gates in concrete.
   (c) Fabrication of different components of radial gates, hydraulic hoists and stoplog gates.
(d) No radial gates have been erected / installed in any of the 26 bays of spillway of Alamatti dam during this period.

(3) The activities carried out by Karnataka Irrigation Department / contractors during September 1997 to May 1998 include:
   (a) Civil works for raising of dam and spillway piers upto their final heights.
   (b) Placement of embedded parts of radial gates and hydraulic hoist suspension system in concrete and placing of wave deflector.
   (c) Fabrication of different components of radial gates, hydraulic hoists and stoplog gates.
   (d) No radial gates have been erected / installed in any of the 26 bays of spillway of Alamatti dam during this period.

(4) The activities carried out by Karnataka Irrigation Department / contractors during June 1998 to 18.10.1998 include:
   (a) Civil works for raising of spillway piers upto their final height and constructing roadway bridge at top.
   (b) Placement of embedded parts in left abutment block.
   (c) Fabrication of different components of radial gates, hydraulic hoists and stoplog gates.
   (d) No radial gates have been erected / installed in any of the 26 bays of spillway of Alamatti dam during this period.

(5) The activities which remain to be carried out (for which Karnataka Irrigation Department has drawn an action plan from November 1998 to June 1999).
   (a) Dismantling of cable way and minor concreting work.
   (b) Transportation, positioning, field welding of radial gate components for 26 gates, their erection / installation, erection of hydraulic hoists for 26 radial gates.
   (c) Testing and commissioning of 26 radial gates and
   (d) Providing permanent power supply, remote control arrangement etc, for operation of gates.

(6) From technical objectives / engineering functioning point of view of radial gates in spillways, it can be said that:

None of the 26 radial gates have been erected / installed in the spillway bays at site and none of the 26 hydraulic hoist assembly erected / installed in any of the 26 bays of spillway of Alamatti dam till 18.10.1998, the date of inspection by Expert Commissioner. The fabricated components for these gates and hoist assembly are lying in Fabrication Yards near the dam site. (Some are yet to arrive). However, the embedded parts of radial gates which are concomitant with civil works / concreting work of spillway piers / abutments have been embedded at designated levels and locations during March 1997 to June 1998. During this period, civil construction / concreting work has also taken place above spillway crest level of RL 509 m to reach final height of and construction of roadway bridge at top.

There is, at present no control on flow of water above the solid crest level at RL 509.0 m and the water continues to flow unobstructed through all the 26 bays of the spillway.

12.06 The Supreme Court passed orders on 02.11.1998 on the contempt petition filed by Andhra Pradesh, directing that the erection of crest gates at Alamatti will not begin till the end of January 1999 and until further orders from the Court.

12.07 Submission of Karnataka in December 1998:-

In December 1998, the counsel of Karnataka made a submission before the Supreme Court that, without in any way raising the existing solid crest level of the dam beyond 509 m or in any way obstructing the free flow of water, Karnataka may be
permitted to proceed with the works of – (a) placement of trunnion assembly; (b) placement of radial arms; (c) placement of horizontal girders; and (d) providing bracings and hoist assembly. This prayer of Karnataka was granted by the Court on 14.12.1998 emphasising that the same would be at the risk and cost of Karnataka and shall be without prejudice to the rights of Andhra Pradesh.

12.08 Submission of Karnataka in February 1999:-

Subsequently, the counsel of Karnataka gave a proposal to the counsel of Andhra Pradesh on 01.02.1999 stating that Karnataka would agree for not exceeding its present planned utilization of 173 TMC even after erection of all the 26 gates to full height corresponding to FRL 524.256 m of the dam and that, in this interim period till the decision of the Supreme Court on the Suits, Karnataka agrees for an effective monitoring system as suggested by CWC in March 1997.

12.09 Change in the stand of Maharashtra:-

An additional written statement was filed by Maharashtra on 09.04.1999 giving a clear go-by to the earlier written statements on the construction of Alamatti dam with FRL 524.256 m. In this additional written statement, it was averred that, by raising the dam at Alamatti, there was a likelihood of an enormous damage to private and public property and work structures including archaeological structures and pilgrimage places in the State of Maharashtra. It was also stated that there would be disruption of communications, enhanced distress and damages during floods each year due to sedimentation. It was further indicated that there would be large scale submergence of area in Maharashtra if the Alamatti dam is constructed to FRL 524.256 m and therefore the related reliefs prayed for by the plaintiff, so far as they related to Alamatti dam under Upper Krishna Project, should be allowed, viz., the State of Karnataka should be injunctioned.

12.10 Submission of Karnataka in April 1999:-

The counsel of Karnataka submitted an alternate proposal to the Court on 23.04.1999 stating that Karnataka would agree for impounding water at Alamatti upto 515.2 m and also for an annual utilization of 155 TMC under UKP even after completion of erection of all the 26 crest gates (with skin plates) to their full height corresponding to FRL 524.256 m and further agree for monitoring by CWC or by a body set up by the Court. Both Maharashtra and Andhra Pradesh filed their responses to the above proposal on 01.05.1999 rejecting the same.

12.11 Further reference to the Constitution Bench and dismissal of the Contempt Petition of Andhra Pradesh:-

The Supreme Court (Bench of 3 judges) heard the case on 03.05.1999 and ordered for hearing by the Constitution Bench as already ordered earlier and that the status-quo on Alamatti dam should be maintained till the matter came up before the Constitution Bench. In the same order, the contempt petition No.312 of 1998 filed by Andhra Pradesh was also dismissed.
12.12 New meaning given to "Surplus waters" by the Union of India and Consulting other States while clearing projects of one State:-

(1) The Union of India in its counter affidavit, filed in November 1999 to the Synopsis filed by Karnataka, interpreted the "surplus waters" as follows:-

(i) The Tribunal has stated in its final Award that the Award may be reviewed after May 2000 if the Basin-States feel so. The Award of the Tribunal is open to alteration, modification and amendment by agreement by the Party-States or through legislation by Parliament.

(ii) "Surplus waters" that may be flowing in any water year would be arising out of either or both sources as mentioned below:-

(a) Any upper riparian State may not have utilized the share for which it was legally entitled to use in terms of the Award.

(b) In the water year, the available water may be so much in excess that even after the upper riparian States withdrew the water for utilization in terms of the Award, a large residue existed.

(iii) The total remaining water is available for use at liberty of Andhra Pradesh as per the Award.

(2) So far as the Plaintiff's case that Central Government is required to consult other States while clearing the projects of one State, it was averred by the Union of India that there was no obligation on the Central Government to consult one party State while clearing the projects of other party States of Krishna Basin when they are within the frame work of KWDT Award.

13.0 Issues framed in OS No.1 of 1997 filed by Karnataka and O.S.No.2 of 1997 filed by Andhra Pradesh:-

13.01 The Constitution Bench, which heard both O.S.No.1 and O.S.No.2, of 1997, comprised the following:-

Justice S.B.Majumdar
Justice G.B.Patnaik
Justice V.N.Khare
Justice U.P.Bannerjee
Justice R.P.Sethi

13.02 Issues framed in O.S.No.1 of 1997 filed by Karnataka:-

On the pleadings of the parties, the following issues were framed by the Court:-

(1) Whether the suit is barred by Article 262(2) of the Constitution read with Section 11 of the Inter-State Water Disputes Act, 1956? (A.P.).

(2) Whether the suit is liable to be dismissed as not disclosing cause of action? (A.P.).

(3) Whether the suit is liable to be dismissed as seeking relief which are contrary to the Report and Decision of the KWDT? (A.P.).

(4) What is the "decision" of the KWDT binding on the parties under Section 6 of the Act in relation to:-

(a) Scheme 'B'
(b) Use of surplus water as contemplated in Clause (V) (c) read with Clause XIV (A) of the Award.

(5) Whether reference to Scheme 'B' in the 1st and the further report of the KWDT, disclose a complete scheme, and whether such scheme is capable of implementation
at this stage, in view of circumstances referred to in Para 11 of the preliminary objections and Para 1 of the parawise reply in the written Statement of Andhra Pradesh? (A.P.).

(6) Is it just, fair and equitable to implement Scheme 'B' at this stage? (MAH).

(7) Whether in view of the fact that Scheme 'B' does not form part of the "Final Order" of KWDT in the original report under Section 5(2) and the further Report under Section 5(3) of the Act, the suit seeking the implementation of Scheme 'B' is maintainable? (A.P).

(8) Whether insertion of Sec.6A in 1980 in the ISWD Act, 1956, ipso facto entitles Karnataka to seek implementation of Scheme 'B' as referred to in the reports of the Tribunal by framing a scheme? (KAR – as modified by A.P.).

(9) Whether the right of Andhra Pradesh to utilize surplus waters in terms of the liberty granted by the decisions of the Tribunal, is reviewable in the present proceedings? (A.P.).

(10) Whether the liberty to use surplus water under the decision of the KWDT precludes utilization of surplus water by A.P., by means of projects of permanent nature? (KAR - as modified by A.P.).

(11) Whether the decision of the KWDT entitles the State of Andhra Pradesh to execute the following projects:- (KAR – as modified by A.P.)
   (a) Telugu-Ganga Project
   (b) Srishailam Right Bank Canal
   (c) Srishailam Left Bank Canal
   (d) Bhima Lift Irrigation
   (e) Pulichintala Diversion

(12) Is not the suit of the Plaintiff unnecessarily permanent as there can be review of the orders of the Tribunal after A.D. 2000? (MAH).

(13) To what reliefs, if any, the Plaintiff is entitled to? (A.P.).

13.03 **Issues framed in OS No.2 of 1997 filed by Andhra Pradesh:-**

On the pleadings of the parties, the following issues were framed by the Court:-

(1) Whether the State of Karnataka has violated the binding decisions dated 24.12.1973 and 27.05.1976 rendered by the KWDT by executing the projects mentioned in Para 66, 68n & 69 of the Plaint? (A.P. / KAR).

(2) Has this Hon'ble Court jurisdiction to entertain and try this suit? (MAH.).

(3) Does the Plaintiff prove that the allocation of Krishna Waters by the KWDT in its Final Order are specific for projects and not enbloc as contended by the Defendant? (MAH.).

(4) Does the Plaintiff prove that the Upper States are not entitled to construct projects without reference to and consent of the other States? (MAH.).

(5) Whether the Plaintiff is entitled to a declaration that all the projects executed and / or which are in the process of execution by the State of Karnataka, and not in conformity with or in conflict with the Decisions of the KWDT are illegal and unauthorized? (A.P.).

(6) Is not the Union Government duty bound to consult all the riparian States before according any approval / sanction / clearance / in-principle clearances to any schemes, projects proposed / undertaken, by any of the riparian States on the Inter-State river Krishna? (A.P.).

(7) Whether the sanctions and the approvals granted by the 2nd Defendant to the State of Karnataka for the projects referred to in Issue I, without the prior concurrence of State of Andhra Pradesh are valid and binding upon the Plaintiff? (A.P.).

(8) Whether sanctions and the approvals granted by the 2nd defendant are liable to be reviewed, reconsidered afresh, after obtaining the views thereon of the other riparian States? (A.P.).
(9)  (a) Whether the construction of the Alamatti dam with a FRL of 524.256 m together with all other projects executed, in progress and contemplated by Karnataka would enable it to utilize more water than allocated by the Tribunal? (A.P.).

(b) Whether Karnataka could be permitted to proceed with construction of such a dam without the consent of other riparian States, and without the approval of the Central Government? (A.P.).

(c) Whether Karnataka could be permitted to raise the storage level at Alamatti dam above RL 509.16 m in view of the likely submergence of territories in Maharashtra? (MAH).

(10) Whether the Plaintiff proves that the reservoir and irrigation canals as alleged in Paragraph 68 of the Plaintiff are oversized. If so, are they contrary to the Decision of the Tribunal? (A.P.).

(11) Whether the Plaintiff State of Andhra Pradesh proves specific allocation / utilization for UKP and canals as alleged? (A.P.)

(12) Whether State of Karnataka is entitled to provide for any irrigation under Alamatti canals and other new projects, when no allocation is made under the decisions of the KWDT? (A.P.).

(13) Whether the Defendant State of Karnataka is entitled unilaterally to reallocate / readjust the allocation / utilization under the UKP or any other project? Is concurrence of other riparian States necessary? (A.P.).

(14) Whether the Union of India can permit and / or is justified in permitting the State of Karnataka to proceed with various projects which are in violation of the decisions rendered by KWDT? (A.P.).

(15) Whether Upper Krishna Stage-II Multipurpose Project could be executed without the environmental clearance under the Environment (Protection) Act, 1986 and Notification issued by the Central Government in 1994 in exercise of its power under the said Act and the Rules made thereunder which mandatorily requires various analysis including dam break analysis? (A.P.).

(16) Whether the acts of the State of Karnataka adversely affect or would adversely affect the State of Andhra Pradesh and if so, with what consequences? (KAR).

(17) Whether Hippargi was always part of the UKP and on that basis the KWDT awarded 5 TMC utilization thereunder? (A.P.).

(18) Whether the utilization of water under Chikkapadasalagi, Heggur and 5 other barrages is not 33 TMC as assessed by the Plaintiff State? (A.P.).

(19) Whether the cumulative utilization in the K2 Sub-basin is 173 TMC as claimed by the State of Karnataka or 428.75 TMC as assessed by the Plaintiff State? (A.P.).

(20) Whether the State of Karnataka has violated the KWDT award by proceeding with several new projects in the sub-basin such as K-6, K-8 and K-9 in respect of which restrictions in quantum of utilization have been imposed in the final decision of the Tribunal? (A.P.).

(21) Whether the utilization under Alamatti would be of the Order of 91 TMC as claimed in Para 66(iii) of the plaint? (A.P.).

(22) To what reliefs if any, the plaintiff is entitled to? (A.P.).

14.0 **Judgement of the Supreme Court:**

14.01 The Constitution Bench of the Supreme Court, after hearing the O.S.No.1 of 1997 filed by Karnataka and O.S.No.2 of 1997 filed by Andhra Pradesh, gave its judgement on 25.04.2000. While passing the judgement, the Court has discussed all the Issues framed in the Suits and also the findings of the Expert Committee constituted by the four Chief Ministers of the then UF Government at the Center, in detail, and has given its opinion / observation on all of them. The details of the Issues framed and the opinion of
the Hon'ble Judges of the Supreme Court in O.S.No.1 of 1997 and O.S.No.2 of 1997 are shown in the statements enclosed as Annexure-3 and Annexure-4 respectively.

14.02 Some of the important opinions on several Issues, expressed by the Court in its judgement, are as stated below:-

(1) **OS No.1 of 1997:-**

(i) The Scheme-B framed by the Tribunal is not the decision of the Tribunal and as such, was not required to be notified under Section 6 and consequently cannot be enforced at the behest of the plaintiff.

(ii) It is appropriate for the Central Government to exercise the discretion while granting any scheme or project of the lowest riparian State and bearing in mind what is really meant by the liberty granted, so that the lowest riparian State should not be allowed to proceed ahead with large scale water projects for utilization of the surplus water in excess of the allocated quantity over which, the State has no right. It is the Central Government which has to exercise this discretion while clearing projects of the lowest riparian State and it should be so exercised that there should not be any apprehension in the minds of the Upper States that for all times to come, their right of sharing the surplus water would in any manner be endangered.

(2) **OS No.2 of 1997:-**

(i) Under the decision of the Tribunal, the allocation of water in the river Krishna was en bloc and not project wise excepting those specific projects mentioned in the Clauses IX and X of the decision.

(ii) There is absolutely no justification for Karnataka to have the dam height at Alamatti of 524.256 m. At the same time, there cannot be any injunction or prohibition to the said State for having dam height at Alamatti upto 519.60 m, which would be in the interest of all concerned.

(iii) Though it may be fully desirable for all the States to know about the developments of the other States but neither the law on the subject require that a State even for utilization of its own water resources would take the consent of other riparian States in case of an Inter-State river.

(iv) It is not proper to entertain the question of submergence, raised by Maharashtra in its additional Written Statement, and decide the question of injunction, in relation to the height of Alamatti dam on that basis.

(v) The grievance that construction of large sized dam at Alamatti by Karnataka would adversely affect Andhra Pradesh and its right could be infringed, is devoid of any substance.

(vi) All the projects of different States concerning use of water available to them in respect of an Inter-State river must be duly sanctioned by the Appropriate Authorities of GOI after proper scanning and it is only then the State would be entitled to carry out the same.

(vii) There is no enough materials to come to the conclusion that the construction of Alamatti dam by Karnataka has in anyway affected or likely to affect Andhra Pradesh in any manner.

14.03 The O.S.No.1 of 1997 filed by Karnataka was accordingly dismissed with the above observations with no order as to the costs. As regards O.S.No.2 of 1997 filed by Andhra Pradesh, the conclusion of the judgement is as stated below:-
The Memorandum of Articles of Association have been exhibited as Exhibit PAP 210. The affidavit has given the details as to how the State Government retains full control over KBJNL and on going through the said affidavit, we have no hesitation to come to the conclusion that the apprehension of the plaintiff State is wholly mis-conceived and devoid of any substances.

In view of our conclusions drawn on different issues it is not possible for the Court to grant the relief of permanent mandatory injunction, so far as construction of the dam at Alamatti is concerned as well as the relief sought for in paragraphs upto (k). But at the same time, we make it clear that there is no bar for raising the height of Dam at Alamatti upto 519.60 m subject to getting clearance from the appropriate Authority of the Central Government and any other Statutory Authority, required under law. The question of raising the height upto 524.256 meters at Alamatti could be appropriately gone into by a Tribunal, to be appointed by the Central Government on being approached by any of the three riparian States and such Tribunal could also go into the question of apprehension of submergence within the territory of the State of Maharashtra and give its decision thereon, in the event the height of the Dam at Alamatti is allowed to be raised upto 524.256 meters. The Tribunal would also be entitled to go into the question of reallocation of the water in river Krishna Basin, if new datas are produced by the States on the basis of improved method of gauging.

The suit is disposed off accordingly. There will be no order as to costs."

15.0  **Erection of crest gates:**

15.01 Consequent to the above said Supreme Court order dated 25.04.2000, the project report of UKP Stage-II (Multi-purpose Project) was discussed in the 73rd meeting of the Advisory Committee of Planning Commission held on 31.05.2000. The Committee accepted the project limiting the FRL / gate level of Alamatti dam to 519.60 m. Thereafter, the Planning Commission cleared the project (irrigation portion) subject to the condition that, as per the verdict of the Supreme Court, the FRL should be restricted to 519.60 m and there should be no physical capacity to store more water above 519.60 m.

15.02 In accordance with the Supreme Court order and the clearances given by GOI, modifications to the crest gates, which had already been fabricated to full height (15.24 m) corresponding to FRL 524.256 m, were carried out in such a manner that only skin plate from the central portion above RL 519.60 m was cut while retaining the vertical stiffeners upto RL 521.0 m duly supported on top horizontal girders. Accordingly the vertical stiffeners remain duly extended upto RL 521.0 m and welded to top horizontal girder which also is now fully supported on the gate frame. The portions of the skin plates cut are such that they could once again be placed in position and welded whenever the storage level in Alamatti dam is to be raised to full height i.e., upto RL 524.256 m. These portions of the cut skin plates are stored in such a manner that the shape to which they are fabricated is not distorted.

15.03 The erection and commissioning of radial crest gates of Alamatti dam were accordingly completed in June 2001 and water was also stored upto 519.60 m in the reservoir during the year 2002.
CHAPTER-17*

MASTER PLAN FOR UTILISATION OF KRISHNA WATERS

1.0 Background:-

1.01 Karnataka, in its Statement of Case before the Krishna Water Disputes Tribunal, had pleaded for an allocation of 1430 TMC out of the 75% dependable flow of river Krishna. Projectwise break up of requirement of water for the projects under operation, under construction and also under contemplation, had also been furnished in support of the above claim.

1.02 The Tribunal gave its report on 23.12.1973 giving Karnataka’s entitlement as follows:-

(i) Out of 75% dependable flows ........................................... 695 TMC
(ii) Out of return flows calculated at 7 ½ % of the excess utilisation under projects using 3 TMC and more over similar utilisation in 1968-69........................................... 25 TMC
(iii) Surplus flows in excess of the 75% dependable flows (when Scheme-B comes into operation) ........................................... 110 TMC (33 ½ % of 330 TMC)

1.03 Keeping the above allocations in view, a plan was prepared for utilising 900 TMC, which was approved by the Government vide Government letter No. PWD 7 LLM 75 dated 08.04.1975. Accordingly, investigations were also taken up.

1.04 Consequent upon seeking clarifications from the Tribunal in terms of Section-5(3) of the Inter-State Water Disputes Act, 1956, the Tribunal, after hearing the parties, forwarded its further report containing its final orders to GOI on 27.05.1976. The final order of the Tribunal was published by GOI in Gazette dated 31.05.1976. Karnataka was entitled, as per the above said final order of the Tribunal, to the following utilisation:-

Under Scheme ‘A’:-

(i) Out of 75% dependable flows ........................................... 700 TMC
(ii) Out of return flows calculated at 10% of the excess utilisation under projects using 3 TMC and more over similar utilisation in 1968-69........................................... 34 TMC

Total: 734 TMC

1.05 Though the Tribunal had also allocated, in its further report dated 27.05.1976, the surplus waters over and above the 75% dependable flows to all the three party States, the Tribunal did not make it a part of the final order stating that the final order should contain only such provision as may be implemented independently of any Agreement or Law made by Parliament. However, according to the Scheme-B drawn up by the Tribunal, Karnataka was entitled for 50% of the surplus flows (when Scheme-B comes into operation), working out to 50% of 330 TMC i.e., 165 TMC.

1.06 Thus, Karnataka’s entitlement was assessed as 734 TMC under Scheme-A plus 165 TMC out of surplus flows when Scheme-B comes into operation, totaling to 899 TMC. Accordingly, a plan was mooted for utilising 900 TMC.

* Source of this chapter: Records made available by KBJNL.
2.0 **Master Plan of 1977**:

2.01 The plan for utilising 900 TMC of water was discussed in a meeting held under the chairmanship of the Special Secretary (Irrigation) to Government on 18.06.1976 keeping in view the availability of water under the Tribunal’s further report dated 27.05.1976. It was decided in the meeting to consider the rate of return flows as 20% as against 10% assumed by the Tribunal and by doing so another 110 TMC of water was assessed as available to Karnataka. Further, 40 TMC of water was also assessed as available to Karnataka by Godavari diversion to Krishna. Thus, the total quantity of water that was assessed as available to Karnataka, was 900+110+40 = 1050 TMC. It was decided in the said meeting that a Master Plan for an ultimate utilisation of 1000 TMC should be prepared. It was also decided that utilisation of some portion of the surplus flows in the Tungabhadra (K-8) and Vedavathi (K-9) sub-basins should also be planned since it was felt that utilisation of all the surplus flows of 165 TMC cannot be planned at UKP alone. Accordingly, a Master Plan for utilisation of 1000 TMC was prepared, the sub-basin wise break up of utilisation being as under:

<table>
<thead>
<tr>
<th>Sub-basin</th>
<th>Utilisation proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Main Krishna stem</td>
<td>385.55 TMC</td>
</tr>
<tr>
<td>(ii) Ghataprabha</td>
<td>89.23 TMC</td>
</tr>
<tr>
<td>(iii) Malaprabha</td>
<td>64.10 TMC</td>
</tr>
<tr>
<td>(iv) Bhima</td>
<td>48.69 TMC</td>
</tr>
<tr>
<td>(v) Tungabhadra:</td>
<td></td>
</tr>
<tr>
<td>(a) Tungabhadra valley</td>
<td>367.43 TMC</td>
</tr>
<tr>
<td>(b) Vedavathi valley</td>
<td>45.00 TMC</td>
</tr>
<tr>
<td></td>
<td><strong>412.43 TMC</strong></td>
</tr>
<tr>
<td>Total:</td>
<td><strong>1000.00 TMC</strong></td>
</tr>
</tbody>
</table>

2.02 The above planning was proposed to be achieved / implemented in two stages. In the first stage, the achievement was proposed to be limited to 734 TMC which is the allocation under Scheme-A and in the second stage, the utilisation was proposed to be stepped up to 1000 TMC when Scheme-B waters were available, by increasing the utilisations under the same projects proposed under Scheme-A.

2.03 The subject was discussed in the first meeting (1976) of the Technical Sub-Committee of MIPC Board held on 27.12.1976. The Committee, while agreeing to the list of projects shown in the Master Plan for utilising 1000 TMC, gave some suggestions with regards to utilisation of waters in Vedavathi sub-basin and investigation of projects for utilisation in the Tunga valley and Bhadra valley. The Committee also expressed the view that the return flow estimated by the Tribunal at 10% was conservative and that it was reasonable to anticipate a return flow of 20% and therefore the water planning need not be restricted to utilise only 1000 TMC. The Committee was of the opinion that the Plan may be revised for utilising 1050 TMC and that the use of such additional 50 TMC could be provided for at UKP.

2.04 The revised Master Plan projecting a utilisation of 1050 TMC of water in Krishna basin was placed before the MIPC Board and the Board in its second meeting (1977) held on 31.05.1977 agreed to the same.

2.05 A copy of the Master Plan of 1977 containing the background note, recommendations of the Technical Sub-Committee, decision of the MIPC Board, and the statements showing the sub-basin wise and project wise water planning, is enclosed as
Annexure-1. The abstract of sub-basin wise utilisation proposed in the above Master Plan is as under:-

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Sub-basin</th>
<th>Under Scheme ‘A’ for utilising 734 TMC</th>
<th>Under the Master Plan to utilise 1050 TMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Krishna Main Stem</td>
<td>176.35 TMC</td>
<td>385.55 +50 = 435.55 TMC</td>
</tr>
<tr>
<td>(ii)</td>
<td>Ghataprabha Valley</td>
<td>89.23 TMC</td>
<td>89.23 TMC</td>
</tr>
<tr>
<td>(iii)</td>
<td>Malaprabha Valley</td>
<td>64.10 TMC</td>
<td>64.10 TMC</td>
</tr>
<tr>
<td>(iv)</td>
<td>Bhima Valley</td>
<td>42.32 TMC</td>
<td>48.69 TMC</td>
</tr>
<tr>
<td>(v)</td>
<td>Tungabhadra Valley</td>
<td>320.00 TMC</td>
<td>367.43 TMC</td>
</tr>
<tr>
<td>(vi)</td>
<td>Vedavathi Valley</td>
<td>42.00 TMC</td>
<td>45.00 TMC</td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong></td>
<td><strong>734.00 TMC</strong></td>
<td><strong>1050.00 TMC</strong></td>
</tr>
</tbody>
</table>

FN: The utilisation proposed for UKP was 163 TMC (including Hippargi Barrage which was a part of UKP at that time) under Scheme ‘A’ and 367.55 + 50 = 417.55 TMC under the 1050 TMC Master Plan.

3.0 Re-allocation of waters for projects, finalised in January 1987 (Master Plan of 1987):-

3.01 After the final order contained in the further report of the Tribunal was published by GOI in its Gazette dated 31.05.1976, the project report of revised UKP stage-I was got up in December 1976 and sent to GOI for according necessary clearances. According to this project report, the CCA proposed in the first stage was 10.50 lakh acres by utilising 125 TMC of water with an irrigation intensity of 104.5%. In the second stage, it was contemplated to bring an additional area of 10.34 lakh acres under irrigation. Hippargi barrage had been included in the second stage of UKP. The Planning Commission of GOI gave its clearance to the First stage project in its letter No. 11-26(6)/77/ I & CAD dated 22.04.1978 for estimated cost of Rs. 283.65 Crores. The irrigation intensity as per the project report approved by the Planning Commission was 108%.

3.02 Subsequently, a project report for the UKP stage-II was prepared in January 1982 and sent to GOI for according necessary approval. According to this project report, the contemplated CCA was 6.31 lakh ha. (15.60 lakh acres) including the first stage CCA of 4.25 lakh ha. (10.50 lakh acres). The total utilisation proposed in the project was 173 TMC including 119 TMC in the 1st Stage, with an irrigation intensity of 106%. Hippargi barrage had been deleted from the second stage of UKP and proposed as a separate project.

3.03 Consequent on changes in the design of the Alamatti Dam, the UKP Stage-I project was further revised in 1985 and sent to GOI for obtaining the necessary clearance. It was proposed to irrigate 10.50 lakh acres in the first stage by utilising 119 TMC of water with an irrigation intensity of 108%. This Stage-I project at an estimated cost of Rs. 1071.10 crores was administratively approved by the Government in G.O. No. PWD 56 WUD 83 dated 03.12.1985. Approval of the Planning Commission for this revised Stage-I project was received in GOI letter No. 2(10) / 88 I & CAD dated 24.09.1990 for an estimated cost of Rs. 1214.97 Crores. The irrigation intensity as cleared by the Planning Commission was 108%.

3.04 In the meanwhile, the second phase of UKP stage-I had been posed for World Bank assistance during 1985-86. As per the project cleared by the World Bank for assistance, the irrigation intensity adopted was 115%. But the Planning Commission, while giving clearance to the revised Stage-I project in 1990, has considered the irrigation intensity as only 108%.
3.05 Before appraisal of second phase project by World Bank, a meeting was held at CWC, New Delhi, on 22/23.09.1986 to discuss the second phase project that had been posed by Karnataka for World Bank Assistance. According to the summary record of discussions of this meeting, the availability of water for utilising 173 TMC under UKP stage-I and stage-II was shown as 150 TMC under Scheme-A of the Tribunal award and 23 TMC from Godavari diversion. However, as the availability of water from Godavari diversion remained uncertain, it became necessary for Karnataka to show an allocation of 173 TMC of water under Scheme-A itself.

3.06 Keeping all the above points in view, the allocation of water for various irrigation projects in Krishna basin in Karnataka was revised in 1987 and this revised allocation was communicated to CWC in Government letter No. PWD 1 MMM 87 dated 08.01.1987 (vide copy enclosed as Annexure-2). The abstract of proposed utilisation under different categories, as communicated to CWC in the above said GOK letter, was as under:

<table>
<thead>
<tr>
<th>Scheme 'A'</th>
<th>TMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Projects in operation</td>
<td>398.04</td>
</tr>
<tr>
<td>(ii) Ongoing projects</td>
<td>248.54</td>
</tr>
<tr>
<td>(iii) New projects</td>
<td>87.42</td>
</tr>
<tr>
<td>(iv) New projects under Godavari diversion</td>
<td>23.00</td>
</tr>
<tr>
<td>Sub-total</td>
<td>734.00</td>
</tr>
<tr>
<td>Total</td>
<td>757.00</td>
</tr>
</tbody>
</table>

3.07 The allocation for UKP stage-I and stage-II was shown in the above revised water plan as 119 TMC and 54 TMC respectively, out of 734 TMC available to Karnataka under Scheme-A. An additional provision of 8 TMC for UKP stage-III and other fresh projects (to be identified) was made out of 23 TMC available under Godavari diversion. Hippargi Barrage was shown as a separate project in this water plan.

4.0 Project-wise allocations as revised in September – 1993 (Master Plan of 1993):

4.01 The project-wise allocation of Krishna waters in Karnataka was discussed by the Secretary to Government, Irrigation Department with the Chairman CWC and the Member (P & P) CWC in the year 1993 in the context of obtaining clearance for Upper Tunga and other projects. Since no allocation had been made for Upper Tunga Project in the 1987 Master Plan (an allocation of 8 TMC had been made for Tunga Lift Scheme under "Godavari Diversion"), it became necessary to show allocation for Upper Tunga Project under Scheme ‘A’ itself, thus necessitating further revision of the Master Plan.

4.02 After detailed examination at the Government level, the project-wise allocations were revised making a provision of 12.24 TMC for Upper Tunga Project under Scheme-A itself and sent to CWC in Government letter No. ID 23 MMS 93 dated 21.09.1993 (copy enclosed as Annexure-3).

4.03 In the above revised Master Plan, the allocation for Upper Krishna Project for Stage-I and Stage-II under Scheme-A remained unaltered i.e., 119 TMC and 54 TMC respectively and the provision for UKP Stage-III made under Godavari diversion in the earlier Master Plan of 1987 was deleted.
5.0 Project-wise allocations further revised in September 2001 (Master Plan of 2001):

5.01 A Committee was constituted under the Chairmanship of Sri.B.C.Angadi, Retired Special Secretary, (Irrigation) by the Government in G.O. No. ID 42 KDM 2000 dated 05.09.2000 to suggest project-wise distribution of surplus waters over and above the 75% dependable yield in river Krishna. The Committee after detailed examination of the ground realities and other factors finalized in its 16th meeting held on 21.09.2001 the revised allocations for projects in Krishna Basin in Karnataka under Scheme-A and Scheme-B (vide copy enclosed as Annexure-4). According to the findings of the Committee, the surplus water available in the river Krishna is 568 TMC over and above 2060 TMC at 75% dependability and Karnataka is entitled, as per the Tribunal award, to 50% of the above surplus water i.e., 284 TMC. Considering that the regeneration of 34 TMC has already being accounted for under Scheme 'A' as per the award, the net surplus water available to Karnataka is worked out by the Committee as 250 TMC plus further regeneration assumed at 20% of utilizations from proposed new projects utilising more than 3 TMC. Thus, the total quantum of surplus water available to Karnataka under Scheme-B, as worked out by the Committee, is 278.70 TMC. The regeneration from the yet unutilised part of Karnataka’s Scheme-A allocation has not been considered by the Committee in the above analysis.

5.02 The summary of sub-basinwise allocations, as revised and finalised by the said Committee under Scheme-A and Scheme-B, is shown as under:-

<table>
<thead>
<tr>
<th>Sub-basin</th>
<th>Allocation under Scheme-A (in TMC)</th>
<th>Allocation under Scheme-B (in TMC)</th>
<th>Total (in TMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-1 Upper Krishna</td>
<td>4.50</td>
<td>--</td>
<td>4.50</td>
</tr>
<tr>
<td>K-2 Middle Krishna</td>
<td>192.80</td>
<td>123.40</td>
<td>316.20</td>
</tr>
<tr>
<td>K-3 Ghataprabha</td>
<td>103.75</td>
<td>1.34</td>
<td>105.09</td>
</tr>
<tr>
<td>K-4 Malaprabha</td>
<td>39.62</td>
<td>0.30</td>
<td>39.92</td>
</tr>
<tr>
<td>K-5 Upper Bhima</td>
<td>0.54</td>
<td>--</td>
<td>0.54</td>
</tr>
<tr>
<td>K-6 Lower Bhima</td>
<td>41.92</td>
<td>12.00</td>
<td>53.92</td>
</tr>
<tr>
<td>K-7 Lower Krishna</td>
<td>1.47</td>
<td>--</td>
<td>1.47</td>
</tr>
<tr>
<td>K-8 Tungabhadra</td>
<td>311.90</td>
<td>45.795</td>
<td>357.695</td>
</tr>
<tr>
<td>K-9 Vedavathy</td>
<td>30.50</td>
<td>--</td>
<td>30.50</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>727.00</td>
<td>182.835</td>
<td>909.835</td>
</tr>
<tr>
<td>(i) Chennai Water Supply</td>
<td>5.00</td>
<td>--</td>
<td>5.00</td>
</tr>
<tr>
<td>(ii) Domestic &amp; Municipal Water Supply</td>
<td>1.50</td>
<td>3.50</td>
<td>5.00</td>
</tr>
<tr>
<td>(iii) Industrial Water Supply</td>
<td>0.50</td>
<td>1.00</td>
<td>1.50</td>
</tr>
<tr>
<td>(iv) By Pumping to V.V. Sagar subject to availability of water at Tunga Anicut in surplus years to benefit Chitradurga, Tumkur, Davangere and Bellary districts (K-8)</td>
<td>--</td>
<td>25.00</td>
<td>25.00</td>
</tr>
<tr>
<td>(v) Minor Irrigation North, Bijapur</td>
<td>--</td>
<td>11.04</td>
<td>11.04</td>
</tr>
<tr>
<td>(vi) Minor Irrigation South, Bangalore</td>
<td>--</td>
<td>2.005</td>
<td>2.005</td>
</tr>
<tr>
<td>(vii) Minor Irrigation Schemes, Government &amp; Private Lifts from rivers and other sources and other future proposals</td>
<td>--</td>
<td>53.36</td>
<td>53.36</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>734.00</td>
<td>278.740</td>
<td>1012.740</td>
</tr>
</tbody>
</table>
5.03 In the above said Master Plan of 2001, the allocation for UKP Stage-I and Stage-II under Scheme-A has remained un-altered i.e., 173 TMC (119 TMC for Stage-I and 54 TMC for Stage-II) and the allocation made for UKP Stage-III under Scheme-B is 105.835 TMC. The components under which this 105.835 TMC has to be utilised, have also been identified by the Committee, which are as shown below:-

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Components of UKP Stage-III</th>
<th>Allocation under Scheme-B (in TMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>NRBC</td>
<td>18.982</td>
</tr>
<tr>
<td>(ii)</td>
<td>Bhima flank</td>
<td>5.151</td>
</tr>
<tr>
<td>(iii)</td>
<td>Indi LIS (extension)</td>
<td>4.940</td>
</tr>
<tr>
<td>(iv)</td>
<td>Rampur LIS</td>
<td>3.324</td>
</tr>
<tr>
<td>(v)</td>
<td>Herkal LIS</td>
<td>3.664</td>
</tr>
<tr>
<td>(vi)</td>
<td>Unserved areas between JBC, MBC &amp; SBC, by lift</td>
<td>8.054</td>
</tr>
<tr>
<td>(vii)</td>
<td>Mulwad lift</td>
<td>36.514</td>
</tr>
<tr>
<td>(viii)</td>
<td>Chimmalgi Lift</td>
<td>20.789</td>
</tr>
<tr>
<td>(ix)</td>
<td>ARBC</td>
<td>4.417</td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong></td>
<td><strong>105.835</strong></td>
</tr>
</tbody>
</table>

5.04 The Master Plan Committee, while finalising the revised allocations as detailed above in its 16th meeting held on 21.09.2001, has made the following recommendations:-

(i) While forwarding the Master Plan to the Government of India while lodging a complaint for the constitution of a Tribunal, the combined Master Plan comprising the projects both under Scheme-A and Scheme-B without making any distinction may be preserved.

(ii) All the necessary administrative and technical approvals have to be accorded before forwarding the combined plan to the Government of India.

(iii) The reports for modernisation of canal systems under Tunga Anicut, Gondi (Bhadra), Anicut and Vijayanagar Channels may be obtained.

5.05 The Managing Director, KBJNL, in his U.O.Note No. D/180/Tech/1096/3 dated 24.1.2002 (copy enclosed as Annexure-5) addressed to the Secretary to Government, Water Resources Department has pointed out that, in the revised Master Plan of 2001, the earlier allocations made for NRBC, ALBC (Chimmalgi Lift), Mulwad Lift, ARBC, Rampur Lift and Herkal Lift have been substantially curtailed. Following Table gives a clear picture of the reduced allocations made for various components of UKP under Scheme-B in the above said revised Master Plan when compared to the earlier allocations made:-

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Component</th>
<th>Original allocation (in TMC)</th>
<th>Revised allocation (in TMC)</th>
<th>Reduction / increase (in TMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>ALBC (Chimmalgi lift)</td>
<td>25.500</td>
<td>20.789</td>
<td>(-)4.711</td>
</tr>
<tr>
<td>(ii)</td>
<td>ARBC</td>
<td>5.500</td>
<td>4.417</td>
<td>(-)1.083</td>
</tr>
<tr>
<td>(iii)</td>
<td>Mulwad Lift</td>
<td>56.500</td>
<td>36.514</td>
<td>(-)19.986</td>
</tr>
<tr>
<td>(iv)</td>
<td>Indi Lift (extension)</td>
<td>4.500</td>
<td>4.940</td>
<td>(+)0.440</td>
</tr>
<tr>
<td>(v)</td>
<td>Herkal Lift</td>
<td>10.500</td>
<td>3.664</td>
<td>(-)6.836</td>
</tr>
<tr>
<td>(vi)</td>
<td>NRBC</td>
<td>22.500</td>
<td>18.982</td>
<td>(-)3.518</td>
</tr>
<tr>
<td>(vii)</td>
<td>Rampur LIS</td>
<td>4.000</td>
<td>3.324</td>
<td>(-)0.676</td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong></td>
<td><strong>129.00</strong></td>
<td><strong>92.630</strong></td>
<td>(-)36.370</td>
</tr>
</tbody>
</table>
5.06 Giving strong reasons for making original allocations for the above said components of UKP, the Managing Director, KBJNL, has urged the Government not to curtail the allocations for these components under Scheme-B and to retain the allocations as originally envisaged.

5.07 Remarks:-

As pointed out by the Managing Director, KBJNL, reducing the allocations made to various components of UKP at this stage may not be proper since the head works of all the lift schemes of UKP have been designed and constructed taking into consideration the original allocations including Scheme-B requirements also. If at this length of time the water allocations are reduced, not only a major portion of the expenditure already incurred may become infructuous but many areas earlier contemplated for irrigation may be deprived of the irrigation benefits. It is therefore just and proper to retain the allocations envisaged earlier in respect of the components of Upper Krishna Project.
CHAPTER-18*

POWER DEVELOPMENT IN UPPER KRISHNA PROJECT

1.0 Visualisation of power generation and provisions in the estimates:-

1.01 Power generation in Upper Krishna Project was visualized as early as in 1963. As a matter of fact, it was mentioned in the project report of 1963 for Phase-I estimated to cost Rs.58.20 crores that power generation had been contemplated at Jaladurga falls where a Head of 120 feet was available and in this direction provision was made, in the project report, for power sluices in the Narayananapur dam.

1.02 Even in the project report of 1970 for the comprehensive UKP project placed before the Krishna Water Disputes Tribunal and in the project report of 1976 for Upper Krishna Project Stage-I, it was mentioned that it was possible to generate hydro-electric power at the foot of Alamatti dam making use of regulated releases for being picked up at Narayananapur. Necessary provision had been made in the estimate for providing 5.5 m dia penstocks in the 5 power blocks of Alamatti dam. The estimated power generation was about 520.50 million Kwh with an installed capacity of 150 MW (5 of 30 MW).

1.03 As per the project report of 1982 for Upper Krishna Project Stage-II, power generation of 600 million Kwh was contemplated at Alamatti dam by having an installed capacity of 218 MW (5 of 40 WM and 1 of 18 MW). Provision for 5 penstocks of 7 m dia and one penstock of 5 m dia in the 6 power blocks of Alamatti dam had also been made in the estimate.

1.04 In the project report of 1987 for revised Upper Krishna Project Stage-I, provision had been made for providing 6 numbers of penstocks in the power blocks of Alamatti dam, comprising 5 numbers of 7 m dia and one number of 3.95 m dia for generation of 714 million units of power annually with an installed capacity of 268 MW (5 of 50 MW and one of 18 MW).

2.0 Power project report of 1983, prepared by KPCL:-

2.01 A detailed project report on Alamatti dam power house was prepared by KPCL and sent to the CEA, GOI during 1983. The FRL considered at Alamatti reservoir was 524.25 m and the power house was designed to have an installed capacity of 268 MW (5 of 50 MW and one of 18 MW). This project was approved by the Department of Environment, GOI vide its letter J-11016/113/83-EN5 dated 26.02.1985 (copy enclosed as Annexure-1) subject to certain conditions.

3.0 Private participation in power generation by foreign entrepreneurs:-

3.01 Consequent upon the amendment made by GOI to the Indian Electricity Act, 1990 and the Electricity (supply) Act, 1948, the State Government decided on 15.07.1992 to permit the private sector participation in power generation and sign MOUs

(*) Source of this Chapter:
1. Papers obtained from KBJNL.
4. Project Reports of Upper Krishna Project.
with private / foreign companies to set up power plants in the State. Accordingly, the Government issued orders in G.O. No.DE 108 PPC 92 dated 24.07.1992 authorising the Commissioner and Secretary to Government, Energy Department, to sign the MOUs with the foreign firms. Accordingly, a MOU was signed on 26.07.1992 (copy enclosed as Annexure-2) with an American Company called "The Asia Power Company Limited" (TAPCO) for development of power at Alamatti dam power house with an installed capacity of 270 MW.

3.02 In the subsequent MOU dated 17.12.1992 (copy enclosed as Annexure-3) signed with TAPCO, it was agreed to entrust Alamatti dam power house along with the Narayanapur dam / Thamankal cluster Hydro Electric Project (estimated total capacity being 600 MW) to M/s.TAPCO superseding the earlier MOU dated 26.07.1992.

4.0 Allotment of Upper Krishna power project to M/S.TAPCO:-

4.01 In accordance with the above said MOUs, orders were issued in G.O. No.DE 96 PPC 90 (Vol.I) dated 18.03.1993 (copy enclosed as Annexure-4), offering the Hydel Project of 600 MW at Alamatti, Narayanapur and Thamankal to M/s.TAPCO.

4.02 Subsequently, M/s. TAPCO proposed to develop 600 MW in the first stage at Alamatti and 4 Cascade power houses at down stream of Narayanapur dam. The Company further proposed to add another 360 WM capacity in the second stage of the Cascade power project.

4.03 In the meanwhile, consequent on the change in Government, it was decided by the Government on 21.12.1992 to review all the MOUs signed earlier. Accordingly, a review of all the MOUs signed earlier was undertaken and in this direction meetings were taken by the Chief Secretary on 19.06.1993 and 29.06.1993 to examine the proposal of M/s.TAPCO. Subsequently, a meeting was also held at the level of the Deputy Chief Minister on 29.06.1993 to discuss the issues arising out of the proposal submitted by the company. After examining the matter in detail, orders were issued in G.O. No.DE 255 PPC 92 dated 10.11.1993 (copy enclosed as Annexure-5), permitting M/s.TAPCO to take up the Upper Krishna Hydel Project including Alamatti, Narayanapur and Thamankal with an installed capacity of 600 MW with an addition of 360 MW in the 2nd Stage as cascade power house scheme subject to certain conditions. The company was permitted in the said G.O. to sell power directly to industrial units subject to getting approval of the State Government for the selling rate and to sell the balance power to KEB at the tariff to be fixed according to the norms laid down by GOI. In the same G.O., the KPCL was permitted to participate in the equity of M/s.TAPCO to the extent of 10%.

4.04 Change in name of the Company:-

Meanwhile, the name of the Company was changed from M/s.TAPCO to M/s.Chamundi Power Corporation Limited and registered under the Indian Companies Act, 1956 in January 1993.

4.05 After the change of Government in 1994, it was once again decided by the Government to review the implementation of the UKP power project being taken up in the private sector. After examining all aspects, it was decided to continue the implementation of the project by M/s.TAPCO (M/s.Chamundi Power Corporation).
Accordingly, orders were issued in G.O. No. DE 147 PPC 95 dated 15.11.1995 (copy enclosed as Annexure-6) approving the implementation of the UKP Hydel project including Alamatti, Narayanapur and Thamankal by M/s.Chamundi Power Corp. (TAPCO) with an approximate installed capacity of 960 MW subject to certain conditions.

5.0 **Project report of 1994 for Alamatti dam power house, prepared by KPCL:**

5.01 A detailed project report was in the meanwhile prepared by KPCL in 1994 according to which the installed capacity at Alamatti power house was revised, based on the concept of M/s.Chamundi Power Corporation, from the earlier 268 MW to 297 MW. However, the power house was designed to accommodate 5 units of 70 MW and one unit of 17 MW with a repair cum service bay. It was initially proposed to install 4 units of 70 MW and one unit of 17 MW and to do only the first stage concreting for the 6th unit of 70 MW.

5.02 As 5 Nos. of penstocks of 7 m dia and one penstock of 3.95 m dia had already been embedded in the dam, only 4 penstocks of 7 m dia and one of 3.95 m dia were proposed to be used initially and the 5th penstock of 7 m dia was proposed to be terminated inside the power house with a bulk head so that the 5th unit of 70 MW could be installed at a later date. The FRL of Alamatti reservoir considered in the power studies was 524.25 m. The power studies were made for a flow series of 39 years from 1950-51 to 1988-89 which were worked out by IISc considering full development of irrigation with a utilization of 173 TMC. The annual energy generation based on the reservoir operation tables was worked out as 672 million units with full development of irrigation. The energy for the present flows was worked out as more than 900 million units per annum on an average.

5.03 The estimated cost of the project, at 1994-95 level of rates, was Rs.318 crores HT bus.

6.0 **In-principle clearance to Upper Krishna Hydro Electric Project (1107 MW) by the CEA:**

6.01 M/s.Chamundi Power Corporation sent a proposal to the CEA, GOI through its letter dated 18.12.1995 with a request to issue the required clearance for the Upper Krishna Hydro-Electric Project with a total installed capacity of 1107 MW including Alamatti dam power house and Narayanapur / Thamankal cluster of Cascade project.

6.02 After examining the proposal, the CEA, through its letter No. 2/KTK/22/96-PAC/260-68 dated 17.01.1996 (copy enclosed as Annexure-7), accorded the In-principle clearance subject to certain conditions.

7.0 **Issue of handing over the penstocks and other related components of Alamatti dam to M/s. Chamundi Power Corporation:**

7.01 Since the penstocks had already been embedded in the power blocks of Alamatti dam, M/s.Chamundi Power Corporation desired that the penstocks be handed over to them as a part of the Alamatti power project. The issue was referred by KPCL to Sri.K.C.Reddy, Chairman, TAC, Irrigation projects, who in turn held a meeting on 09.09.1996 to discuss the matter in greater detail. The meeting was attended, among
others, by the Irrigation Secretary, the Managing Director of KPCL and the Special Officer, PWD Finance Cell.

7.02 After thorough discussions on all the related issues, following decisions were taken in the above said meeting:-

(i) The Finance Director of KPCL and the Special Officer, PWD Finance Cell shall examine the accounts of Irrigation Department as well as of KPCL and determine the final costs incurred by KPCL as well as by the Irrigation Department towards the power components separately.

(ii) The Senior Level Engineers of KPCL and Irrigation Department shall jointly inspect the Irrigation power project and prepare an inventory of the power components already executed so far and the balance works still to be executed to bring it to safe acceptable stage. The KPCL will take necessary action to bring the balance work on power components to a safe stage.

(iii) The Irrigation Department shall make payment to KPCL towards the cost incurred by KPCL on the power components based on the final costs as determined by the Finance Director, KPCL and the Special Officer, PWD Finance Cell, after getting itself satisfied of the standard of works carried out by KPCL. The KPCL will provide all the designs/drawings and test data required for this purpose to the Irrigation Department and extend full assistance during the testing process.

(iv) On receipt of payment from Irrigation Department, the KPCL shall hand over the penstocks and other related components to the Irrigation Department which will take expeditious action to complete the balance works of power component as per design requirements in consultation with M/s. Chamundi Power Corporation.

(v) The Irrigation Department shall continue to be the absolute owner of the Alamatti penstocks and other related components also irrespective of the agency to execute the Alamatti Power Project. There is no need for the Irrigation Department to sell or lease out the Alamatti penstocks to M/s. Chamundi Power Corporation. It is sufficient if the Power project executing agency i.e., M/s. Chamundi Power Corporation is assured of releases of water for power generation at Alamatti through penstocks in accordance with the Water Management Agreement to be executed separately by the Irrigation Department with M/s. Chamundi Power Corporation. The Irrigation Department shall be the sole maintenance and controlling authority to release the waters from the dam as per this Agreement.

(vi) The Irrigation Department should include the cost of Alamatti penstocks and other related components in the overall cost to be determined separately for sharing by M/s. Chamundi Power Corporation consequent on having additional storage at Alamatti for power generation.

(vii) The Irrigation Department shall arrange to issue necessary Government Orders on the above lines, expeditiously.

7.03 In accordance with the decision taken in the above meeting held on 09.09.1996, Government issued orders in G.O. No. ID 96 WUD 89 dated 25.11.1996 (copy enclosed as Annexure-8) forming a team to prepare an inventory of the power components already executed so far by KPCL under the Alamatti power project and to assess the balance work still to be executed to bring it to a safe and acceptable stage. The team comprised officers of the Irrigation Department & the KPCL, the MD of KBJNL, Representatives of M/s. Chamundi Power Corporation & the IISc and the Secretary, TAC.
7.04 The team constituted in the above said G.O. dated 25.11.1996 inspected the Alamatti penstocks on 17.02.1997. Prof. M.N. Srinivasan of IISc also accompanied the team during inspection. Following are some of the observations / suggestions made by the team after its inspection:-

(i) The tubular portion of all the six penstocks as also the transition portion at entry and the intake structures were examined. Other structures which were partially submerged could not be visually examined.

(ii) The geometric profiles of three penstocks in the tubular portion have deviated from the relevant drawings. Bulges were observed at some locations in these penstocks.

(iii) The nature and extent of these deviations can be quantitatively assessed only after a detailed survey of the geometry of the system.

(iv) Necessary corrective measures will have to be taken up urgently for rendering these pipes fit for use.

(v) Though some test reports and documents have been handed over by KPCL to the Irrigation Department, some more details still remain to be handed-over.

(vi) M/s. Tungabhadra Steel Products Limited have to furnish certain details which they promised during the course of joint inspection on 17.02.1997.

(vii) The penstocks and intake structures have to be handed-over by KPCL to the Irrigation Department on "as is where is" basis immediately. The transferor and the transferee should jointly prepare an inventory of items for this purpose immediately.

7.05 Thereafter, a meeting was held in the chambers of the Chairman, TAC on 10.03.1997 to discuss the various issues arising out of the joint inspection of the power dam at Alamatti undertaken by the above said team. After considerable discussions and keeping in view the urgency to push through the power project, following decisions were taken in the meeting:-

(i) The Irrigation Department/Krishna Bhagya Jala Nigam Limited and M/s. Karnataka Power Corporation Limited should prepare a joint inventory of the items so far executed by KPCL immediately and keep it ready by the 2nd of April 1997.

(ii) M/s. KPCL should hand over possession of the Alamatti penstocks with intake structures to the Irrigation Department / KBJNL on "as is where is" basis by the 2nd of April 1997 pending settlement of accounts.

(iii) The Irrigation Department, after taking possession of the penstocks and intake structures, shall complete the balance works in consultation with M/s.Chamundi Power Corporation and charge this expenditure to the power project. Alternately, the Irrigation Department may still retain the ownership of penstocks & intake structures and request M/s.Chamundi Power Corporation to get the balance works completed by their own agency with the approval of Irrigation Department and include such costs in the capital cost of the power project.

(iv) The Irrigation Department should hand-over all the details so far received from KPCL to M/s.Chamundi Power Corporation immediately.
(v) The Joint Inspection Committee constituted by the Irrigation Department in G.O. dated 25.11.1996 may be wound up since its purpose has been served and the consensus for further action has been reached.

(vi) The Irrigation Department should arrange to issue necessary Government Orders on the above lines in consultation with the Energy Department.

8.0 **Project reports of 1996 and 1997 for UKP Hydel Power Project, prepared by M/s.Chamundi Power Corporation:**

8.01 M/s.Chamundi Power Corporation, after conducting detailed investigations, surveys and studies, prepared detailed project reports for the Alamatti Power Project under Phase-I and for the Narayanapur / Thamankal cascade project under Phase-II with estimated costs as Rs.1045 crores (at 1996 prices) and Rs.3848 crores (at 1997 prices) respectively. The project report for Alamatti Power House was sent to CEA in October 1996.

8.02 Due to the dispute relating to height of Alamatti dam raised in the meantime by Andhra Pradesh and also due to litigations in the Andhra Pradesh High Court as well as in Supreme Court, detailed examination and eventual clearance by the CEA were held up. More details on the dispute are given in the chapter "Dispute regarding the height of Alamatti dam".

8.03 M/s. Chamundi Power Corporation informed the GOK through its letter dated 16.07.1997 that the DPR of Alamatti Power Project had been returned by the CEA because of the Inter-State water dispute and that extension of time had been given to re-file the DPR after the water dispute was resolved. Considering the situation and the request of the Company, the Government issued orders in G.O. No. DE 212 PPC 96 dated 22.11.1997 (copy enclosed as Annexure-9) extending the tenure of financial closure of the Company for a further period of two years from 15.11.1997 for the 1st Phase project.

9.0 **Water supply and Management Agreement (WSMA) drafted by M/s.Chamundi Power Corporation:**

9.01 M/s.Chamundi Power Corporation, in the meanwhile prepared a draft Water Supply and Management Agreement (WSMA) and submitted the same to Government for consideration. The issue was discussed in a meeting held under the Chairmanship of the Chairman, Technical Advisory Committee, on 24.01.1997 and it was felt that the issue involves intricate technical details and therefore requires to be examined by a Committee of technical experts. Accordingly, a Committee was constituted under the chairmanship of Sri.K.C.Reddy, Chairman, Technical Advisory Committee in G.O. No. DE 212 PPC 96n dated 07.02.1997 (copy enclosed as Annexure-10) to examine the technical details of the WSMA. The Committee included the Irrigation Secretary, the Managing Director of KBJNL, Member (Technical) of KEB, Representatives of WAPCOS (Technical consultants appointed by KEB), Representatives of M/s.Chamundi Power Corporation and the Secretary of TAC.

9.02 The above said Committee held its 1st meeting on 21.02.1997 and finalized the issues for further detailed discussions. Some of the important issues framed by the Committee were:-
(i) Who should be the agency for O&M of Intake structures and penstocks keeping in view the safety of the dam / equipment and power house.

(ii) Who should be vested with the responsibility of controlling and regulation of water through penstocks.

(iii) The impact of Inter-State water disputes on the releases of water and the extent to which commitments can be made by the Irrigation Department in the present Circumstances.

(iv) Possibility of limiting the storage in Alamatti reservoir upto elevation 519.6 m.

(v) Whether “Monthly Releases Plan” could be an authoritative issue or only a flexible and tentative indication.

(vi) The feasibility of making arrangements to measure water at the end of penstocks and payment of royalty by M/s.Chamundi Power Corporation based on the quantity of water so measured.

(vii) Development of an Integrated Reservoir Simulation Model and its impact on power generation.

(viii) Impact of loss in storage capacity due to various reasons like siltation / sedimentation / sudden draw-down etc on power generation and the provisions to be made in the agreement in this direction.

(ix) Possibility of generating power in the summer months of April, May and June.

(x) Whether it is proper to make a firm commitment on the design energy since it depends on various factors. If the hydrology / yield varies or changes during the period of operation, the entire scenario would change.

9.03 The Committee in its next meeting held on 12th & 13th March 1997 deliberated the issues framed in its earlier meeting and gave decisions / recommendations on all the issues. Some of the important issues discussed in the meeting and decisions taken thereon, are as noted below:-

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Issue</th>
<th>Decision of the Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Who should be the agency for O&amp;M of Intake structures and penstocks keeping in view the safety of the dam / equipment and power house.</td>
<td>Whoever is the owner of the dam shall be the owner of the Intake structures and penstocks.</td>
</tr>
<tr>
<td>2.</td>
<td>Who should be vested with the responsibility of controlling and regulation of water through penstocks.</td>
<td>The owner of Intake structures and penstocks shall be responsible for controlling and regulation of water through penstocks. A representative of the owner shall be stationed in the Control Room of the Power House of M/s.Chamundi Power Corporation to jointly monitor the releases of water for power generation and the actual generation of power.</td>
</tr>
<tr>
<td>3.</td>
<td>The impact of Inter-State water disputes on the releases of water and the extent to which commitments can be made by the Irrigation Department in the present Circumstances.</td>
<td>Since 173 TMC of water is allocated to the Upper Krishna Project under Scheme-A of the Tribunal Award which is now in operation, the commitment to be made by the Irrigation Department shall be limited to utilization of 173 TMC for the time being. However, provision shall be made for review of utilization and storage of any additional waters available.</td>
</tr>
<tr>
<td></td>
<td>Possibility of limiting the storage in Alamatti reservoir upto elevation 519.6 m.</td>
<td>Since the FRL required to utilize the allocated water of 173 TMC for irrigation purpose is estimated as 519.60 m, the storage may have to be limited for the present only to this level. However, for multi-purpose use additional storages are contemplated and might become available.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5.</td>
<td>Whether “Monthly Releases Plan” could be an authoritative issue or only a flexible and tentative indication.</td>
<td>The “Monthly Releases Plan” shall be only a flexible and tentative indication.</td>
</tr>
<tr>
<td>6.</td>
<td>The feasibility of making arrangements to measure water at the end of penstocks and payment of royalty by M/s.Chamundi Power Corporation based on the quantity of water so measured.</td>
<td>M/s.Chamundi Power Corporation shall make necessary arrangements to measure water at the end of penstocks by installing suitable devices. The payment of water royalty by M/s.Chamundi Power Corporation shall be based on the unit power generated including auxiliary consumption and shall be correlated to the quantity of water measured and released for power generation at the end of the penstocks.</td>
</tr>
<tr>
<td>7.</td>
<td>Development of an Integrated Reservoir Simulation Model and its impact on power generation.</td>
<td>An Integrated Reservoir Simulation Model covering all the projects on the main Krishna stem in Karnataka shall be developed by the Irrigation Department. The study will take into consideration all usages like ground water, surface water, power generation, etc.</td>
</tr>
<tr>
<td>8.</td>
<td>Impact of loss in storage capacity due to various reasons like siltation / sedimentation / sudden draw-down etc on power generation and the provisions to be made in the agreement in this direction.</td>
<td>The siltation and sedimentation is a continuous process and this aspect has already been taken care of in the Project Planning itself. However, in the event of loss of storage due to act of God or natural calamities, provisions of &quot;force-majeure&quot; clause would be attracted. The Irrigation Department will not be responsible for any loss of storage due to reasons beyond its control, other than due to act of God / natural calamities. Similarly, M/s.Chamundi Power Corporation will not be responsible for not utilising the waters for power generation even when there is storage available for generation of power, if it is due to reasons beyond its control.</td>
</tr>
<tr>
<td>9.</td>
<td>Possibility of generating power in the summer months of April, May and June.</td>
<td>Generation of power in the summer months is dependent on the availability of water for power generation. This issue can be examined by the Technical Committee as and when the need arises.</td>
</tr>
<tr>
<td>10.</td>
<td>Whether it is proper to make a firm commitment on the design energy since it depends on various factors; if the hydrology / yield varies or changes during the period of operation, the entire scenario would change.</td>
<td>This is a matter to be examined at the time of PPA. Irrigation Department has no comments.</td>
</tr>
</tbody>
</table>

9.04 Formation of Technical Sub-committee:-

(1) Subsequently, an exclusively Technical Sub-Committee was constituted vide G.O. No.DE 212 PC 96 (P) dated 26.09.1997 (copy enclosed Annexure-11) for sorting out the various issues connected with the WSMA. The Committee included the representatives of WAPCOS, M/s.Chamundi Power Corporation, Irrigation Department, KEB and the Secretary of TAC. The objective of the Committee, as per the G.O., was to study the following issues:-
(i) Risk sharing arrangement  
(ii) Rule curve simulation  
(iii) The impact of delay in upstream utilization and command area development in Upper Krishna Project.  
(iv) Growth of irrigation and cropping pattern.  
(v) Tail water rating curve  
(vi) Monthly pattern of water releases  
(vii) Sedimentation in Alamatti and Narayanapur reservoirs.  
(viii) The Impact of dam height and cascade system downstream of Narayanapur.

(2) M/s. Chamundi Power Corporation was required, under the said G.O., to make studies on the sensitive issues of design energy and energy generation for various scenarios of irrigation in consultation with M/s. WAPCOS and present the same to the above Committee for discussions.

9.05 Findings of the Technical Sub-committee:

(1) A detailed note on all the issues referred to in the above said G.O. dated 26.09.1997 was prepared by Dr. Peter Meier of M/s. Chamundi Power Corporation in consultation with WAPCOS and placed before the Technical Sub-committee for further discussions. The Committee held 4 meetings and, after detailed deliberations on all the connected issues, finalized the report in its 4th meeting held on 17.07.1998. The report was submitted by KEB to the Secretary to Government in Energy Department through its letter No. KEB/SEE/(PROJ)/782-88/98-99 dated 22.08.1998. Another copy of the report was also sent to the Secretary to Government in Irrigation Department by the Secretary, TAC through his letter dated 27.08.1998.

(2) Following is the summary of findings on several issues examined by the Committee:

(The elevations / levels indicated are w.r.t. Alamatti reservoir)

(i) The cost of energy as a function of FRL:

The indicative energy cost rises from around Rs.1.7/kWh at El. 524.256 to Rs.2.35/kWh at 519.6. More importantly, however, at El. 519.6 only 31% of total energy would be delivered in Rabi and summer, whereas at El. 524.256, 43% of total energy is in Rabi and summer. Since the southern grid is in surplus during the monsoon season, it is dry season energy that is of most value to KEB.

(ii) Impact of Alamatti FRL on the cascade:

At FRL 524.256, the cascade produces 609 GWh of dry season energy. This falls to 328 GWh of dry season energy were the FRL at Alamatti to be permanently limited to 519.6.

(iii) Impact of a limitation to 519.6 on station design:

Even if the FRL were permanently limited to El. 519.6, the full station configuration (i.e. 4 x 70 + 17 MW) should be built. Both the cost of energy and capacity value increase significantly if fewer units are installed. This is due to scale economies and civil costs that are relatively constant.
(a) The following Table summarises the key indicators illustrating the importance of FRL:

<table>
<thead>
<tr>
<th>FRL (in m)</th>
<th>Alamatti Annual Energy (GWh)</th>
<th>Capacity value (MW)</th>
<th>Indicative energy cost (Rs/KWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>512</td>
<td>318</td>
<td>18</td>
<td>3.60</td>
</tr>
<tr>
<td>514</td>
<td>355</td>
<td>33</td>
<td>3.23</td>
</tr>
<tr>
<td>516</td>
<td>398</td>
<td>56</td>
<td>2.89</td>
</tr>
<tr>
<td>518</td>
<td>448</td>
<td>90</td>
<td>2.56</td>
</tr>
<tr>
<td>519.6</td>
<td>495</td>
<td>120</td>
<td>2.35</td>
</tr>
<tr>
<td>524.256: DPR</td>
<td>682</td>
<td>105</td>
<td>1.66</td>
</tr>
<tr>
<td>524.256: optimized for capacity value</td>
<td>610</td>
<td>261</td>
<td>1.88</td>
</tr>
</tbody>
</table>

(b) The following Table illustrates the impact of FRL limitation on the cascade with an installed capacity of 810 MW (for the optimized operating rule):

<table>
<thead>
<tr>
<th>Item</th>
<th>FRL 524.256</th>
<th>FRL 519.6</th>
<th>Ratio: 519.6 / 524.256</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual energy in GWh</td>
<td>1,611</td>
<td>1,407</td>
<td>87%</td>
</tr>
<tr>
<td>Rabi + summer season energy, in GWh</td>
<td>609</td>
<td>328</td>
<td>53%</td>
</tr>
<tr>
<td>Proportion of annual and Rabi + summer seasons</td>
<td>38%</td>
<td>23%</td>
<td>-</td>
</tr>
</tbody>
</table>

(iv) The impact of upstream utilization:

At El. 524.256, Alamatti annual generation based on full utilization under Scheme-A results in 610 to 681 GWh/year, depending upon operating rule assumptions. Based on the historical flows 1982-1983, this increases to 812 to 920 GWh/year. A similar increase occurs at FRL of 519.6. Assumptions about the timing of achievement of full upstream utilization will therefore have a significant impact on the tariff, particularly if the GOI norm continues to depend upon secondary energy charges for a substantial fraction of incentive returns.

The following Table illustrates the power generation as a function of upstream utilization for FRL 524 (with optimum operating rule):

<table>
<thead>
<tr>
<th>Item</th>
<th>Based on full upstream utilization (as per IISc estimates)</th>
<th>Based on current flows, 1982-1983</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual generation in GWh</td>
<td>610</td>
<td>812</td>
</tr>
<tr>
<td>Capacity value, MWCV</td>
<td>261</td>
<td>265</td>
</tr>
<tr>
<td>Fraction of generation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in – Kharif</td>
<td>0.62</td>
<td>0.57</td>
</tr>
<tr>
<td>Rabi</td>
<td>0.14</td>
<td>0.22</td>
</tr>
<tr>
<td>Summer</td>
<td>0.23</td>
<td>0.20</td>
</tr>
</tbody>
</table>

(v) Impact of UKP command area development:

Delays in achieving full command area development would have little impact on the tariff. This is because the bulk of irrigation requirements under Scheme-A occur at Narayanapur. However, the cascade is much more sensitive to this uncertainty; generation in the cascade falls from 2270 GWh under present conditions to 1875 GWh/year once the full UKP command area is developed.
(vi) Impact of the operating rule:

(a) The operating rule has a relatively small impact on annual energy production, which varies by only 10% across the range given by optimizing for energy versus optimizing for capacity value. The variation for capacity value, however, is about 250% (from 105 MW to 261 MW).

Following Table illustrates the optimization of the operating rule and irrigation objectives:

<table>
<thead>
<tr>
<th>Item</th>
<th>DPR</th>
<th>7h/day</th>
<th>6h/day</th>
<th>5h/day</th>
<th>4h/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual average irrigation utilization in TMC</td>
<td>132.5</td>
<td>134.3</td>
<td>134.9</td>
<td>135.7</td>
<td>136.7</td>
</tr>
<tr>
<td>Karnataka consumptive use in TMC</td>
<td>162.4</td>
<td>174.4</td>
<td>177.7</td>
<td>182</td>
<td>188.1</td>
</tr>
<tr>
<td>Capacity value in MW</td>
<td>105</td>
<td>150</td>
<td>183</td>
<td>250</td>
<td>261</td>
</tr>
<tr>
<td>Annual energy in GWh</td>
<td>682</td>
<td>643</td>
<td>636</td>
<td>619</td>
<td>610</td>
</tr>
</tbody>
</table>

(b) Whether operated for capacity or for energy, irrigation objectives can always be met. Indeed, when operated for maximum capacity value, the rate of irrigation failure decreases. However, there is a trade-off with evaporation; higher average water levels that accompany operation for maximum capacity value also imply higher evaporation.

(c) It is recognized that the optimized operating rule, although providing better operation for both irrigation and power, results in gross utilization that exceeds the GOK's 173 TMC project allocation to the UKP. However, because of delays in UKP command area development for full utilization; higher inflows due to delays in other upstream projects including those in Maharashtra; and uncertainties in evaporation assumptions, such an operating rule is still appropriate.

(d) Further optimization of the operating rule, based on the use of optimization rather than simulation modeling, may be required. Verification of evaporation rates (which are based on pan evaporation experiments that seem quite dated) may also be indicated.

(vii) Sedimentation:

Unless the rates of siltation into both the Alamatti and Narayanapur impoundments are very much higher than expected, siltation will not have a significant impact on power generation and the power tariff. Other assumptions, particularly concerning upstream utilization, have a far more significant impact.

(3) The Committee did not report on the following matters for the reasons indicated:

(i) Impact of Scheme-B: Although the Committee recognized the potential importance of Scheme-B to UKP, lack of necessary information and assumptions prevented quantitative studies from being undertaken.

(ii) Impact of tail water rating curves: The uncertainty associated with the tail water rating curve was considered very minor compared to other factors examined.

(iii) Design energy: This has been calculated for some of the scenarios. However, the Committee noted that the design energy is a tariff and legal definition rather than a technical concept, and chose not to elaborate further.
(iv) Risk sharing: As in the case of design energy, how commercial risks are to be shared between the various parties is a matter for negotiations and cannot be answered on technical grounds. The Committee decided that it could assess only and strictly technical matters.

10.0 Orders of the Supreme Court on the issue of height of Alamatti dam:-

10.01 The Supreme Court passed orders in April 2000 permitting Karnataka to limit the FRL / gate level of Alamatti reservoir to 519.6 m.

11.0 DPR of Alamatti Power Project prepared by M/s Chamundi Power Corporation, after the orders of Supreme Court:-

11.01 Consequent upon the issue of the height (FRL) of Alamatti dam coming to a finality with the orders of the Supreme Court passed in April 2000, M/s Chamundi Power Corporation prepared a modified project report for the Alamatti Power Project during August 2000. The estimated cost of the project was Rs.1469.8 crores for an installed capacity of 297 MW (4 of 70 MW and one of 17 MW).

12.0 Withdrawal of the UKP Power Project from M/s Chamundi Power Corporation:-

12.01 Considering the huge cost projected by M/s Chamundi Power Corporation, GOK withdrew the UKP Power Project (Alamatti Power Project) from M/s Chamundi Power Corporation in January 2001, and entrusted the same to Karnataka Power Corporation Limited.

13.0 DPR of Alamatti Power Project prepared by Karnataka Power Corporation Limited and clearance by Government of India:-

13.01 Subsequent to entrustment of the Alamatti Power Project to Karnataka Power Corporation Limited (KPCL), modified DPR was prepared by KPCL during April 2001 and sent to CEA, GOI, according to which the installed capacity was 290 MW (5 of 55 MW and one of 15 MW). The estimated cost of the project was Rs.714.93 crores.

13.02 The KPCL project report was cleared by CEA, GOI in February 2002 for an estimated cost of Rs.674.38 crores.

13.03 All other clearances required for the construction of Alamatti Power House have been obtained, including the following:-

(i) Ministry of Environment & Forests, GOI.
(ii) Ministry of Environment & Forests, GOK.
(iii) Karnataka State Health Department.
(iv) Karnataka State Fisheries Department.
(v) Karnataka State Pollution Control Board.
13.04 **Salient features of the Alamatti Power House:-**

(1) The following are some of the important salient features of Alamatti Power House:-

(i) Installed capacity…………………………………… 5 units of 55 MW and one unit of 15 MW (total 290 MW).

(ii) Annual design energy :
   - (a) For present flows……………………………… 483 MU
   - (b) For future flows………………………………… 286 MU

(iii) Type of turbine…………………………………… Vertical Kaplan.

(iv) Rated net Head :
   - (a) For 55 MW unit………………………………… 26.60 m
   - (b) For 15 MW unit………………………………… 24.09 m

(v) Total hard cost……………………………………… Rs.568.26 crores

(vi) Total soft cost……………………………………… Rs.106.12 crores

(vii) Total cost………………………………………… Rs.674.38 crores

(viii) Cost per MW……………………………………….. Rs.2.325 crores

14.0 **State-of-the-art Technique:-**

14.01 Some of the State-of-the-art and innovative techniques that are adopted for cost effective and timely implementation of this fast-track project, are:-

(i) Providing structural steel frames for super-structure.
(ii) Galvalume sheets for roofing.
(iii) Machine hall without generator floor.
(iv) Locating control room below tail race deck slab.
(v) Space for two units assembly in erection bay.

15.0 **Present Status:-**

15.01 The Hon'ble Chief Minister flagged off the implementation of the Alamatti power project on 15.03.2002. The construction of the project is in full swing.

15.02 The project is being implemented as a fast-track project and the first unit of 15 MW is programmed to be completed in a record period of 21 months.

15.03 It is programmed to complete the mechanical rotation of the first unit of 15 MW during March 2004 and to complete all the works of the Power House within 37 months.