

CHAPTER 5

WATER RESOURCES

Water sector has undergone basic changes in recent years. While focus in this past was mainly on investment in physical structures, recent developments are associated to a great extent with improved management, conservation and institutional changes.

International Year of Fresh Water

5.2. The United Nations declared 2003 as the 'International Year for Fresh Water'. To focus on the role of water as a precious and finite resource that must be used carefully. To feed an additional 2 billion people by 2030, water needs to be used more efficiently. Only 20 per cent of the arable land in developing countries is irrigated. The irrigated area in developing countries is expected to increase by 20 per cent by 2030.

5.3 The technical solutions to produce 'more crop per drop' exist for which modernisation of irrigation system is also essential. The message

of FAO in the context of international year for fresh water is given in BOX.5.1.

5.4 The fresh water availability of Kerala according to the available estimates (1974) is 77.35 Billion Cubic Meters including re-generated flow from ground water. Nearly 40 percent of available water resources is lost as run off. The utilisable resources as per the earlier assessment is around 42 BCM whereas the requirement for water for various purposes like irrigation, domestic and saline water intrusion etc. is reckoned at 49.70 BCM. The purpose-wise annual fresh water withdrawals is shown in Table 5.1.

5.5 As far as the use of fresh water in the World is concerned, the major share (71%) is consumed for agriculture followed by industry (20%) and domestic (10%). In the case of low income countries, the percentage share for agriculture is 90 where as in the high income countries, the share is comparatively less (42 %). In India the major share of fresh water withdrawal is for irrigation (92%) and in Kerala the percentage share for agriculture is 71 per cent.

5.6 The pattern of demand for water in Kerala is undergoing gradual but continuous change towards increasing pressure for drinking and other household and commercial needs relative to the demand for irrigation which is also declining towards less water demanding perennial crops in lieu of seasonal food crops.

5.7 "Optimal sustainable development, maintenance of quality and efficient use of country's water resources to match the growing demands on the precious natural resource with active involvement of all stake holders in order to achieve accelerated, equitable economic development of the country" is the vision for integrated water resources development and management.

Box -5.1

More Crop per Drop

- Agriculture is the sector where the potential for water productivity is the highest.
- To accept that all sources of water/rain, surface water, ground water and waste water are important to activate food security.
- To create the right policy, institutions and market incentives to increase water use productivity in agriculture.
- To move from supply to demand driven and service oriented water management

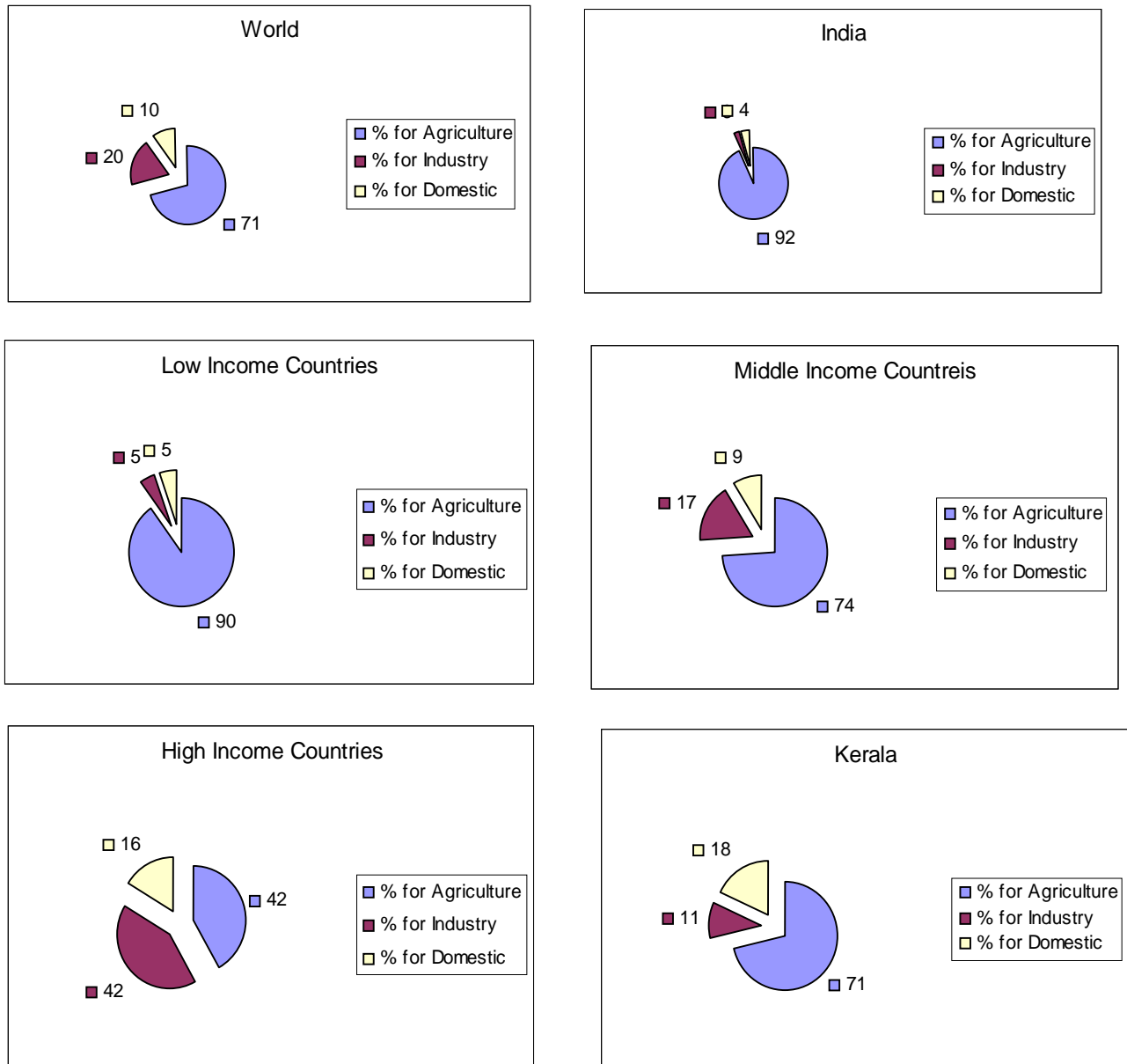
FAO, 2003

Table 5.1.
Purpose-wise Annual Fresh Water Withdrawals

Sl. No	Country/Category	Annual Fresh Water Withdrawals (%)		
		Agriculture	Industry	Domestic
1	World	71	20	10
2	India	92	3	4
3.	Low income countries	90	5	5
4.	Middle income countries	74	17	9
5.	High income countries	42	42	16
6	Kerala	71	11*	18

Source : World Development Indicators 2003, Water Resources of Kerala, (PWD)1974. * Percentage includes saline water intrusion

FIG.. 5.1
Annual Freshwater Withdrawals



5.8 The strategies designed for achieving the vision for integrated water resources development and management (2003-2017) prepared by the Ministry of Water Resources are: integrated management of water resources, development of new resources, optimal utilisation of developed water resources, preserving the resources, realistic assessment of water resources and their requirements in different regions, augmenting the available water resources by transferring water from surplus regions to water deficit areas, stakeholders' participation in water resources management, demand side management through mass awareness, optimal utilisation of the flood plains keeping adverse impacts to a minimum, dissemination and application of technology and research.

5.9 The various action points suggested to achieve the strategy are summarised below.

- Establish one RBO in each state with the assistance of Ministry of Water Resources.
- Creation of data bank for water.
- Laying down a policy for zoning the water basins according to water availability.
- Accelerated ground water exploration in unexplored areas and drought prone areas through construction of 15000 deep tube wells over 15 years.
- Support Non-Governmental efforts in rainwater harvesting.
- Promotion of PIM.
- Adoption of modern irrigation techniques like sprinkler and drip irrigation etc.
- Restructure and modernisation of old irrigation projects.
- For new projects, review the procedures of economic evaluation of water resource projects and prepare guidelines for prioritization of projects.
- Enact dam safety legislation.
- Rehabilitation of minor irrigation projects.
- Encourage Non-Governmental Organisations to help WUAs in capacity building.
- Legislation for promotion of existing water bodies.
- Support Non-Governmental efforts in artificial recharge of ground water.
- Create mass awareness about the need for conservation of water and maintaining the quality of ground and surface water sources.
- Strengthening of WALMIs for facilitating training and technical support to WUAs.

5.10. 22nd March is celebrated as World Water Day

and countries are to implement the UN recommendation and initiate activities related to conservation and development of water resources. The theme for the various years is given in BOX 5.2.

Water Resources in the Country

5.11 India, which has 17 percent of the world's population, has only 2.45 percent of world's land resources

Box -5.2

World Water Day

- 1994 : Caring for our water resource is every one's business
- 1995 : Women & Water
- 1996 : Water for thirsty cities
- 1997 : The World's Water. Is there enough?
- 1998 : Ground water. The invisible resource
- 1999 : Every one lives Downstream
- 2000 : Water for 21st century
- 2001 : Water & Health
- 2002 : Water for Development
- 2003 : Water for the Future
- 2004 : Water and Disaster

and 4 percent of the world's fresh water resources. Monsoon rains is the main resource of fresh water. The rain fall in India is confined mainly to the South-West Monsoon months of June to September. The South West Monsoon contributes about 75 to 80 percentage of rainfall in most parts of India. Rainfall occurs during October – December in the south and south east regions under the influences of North east Monsoon. The maximum rainfall is about 110,00mm. in North East regions whereas in Rajasthan it may be less than 100 mm. Since most rainfall occurs only during 3 to 4 months of the year, assured water supply to agriculture, industries and drinking purposes is a challenge.

5.12 Country's water resources have been estimated by various committees and commissions like Irrigation Commission, National Commission on Agriculture, National commission on Integrated Water Resources Development etc., but still the exact quantity has not been arrived at. However, the amounts of water which are available both surface and ground water, have been calculated. The total annual surface water flow including regenerated flow from ground water is estimated at about 4000 billion cubic meters (BCM)

The average annual flow in rivers is 1869 BCM. The Ganga- Brahmaputhra Barak system is the major contributory to the total water resources potential of the country. The water resource of this basin is estimated at 1110.62 BCM which is about 59 per cent of the total water resources. The potential of the west flowing rivers from Tadri to Kanyakumary accounts for 11% of the total potential. It has been estimated that only about 1086 BCM of the total potential of 1869 BCM can be put to beneficial use (690 BCM from surface water resource and 396 BCM from ground water). Out of the total fresh water availability of 4000 BCM only about 1086 BCM could be utilised, the balance flows into the sea. This water has to be channelised for utilisation.

Box -5.3**National Water Resources at a Glance:**

• Annual Precipitation (Including snow fall)	4000 BCM
• Average Annual Potential flow in Rivers	1869 BCM
• Per Capita Water Availability (1997)	1967 Cu. m
• Utilizable Water Resources	1086BCM.
• (i) Surface Water Resources	690 BCM.
• (ii) Ground Water Resource	396 BCM.

5.13 The water resources potential of the river basins of India is given in Table: 5.2.

Table 5.2
Water Resources Potential of the River Basins of India

Sl No.	Name of the River Basin	Average annual potential in river (BCM)	Utilisable Surface flow (BCM)	Repleni shable Ground flow (BCM)
1	Indus (up to border)	73.31	46.0	26.49
2	a) Ganga	525.02	250.0	170.99
	b) Bhramaputra Barak & Others	585.60	24.0	26.55
3	Godavari	110.54	76.3	40.65
4	Krishna	78.12	58.0	26.41
5	Cauvery	21.36	6.8	12.30
6	Pennar	6.32	6.9	4.93
7	East Flowing Rivers Between Mahanandi & Pennar	22.52	13.1	18.84
8	East Flowing Rivers Between Pennar and Kanyakumari	16.46	16.7	18.22
9	Mahanadi	66.88	50.0	16.46
10	Brahmani & Baitarni	28.48	18.3	4.05
11	Subernarekha	12.37	6.8	1.82
12	Sabarmati	3.81	1.9	..
13	Mahi	11.02	3.1	8.52
14	West Flowing Rivers of Kutch, Sabarmati including Luni	15.10	15.0	11.23
15	Narmada	45.64	34.5	10.83
16	Tapi	14.88	14.5	8.27
17	West Flowing Rivers from Tapi to Tadri	87.41	11.9	
18	West Flowing Rivers from Tadri to Kanyakumari	113.53	24.3	17.69
19	Minor River Basin Drainage into Bangladesh & Burma	31.00	..	
	TOTAL	1869.37	690.3	431.42

Source: Ministry of Water Resources

Interlinking of Rivers

5.14 The National Perspective Plan for water prepared in 1980 envisaged interbasin transfers beginning with the peninsular rivers. Specifically it envisaged the interlinking of the Mahanadi- Godavari -Krishha-Pennar-Kauvery and diversion of surplus West flowing rivers eastward. It estimated that by doing so all the four southern states can get substantial additional supplies totalling 58 BCM capable of irrigating an extra 9-10 m ha. Similarly National Water Development Agency had prepared a feasibility report for the Pamba Achankoil Vaipar Link Project on the basis of water balance study conducted in the 1980s for diverting 634 mcm of surplus water to deficit Vaipar basin. The study conducted by CWRDM shows a deficit of 3537 mcm of water in Pampa-Achankoil rivers by 2051 which makes the transfer unfeasible. The National Commission on Integrated Water Resources Development found (1998) that in Peninsular rivers only Godavari had some surplus. Inter-linking of the rivers in the country has once again become a subject for study and discussion, following the observations of the Supreme Court in a case. The Government of India has appointed a high level Task Force for the purpose once again. Several major issues - legal, political, social, economic, technical, environmental - are involved.

River Basin Organisation

5.15 River Basin Organisation (RBOs) has been suggested to be established for the integrated, optimum and holistic development and management of water resources. Each RBO will be an inter disciplinary body representing various disciplines. Considering the need for the formation of RBO's in the country, Ministry of Water Resources would help to establish one RBO in each state. RBO's will address the issues of soil conservation, pollution control, flood control, optimum usage of water resources in a river and long term conservation of rivers. In Kerala it is proposed to organize RBOs in five major river basins viz. Chaliyar, Bharathapuzha, Periyar, Pamba and Achankovil.

Participatory Irrigation Management (PIM)

5.16 The Participatory development is a process through which stake holders influence and share control over development activities and the decisions and resources which affect them. PIM is introduced with the objectives of improving performance of irrigation, improving planning and water distribution, ensuring equality and uniformity among all stake holders, de-

veloping a source of ownership of the newly created infrastructure, upkeep of the field channels in running condition through weeding and desilting, attending to repair and maintenance of field channels, ensuring efficient and economic use of canal water and to determine crops to be sown for optimum utilisation of available water.

5.17 The sustainability and success of PIM depend on mutual accountability between WUAs and the Water Resources Department, attitudinal change in the bureaucracy, autonomy for the WUAs, multi functional nature of WUAs and choice of appropriate model for PIM with appropriate legal and institutional framework. The irrigated area transferred to Water Users Association (WAUs) in India is about 7 percent as against 45 per cent in Indonesia, 51 per cent in Mexico, 65 per cent in Philippines, 25 per cent in Thailand, 35 per cent in Turkey and 19 per cent in Sri Lanka.

5.18 Legislation has been made by Governments of Andhra Pradesh and Madhya Pradesh for Participatory Irrigation Management and are being framed by some other state governments for effective involvement of farmers in the O & M of the irrigation systems. In Tamil Nadu, a Bill on Farmers Management of Irrigation System was introduced in 1999.

5.19 As a part of Tenth Plan strategy it is proposed to introduce PIM in selected projects. Government of Kerala has initiated two Pilot studies in Neyyar and Malampuzha to operationalise the modalities of implementation of PIM. Water Users' Associations will be formed for the O & M of the branch canals and distributories.

Irrigation Management

5.20 Effective steps were not taken for improving water use efficiency through modernisation/renovation of existing systems which have deteriorated over the years. The major recommendations of International Irrigation and Water Management Institute - TATA Water Policy Programme are shown in BOX 5.4.

5.21 Integrated management of water resource should be based on the treatment of water as an integral part of the eco-system and as a natural resource whose quality and quantity determines the nature of its utilisation. Water use, in turn, has its impact on water quality and therefore utilisation of water has to be so managed as

Box -5.4**Recommendations of IWMI - TATA Water Policy Programme**

- Before investing in expanding irrigated area, look at options for improving water productivity.
- Take a basin perspective on water savings and understand how changes in water management or allocation in one area affect users in another
- Integrate management of blue water - from rivers and reservoirs - with green water - rainfall stored in the soil profile in aquifers.
- Invest in efforts to provide reliable irrigation to farmers in existing schemes.
- Create policies and incentives to support the uptake of technologies and practices that will improve water productivity and reduce degradation of agro ecosystems.
- Ensure that the poor benefit from investments in improving water productivity by ensuring access to water for income generation, developing and promoting affordable water productivity enhancing technologies and giving the poor a voice in water decision.

not to contribute to the deterioration of water quality.

5.22 Conjunctive use of ground water and surface water resources needs to be planned in the irrigation projects from the beginning. There is a need to take effective steps for improving water use efficiency through renovation and modernisation of existing systems.

5.23 Water resources development is to be seen not merely as a single-sector-end objective, but as a prime mover in developing larger systems with multiple linkages. This calls for a well-set out multidisciplinary research agenda covering not only technological issues but also issues of social, economic, legal and environmental concerns. A trained, motivated manpower being the backbone of any development activity, in the water resources sector also, there is need for human resource development. The kind of approach suggested required multi-level training of personnel involved in the sector to undertake the challenging task ahead.

Rain water Harvesting

5.24 Increasing importance is being placed on in situ rain water harvesting and recharge. Ground Water depletion has also revived popular interest in rainwater harvesting. Khadins in Rajasthan, 'Tankas' in Western Gujarat and a whole new range of roof water harvesting techniques are coming back in to

vogue. Rainwater harvesting is a viable alternative to conventional water supply. Rainwater harvesting besides helping to meet the increasing demand for water helps to reduce the run-off which is choking storm drains avoid flooding of roads, augment the ground water storage and to control decline of water level, reduce the ground water pollution, improve quality of ground water and reduce soil erosion. This is considered an ideal solution of water problem in areas where ground water supply is inadequate and surface resources are insufficient. Rainwater is bacteriologically pure and free from organic matter and soft in nature. The structures required for harvesting the rainwater are simple, economical and eco-friendly.

5.25 Kerala is blessed with two predominant rainy seasons caused by Southwest and Northeast Monsoon. On an average, the state receives 3000 mm of rains, of which 60 per cent is obtained during Southwest Monsoon. 25 per cent during the Northeast Monsoon and 15 per cent during summer months. The high variations in spatial and temporal rainfall add to the complexity of the problems associated with water management faced by the State. State losses about 40 per cent of the rainwater through runoff. Hence rainwater harvesting assumes importance in our state.

5.26 Awareness on rainwater harvesting has to be created among the stakeholders through seminars and

workshops. A committee has been constituted under the chairmanship of Vice Chairman, State Planning Board to co ordinate various agencies involved in the promotion of rainwater harvesting and to prepare policy guidelines.

Kerala Irrigation and Water Conservation Act

5.27 The State Government have passed a law named “Kerala Irrigation and Water Conservation Act 2003” to consolidate and amend the laws relating to construc-

tion of works, conservation and distribution of water for the purpose of irrigation and levy of betterment contribution and irrigation cess on lands benefitted by irrigation works, to provide for involvement of farmers in water utilisation systems and for matters connected there with or incidental there to. The salient features of the Act are given in BOX 5.5.

Dam Safety

5.28 There are 18 dams intended mainly for irrigation. Safety of the existing dams is one of the items in

Box -5.5

The Kerala Irrigation and Water Conservation Act 2003

The Salient features of the Bill are:

- All watercourses and all water in such water courses in the State shall be the property of government. Conservation of water in the watercourses shall be the responsibility of the Government.
- Government can construct and commission an irrigation work of any kind on any land by notification,
- Redefining the category of irrigation works to Major, Medium and Minor irrigation works - Major irrigation scheme - a scheme benefiting an irrigable command of more than 10,000 hectares, Medium irrigation – benefiting and irrigable command area of more than 15 hectares but less than 10,000 hectares, and Minor Irrigation works includes less than 15 hectares.
- Construction and maintenance of all of minor irrigation works within the limit of a local authority shall devolve upon that authority.
- The alignment and construction of any field channel and technical specification thereof shall be the responsibility of the Government.
- The Government shall be entitled to issue certificates and levy of irrigation cess.
- Distribution of water from all irrigation works constructed or maintained wholly or partly at the cost of Government shall be regulated by rules or orders issued by Government.
- Distribution of water to any other state or Union Territory shall be in accordance with an agreement between the State Government and the Government of such other State or Union Territories.
- No encroachment shall be allowed in the irrigation land.
- Introducing Participatory Irrigation Management through Water Users’ Association with in an area of every forty hectares benefitted by an irrigation system. The Water Users’ Association shall prepare and implement water schedule for each irrigation season, prepare a plan for the maintenance of irrigation system in the area of its operation and carry out the maintenance works of the distribution system. Government shall authorise the association to take up and execute all the works for rehabilitation of the system prior to taking possession of the same and all maintenance work of the system under the area of operation.
- Constitution of a Dam Safety Authority for the purpose of surveillance, inspection and advice on maintenance of dams situated within the territory of the state.
- Constitution of a Water Management and Utilisation Board with respect to any basin or cluster of river basins or project or irrigation work or any major irrigation work, for advising the Government on matters relating to the regulation of the distribution of water from the irrigation work in that area or the major irrigation work, as the case may be and on such other matters as may be referred to it. The Board constituted shall consist of not more than twenty members appointed by the Government representing agriculturists in the area, non official of such interests as may be prescribed, officials and representatives of local bodies.

the National Water Policy. Almost all of them were completed in the 1950's and are constructed of masonry/earth or a combination of both. Excessive seepage/leakage, mal functioning of gates etc. caused distressed conditions as noticed by the State level Dam Safety Committee. Besides this, the storage capacity of the reservoir gets depleted due to excessive siltation. If these problems are not attended properly, it can cause downstream damages. Hence rehabilitation of the dams are essential. As per the Dam Safety Act-2000 every State having a significant number of dams shall constitute a body called 'Dam Safety Organisation (DSO). Accordingly in Kerala also constituted a 'Dam Safety Organisation'. The main responsibilities of the Dam Safety Organisation are:

- Monitoring the post and pre-monsoon inspections of dams and maintenance and surveillance and safety activities of the dam.
- Hydrological review to check the adequacy of design flood, preparation of emergency action plan, prioritization of dam for rehabilitation purposes, interaction with the Dam Safety Organisation of the Central Water Commission, conducting structural analysis, and checking the safety of dams once in 10 years.

5.29 During 2002-03, Dam Safety Organisation along with Dam Safety Committee had inspected the dams in Neyyar, Malampuzha, Chimmomy, Vazhani, Kanjhirappuzha, Siruvani, Kallada and Peechi. Execution of safety measures could not be done during 2002-03.

5.30 As part of the newly enacted Kerala Irrigation and Water Conservation Act a Dam Safety Authority has been recommended for the purpose of surveillance, inspection and advice on maintenance of dams situated within the territory of the state.

Investment in Irrigation

5.31 Keeping in line with the national perspective, Kerala also relied upon surface water irrigation system operate on gravitational force for distribution. A major chunk of the outlay on water resources sector has been earmarked for Major & Medium Irrigation. Out of a cumulative investment of Rs.3245 crores made from first Plan to first year of the Tenth plan, Rs.2220.00 crores (68%) was for major and medium irrigation. Such a huge investment made has not succeeded in generating commensurate increase in area

irrigated. Most of the projects remain incomplete and with escalation of cost as well as time over run. Under time bound completion, eight projects were targeted during the Ninth Plan period. Against these, four projects, viz., Chimmoni-Mupli, Pazahsi, Kanakkankadavu and Kanhirapuzha could be completed. Kallada, Muvattupuzha, Karapuzha and Idamalayar are the projects, which could not be completed as scheduled. This is not the case of Kerala alone.

5.32 According to the latest published data by Planning Commission, 380 irrigation projects of the Ninth Plan period has been spilled over to Tenth Plan spanning across 23 states have added to a total of Rs.98089.00 crores to the project implementation cost. According to the Planning commission figures, 380 projects, which had a potential to bring 201.99 lakh ha. under irrigation during the Ninth Plan had spilled over to the Tenth Plan Period. Maharashtra has the highest spill over projects (138) followed by Karnataka (31), Madhya Pradesh (27), Jharkand (26) and Gujarat (21). Though Gujarat has less number of spillover projects, the maximum financial spillover commitment is to Gujarat (Rs.18676.1 crores).

5.33 State wise details of Irrigation Projects spilled over from Ninth Plan to Tenth Plan are given in Table: 5.3.

5.34 Public investment in irrigation has fallen significantly over successive Plan periods. This is largely due to resource constraints faced by governments both at the Centre and the States. However, resources are not the only problem. Potential irrigation projects are located in areas which are either more difficult or environmentally more sensitive which makes it difficult to implement irrigation projects. The Tenth Plan aims at a major revival of public investment in irrigation capacity and water management. The Accelerated Irrigation Benefit Programme (AIBP) launched in 1996-97 for the expeditious completion of approved ongoing major and medium irrigation projects is a potentially important instrument for providing resources to state governments in support of ongoing irrigation schemes. Allocations under this programme have been massively increased. Upto 2002-03, Government of India had sanctioned Rs. 9590 crores to various states. The assistance sanctioned to Gujarat was Rs. 2262 crores (23%), Karnataka Rs. 1252 crores (13%) & Andhra Pradesh Rs. 651 crores (6.79%) and Kerala Rs.

Table 5.3
State-wise Details of Irrigation Projects Spilled Over from the
Ninth to the Tenth Plan

(Rs in Crores)

Sl. No.	State/UT	Total No of Projects	Latest estimated cost	Expenditure Upto X Plan	Increase (3-4)	Total Potential (In'000Ha.)
1	2	3	4	5	6	7
1	Gujarat	21	31940	13263.9	18676.1	1909
2	Maharashtra	138	31299	14311.7	16987.3	3098
3	Madhya Pradesh	27	17353	4661.5	12691.5	2046
4	Andhra Pradesh	24	17606	7399.3	10206.7	2202
5	Karnataka	31	20034	10996.4	9037.6	1835
6	Uttaranchal	3	5334	264.6	5069.4	312
7	Orissa	13	6034	1943.9	4090.1	588
8	Jharkhand	26	5178	1708.7	3469.3	534
9	Uttar Pradesh	11	7273	3825.4	3447.6	2395
10	Rajasthan	9	6989	3805.5	3183.5	1598
11	Bihar	13	4784	1887.8	2896.2	747
12	West bengal	11	2734	959.7	1774.3	670
13	Assam	10	1841	485.3	1355.7	268
14	Punjab	1	1324	20.0	1304.0	37
15	Kerala	8	2609	1357.7	1251.3	221
16	Haryana	5	1776	893.3	882.7	786
17	Chhattrisgarh	10	1991	1307.6	683.4	777
18	Goa	1	859	470.0	389.0	27
19	Manipur	3	702	364.8	337.2	56
20	Himachal Pradesh	3	213	53.9	159.1	33
21	Jammu & Kashmir	8	232	107.7	124.3	27
21	Meghalaya	1	57	15.6	41.4	5
23	Tripura	3	162	129.5	32.5	27
	Total	380	168323	70234.0	98089	20199

Source: Planning Commission

59.06 crores (0.6%)

5.35 Central assistance is given under the programme in the form of loan and is provided to those projects which have investment clearance by Planning Commission. The pattern of assistance was on a 50:50 basis up to 1999-2000 and later it was revised in the ratio of 2:1 (Central and State). In Kerala, Kallada and Muvattupuzha Projects were assisted through the AIBP - Rs. 29.47 crores and Rs. 29.59 crores respectively. The assistance is provided based on individual selected components of public works identified under each project.

5.36 As part of the implementing policy on long pending infrastructure projects, one of the initiatives of the 'Modernizing government programmes', action has been initiated to identify long pending infrastructure projects and to prepare a plan recommending speedy

completion of on going projects /termination of projects which are unproductive. Based on the results of the initiative, projects which seems too beneficial, will be completed in a fast track method.

5.37 The ultimate irrigation potential of the state as per the earlier assessment is 25 lakhs ha. (gross) covering 16.00 lakhs through major and medium irrigation projects and 9 lakhs through minor irrigation schemes. Against this, as per the statistics of the Directorate of Economics and Statistics the state could achieve only 4.47 lakh ha. (gross) The share of major and medium projects was 2.29 lakh ha. and that of minor irrigation schemes is 2.18 lakh ha.

Review of Major Projects

5.38 At the beginning of the Tenth Plan there were 18 completed projects and 7 ongoing projects which were

in different stages of implementation. The strategy adopted for major and medium irrigation was (i) time bound completion of ongoing projects which are in an advanced stage of completion (ii) continuing the programme of revamping and consolidation of old generation projects through a modernization programme (iii) reinvestigation of projects which are in the initial stages of investigation, (iv) optimum utilisation of the potential already created through proper maintenance and (v) Introduction of Participatory Irrigation Management (PIM).

5.39 Under time bound completion, 6 projects are targeted for completion during the Tenth Plan period. Out of this work relating to Muvattupuzha and Karappuzha are progressing.

5.40 Kallada Irrigation and Tree Crop development Project is the second largest project in Kerala started in 1961 with an original cost of Rs.13.28 crores and revised estimate of Rs. 725 crores in the 1999 schedule of rates. The cost escalation reported is 5356 per cent. The ayacut targeted was 61630 ha. (net) and 92800 ha. (gross). Though the project was targeted for completion and priority in allocation was given during Ninth Plan it could not be completed and commissioned fully. Certain branches and distributories for which land has not acquired so far were not taken up. Exempting the ayacut of such branches and distributories (8116 ha.), the remaining ayacut is 53514 ha. and the work completed till 2003 March is 51322 ha. (96%) and water has been distributed to 43626 ha.

5.41 As majority of the work has been completed, during Tenth Plan the project was closed as an indynamic one. Certain spillover commitments are met under 'Winding up of projects. The cumulative expenditure as on 03/2003 for the project was Rs.656.59 crores and the ayacut achieved is 43626 ha

5.42 As far as Muvattupuzha Project is concerned, work relating to dam and major portion of the main canal has been completed. Major portion of the branches and distributories have to be completed. Out of a total length of 57.16 km. of branch canals, only 30.79 km. has been completed and out of 184 kms. of distributories only 56.82 km. has been completed. The progress of execution was very slow and the ayacut achieved was only 7200 ha. as on 3/03.

5.43 In the case of Idamalayar project, out of 32.278 kms. of Main canal work relating to 9.364 kms. is completed and in the case of low level canals, only 3.58 km. has been completed. The progress of execution is very slow. One of the problems indicated was the delay in getting forest land for the construction of the canals.

5.44 The Karappuzha project is also nearing completion. All the major works except the distributories have been completed. But no ayacut is achieved till date. Over time run the cropping pattern in the ayacut has changed and it is doubtful whether the original ayacut targeted could be achieved.

5.45 The physical achievement of the works in main canals, branch canal and distributories of the 3 projects Kallada, Muvattupuzha and Karappuzha are given in Fig. 5.2.

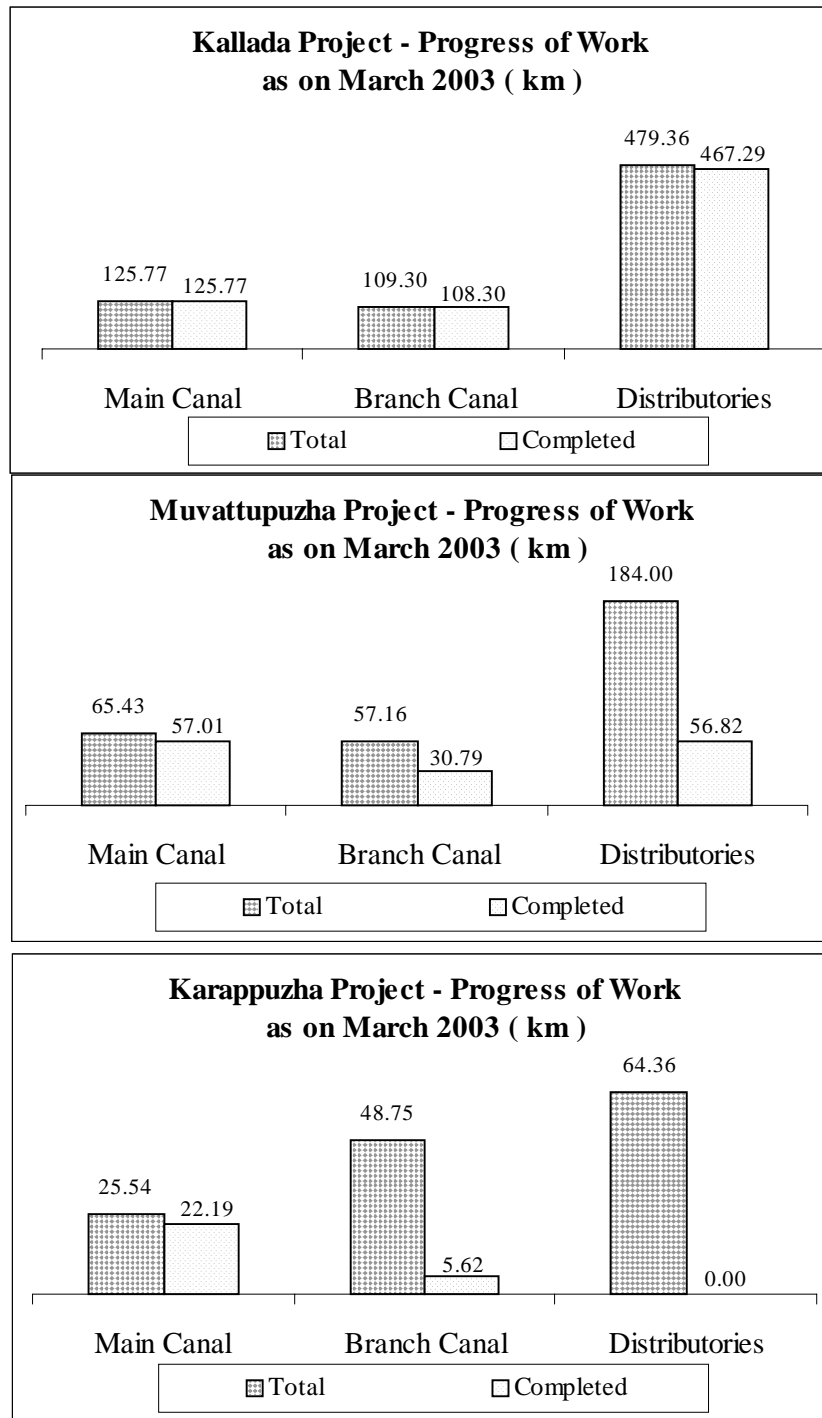
5.46 The overall performance of the major and medium irrigation sector during the initial year of Tenth Plan was not encouraging. Additional irrigation facility could be extended only in Muvattupuzha project. The additional area brought under irrigation by the project is only 4450 ha. The cumulative area brought under irrigation through major and medium irrigation projects is 2.29 lakh hectares. (gross). The details of the progress of implementation of ongoing projects as on 3/2003 is given in Table-5.4.

Revamping and Consolidation of Old generation Projects

5.47 The principal requirement of a good water distribution system is that it involves minimum loss of water and ensures timely and equitable supply of water to all irrigators in the command irrespective of the relative location of their fields in the command. Due to the long gestation period most of the projects has lost their efficiency in water distribution. The remodeling and modernization of the existing system has become imperative due to various reasons such as meeting the water requirements of crops at various stages of their growth, change in cropping pattern and improvement in operational methodologies etc. Hence, Kerala also has introduced a revamping and consolidation programme for augmenting the water use efficiency of the old generation projects which had deteriorated over the years and occurred radical changes in the water distribution system. Nine projects out of the old ten projects were taken up. Rehabilitation packages were drawn

Fig 5.2

Progress of Irrigation Work



up based on detailed baseline study of each project and modifications/interventions necessary to make the system more effective were drawn up and implemented. Even though a time bound implementation was targeted it could not be completed as scheduled. Out of the projects taken up for implementation two projects have been completed and others spilled over to the Tenth

plan. Against a financial target of Rs.50 crores for the project, the expenditure incurred up to 3/2003 was Rs. 28.48 crores and the additional area brought under irrigation is 35,746 hectares. In the case of system modernized, the participatory approach for irrigation scheduling and management has not been included so far.

Table 5.4
Project-wise Details of Ongoing Projects

(Rs. lakhs)

Sl. No.	Name of Project	Year of starting	Original estimate	Revised estimate	Year of revision	Cost escalation (%)	Expenditure upto March 2003	Target area to be irrigated (Ha.)		Physical achievements (Ha.)	
								Net	Gross	Net	Gross
1	2	3	4	5	6	7	8	9	10	11	12
1	Muvattupuzha	1974	2086	51500	1999	2368	40888	17737	34737	7200	14100
2	Idamalayar	1981	1785	41200	1999	2208	13223	14394	29036	-	-
3	Kuriyarkutty-Karappara	1987	1036	15830	1999	1427	1321	17488	34976	-	-
4	Karapuzha	1979	760	25300	1999	3228	19117	5221	8721	-	-
5	Banasurasagar	1979	800	5000	1999	525	932	2800	4740	-	-
6	Chamravattom	1985	1327	12000	1999	804	1227	3106	9659	-	-
7	Thrithala	1998	1900	2660	1999	40	1780	1303	3997	-	-

Source: Department of Water Resources

Table 5.5
Details of Revamping and Consolidation Programme

(Rs. in lakhs)

Sl. No.	Name of Project	Estimated Cost	Approved Cost of Revamping	Estimated cost and expenditure for								Total Expenditure as on 3/03
				Head Works		Main Canal		Branch Canal		Distributories		
				Est.	Expd.	Est.	Expd.	Est.	Expd.	Est.	Expd.	
1	Malampuzha	1658	693		6	279	113	1110	278	268	NIL	396
2	Pothundy	831	452	53	56	150	80	594	223	15	NIL	358
3	Mangalam	430	670	7	NIL	22	244	204	59	197	NIL	303
4	Walayar	370	560	27	NIL	155	227	127	NIL	61	NIL	228
5	Gayathri	700	465	42	NIL	284	265	331	NIL	42	NIL	265
6	Neyyar	380	590	35	NIL	119	190	158	NIL	68	172	362
7	Vazhani	145	360	8	19	46	227	75	115	16		361
8	Cheerakuzhi	230	360	26	16	166	60	39	28			104
9	Peechi	810	510	50	NIL	412	312	201	18	146	98	427
10	Regulators of Koleland	188	290		44		NIL		NIL		NIL	44
	TOTAL	5742	4950	248	141	1633	1718	2839	719	814	270	2848

Source: Department of Water Resources

The component-wise financial achievement of the projects as on 3/2003 is given in Table-5.5.

5.48 Considering the merits of the scheme, the scheme is continued for the second generation projects also during Tenth Plan. Steps have been initiated for identifying the interventions, which are needed for modernising the projects for the optimum utilisation of the infrastructure already created.

Externally Assisted Project - NHP

5.49 National Hydrology Project assisted by World Bank is the only project implemented in Kerala during the Tenth Plan period.

5.50 The Hydrology Project is a National Project aided by World Bank under a credit agreement with Government of India represented by CWC, CGWB, CW PRS - Pune and NIH - Roorkee and 8 State Governments namely Andhra Pradesh, Gujarat, Kerala, Madhya Pradesh, Maharashtra, Orissa, Karnataka and Tamil Nadu.

	Crores
Project Cost (India)	Rs. 455.78
Kerala HP component (Original)	Rs. 35.97
SW Component (Original)	Rs. 18.95
GW Component (Original)	Rs. 17.02

5.51 The project was started in Kerala in January 1996 and implemented by the Water Resources Department both surface and ground water components with a total cost of Rs. 35.97 crores. The original scheduled period of completion was March 2002. During the Mid term review by the external agency, the financial target has been reduced to Rs. 32.78 crores and extended the term of completion till December 2003. After reviewing the performance by the Joint Supervision Mission in April 2002, the financial target has again been reduced to Rs. 29.54 crores (Ground Water – Rs. 13.39 crores and Surface Water Rs. 16.15 crores) from Rs. 32.78 crores and physical target has also been revised.

The Objectives of the project are:

1. To improve organisational arrangements for measurement, validation, collation and analysis of hydrological, meteorological and water

quality data.

2. To strengthen institutional and technical capabilities.
3. To improve physical facilities and hydrology services for data measurement, validation, collation and analysis of hydro-meteorological and water quality data.
4. Use of hydrological and hydro meteorological data.

5.52 Details of Allocation and expenditure and reimbursement claimed as on September 2003 and the physical achievement is given in Appendix: 5.1 and Appendix - 5.2

5.53 The physical targets has been achieved. The major physical achievements are summarised as follows.

Under Surface Water

- Data generated at the hydrological and meteorological stations are compiled at respective sections and sent to sub divisions where primary validation is done.
- Data entry is almost stabilised and is up to date.
- Data after primary validation is sent to the corresponding divisions for secondary validation. The data transfer is through floppy disks on bimonthly basis.
- Data processing software HYMOS (Hydrology Modelling system) is established in 2 DDPCs & SDPC. Secondary Validation of data using HYMOS is completed. Preparation of digitised station maps completed and data entry operation of historical rainfall data from 1960 to '99 has been completed though Surface Water Entry System (SWDES). The historical data is published in the form of Year Book. Year Book for the years 2000,2001 & 2002 have been prepared. The data available in digital media is kept in CDs. The validated current data is kept in CDs.

Under Ground Water

- With the installation of GEMS software, at the State Data Centre the operationalisation of the ground water dedicated software has been started.
- The transfer of data from GWDES has been done and the preliminary integration of the GEMS is on.
- Two TOTs were sponsored at Faridabad.

- Local training in I.T. covering all the modules have been imparted by CDAC
- The implementation of hardware and software package is undertaken by the SWD. Now the combined Data storage is done by the GWD in the State Data Centre.

5.54 The project implementation in Kerala has achieved sufficient progress towards project objectives in terms of improving the organisational arrangements, institutional and technical capabilities and physical facilities for measurement, validation, collation, analysis, transfer and dissemination of hydrological, hydro meteorological water quality data and for basic water resources development. Though sufficient progress has been achieved much headway could not be made in the dissemination and use of hydrological data by surface water component. There is a forward movement in data dissemination and use in ground water component and hence the donor agency in their implementation progress rating, has rated Ground Water component as 'satisfactory'.

5.55 Under NHP, sophisticated equipments like AWLRs (45), DWLRs (304), equipments for Level I & II labs, 53 computer packages and other modern equipments for the processing of data were supplied.

Also 59 meteorological stations, 33 Automatic rain gauge (ARG) & 106 Standard rain gauges (SRGs) are functioning under the project. Arrangements for the O&M of the equipments and stations are to be made in the post project period. Hence a proposal for the post project period has been prepared by the department and has forwarded to GOI. The proposal was mainly prepared for continuance of the project as NHP II.

Irrigation Status

5.56 The source-wise and crop-wise area irrigated as on March 2002 is given Tables: 5.6 and 5.7

5.57 As per the assessment of the Directorate of Economics and Statistics the net irrigated area in the state as on 3/03, was 3.93 lakh ha. and the gross area irrigated is 4.47 lakh ha. Only 17.83 per cent of the net cropped area is under irrigation. The major source of irrigation is wells, which contribute 30 per cent followed by government canals 25.5 per cent, tanks 17.04 per cent and private canals 1.01 per cent. In the source wise irrigation, the contribution of private wells predominates. The area benefitted by lift irrigation schemes comes to 0.27 lakh hectares

5.58 Among the crops, paddy continued to be the ma-

Table 5.6
Net Area Irrigated (Source wise)

(in Ha.)

Sl. No.	Source	1990-91	1995-96	1998-99	1999-00	2000-01	2001-02	2002-03 *
1	2	3	4	5	6	7	8	9
1	Government canals	104265	103136	94643	81231	100926	95270	101139
2	Private canals	3691	3681	2482	4803	4041	4413	4272
3	Tanks	48952	49213	47532	52932	49972	49945	66729
4	Wells	65678	73137	107213	121605	115703	86297	117490
5	Other sources	110783	113026	122639	119472	110399	110788	103541
6	Total	333369	342193	374509	380043	381041	377162	393171
7	Area irrigated more than once in a year	51282	123311	46335	90655	76824	55055	
8	Gross irrigated area	384651	465504	420844	470698	457865	432217	447490
9	Net area irrigated to net area Sown(%)		15.11	16.58	16.97	17.27	17.2	17.83
10	Gross irrigated area to gross cropped area (%)		15.18	14.43	15.68	15.15	14.44	14.77
11	Irrigated area under paddy to total irrigated area	58%	49	47	44.21	45.44	42.57	41.16

*Provisional

Source: Directorate of Economics & Statistics

Table 5.7
Gross Area Irrigated (Crop-wise) (in Ha.)

Sl. No	Crops	1990-91	1995-96	1998-99	1999-00	2000-01	2001-02	2002-03 *
1	Paddy	225063	234409	196927	208790	208047	183992	183703
2	Tubers	885	954	887	931	979	972	1008
3	Vegetables	5766	7428	7049	7813	8529	8972	9786
4	Coconut	104889	164518	152917	169894	165957	158050	163550
5	Arecanut	20208	25544	26798	32115	30501	31467	34205
6	Nutmeg/clove	828	1459	1804	2407	2466	2170	2948
7	Other Spices and condiments	1361	2942	2824	2967	3074	3109	3212
8	Banana	10557	10737	11735	18792	19448	24372	29209
9	Betel leaves	908	931	881	1024	990	944	990
10	Sugarcane	2180	3844	6160	5780	3367	3267	3426
11	Others	11916	12738	12826	20185	14507	14569	15373
Total		384561	465504	420844	470698	457865	432217	447490

*Provisional

Source: Directorate of Economics & Statistics

major crop supported by irrigation. It accounted for about 39 per cent followed by coconut (36%) arecanut (8%) banana (6%) and vegetables (2.2%). Though rice is the major crop supported by irrigation, it could only support 59 per cent of the total area under the crop. Similarly irrigation could be provided to 18 per cent of the total area under coconut, 37 per cent of the area under arecanut and 56 per cent of the area under banana. Compared to last year the area irrigated under all crops has been increased. Even though an increase of 4 per cent has been recorded in the gross irrigated area, a slight decrease (0.11%) is noted in the area irrigated under Paddy. This may be due to the reduction of area under rice and the change in the cropping pattern from more water demanding crops to less water demanding crops.

Minor Irrigation

5.59 Kerala has a wide network of rivers and rivulets and springs spread over the entire cropped area. Minor irrigation sector received considerable boost during the Ninth Plan period consequent to the enhanced flow of funds from the grant in aid of the local bodies as well as on account of special support received from the external agencies like European Economic Community, Dutch Government, assistance under RIDF of NABARD. With the introduction of decentralised planning, all minor irrigation works (having cultivable command area up to 2000 ha.) were vested with the Panchayat Raj Institutions (PRIs). But by the enact-

ment of the new Act 'Kerala Irrigation and Water Management Act' the definition of minor irrigation has been changed and that the works benefiting an area less than 15 ha. only comes under the category of minor irrigation and is vested with PRIs. All other works having cultivable command area greater than 15 ha. has been taken over by the Water Resources Department as medium irrigation. The major works implemented under surface water are minor irrigation Class - I & II and Lift irrigations schemes. Construction of check dams, Vented cross bars, weirs, tanks etc are the various works executed under minor irrigation Class-I & II.

5.60 During the year under review (2002-03) the Department has invested Rs.14.43 crores for implementing surface water minor irrigation schemes. The additional area reported to be brought under irrigation during 2002-03 was 3479 ha. Compared to the last year a slight increase (20%) is noted in the achievement.

5.61 In the ninth Plan period local governments tended to go in for structures for drainage and for land protection. Now to wean the local governments from this unproductive practice, farmer involvement is mandated. 20 per cent of the capital cost has to be paid by the benefited farmers in cash and the entire O&M is their responsibility.

Local Water Resources

5.62 Local water resource development and management would be an important element of the strategy of meeting the water needs of the future particularly in water-scarce regions. There is a need to lay emphasis on local water planning, water harvesting at micro level and integrated water shed development.

5.63 Among the traditional water harvesting system, the prominent ones are Khadins in Rajasthan, Haveli system in Madhya Pradesh, Guhl in Himachal Pradesh and Utter Pradesh, Ahar in Bihar, Churams of North Kerala etc. The Pani panchayats in Maharashtra, Phad system in Western Maharashtra and Traditional irrigation institutions in Tamil Nadu are good examples of revival of traditional institutions and methods. In Pani panchayat, which is an integrated scheme of management of water, land and cropping patterns, 20 per cent of the total cost of the development is shared by beneficiaries, 30 per cent from the village management institutions (Grama Gaurav Pratistan) and 50 per cent is the government subsidy.

5.64 Renovation of local water resources in the State must start with a clear recognition of the fact that it is beyond the ability of government to undertake the repair and maintenance of all structures. Years of disrepair and lack of proactive management have hit the overall productivity and efficiency of local water harvesting structures. The strategy of water shed development has to be popularised further which will effectively contribute to the revival of local level traditional water harvesting structures. Micro watershed development provides a medium for revival and integration of local water resources. Action research could be initiated in the state in the first phase to rehabilitate the local water resource structures in a participatory mode. A Master Plan needs to be prepared for the revival and rehabilitation of local water resources in the state.

Ground Water Development

5.65 The contribution of ground water in the total irrigation potential of the country has been estimated as 47 per cent. Although ground water is annually replenishable resource, its availability is non-uniform in space and time. Hence, precise estimation of ground water resource and irrigation potential is a pre-requisite for planning its development. The scientific assessment of the ground water resources of India has been made by the Central Ground Water Board in col-

laboration with concerned State Departments in 1997. Total ground water resource of the country has been estimated at 432 BCM. The availability of renewable ground water resource for irrigation has been computed at 360.9 BCM. Stage of ground water development in the country is about 32%.

5.66 In Kerala, groundwater occurs under phreatic, semi-confined and confined conditions. The groundwater resources are largely concentrated in the sedimentary aquifers of the coastal regions. The groundwater resources are tapped mainly for drinking and irrigation purposes. The state has a replenishable groundwater resource of 6840 million cubic meters. The net groundwater availability is 6229 million cubic meters. The gross groundwater draft is 2693 million cubic meters and the net groundwater available for future use is 3536 million cubic meters.

5.67 A district-wise analysis of ground water resources of Kerala shows that Palakkad has the higher potential for ground water recharge (12%) followed by Thrissur (11%), Ernakulam (9%), Kannur (8%), Kottayam (7%) and Alleppey (6.8%). Thiruvananthapuram has the lowest (4%) potential for ground water recharge. The stage of development of groundwater is the highest in Kasargod district (71%) and the lowest is in Wayanad (22%). The overall stage of development in the State is 43%. The ground water resources of Kerala as on 31.3.1999 is given in Appendix.5.4.

5.68 Monitoring and preservation of groundwater is an important aspect, which requires serious attention. The factors like over exploitation of groundwater, the deep infiltration of surface water from irrigated fields using chemical fertilizers and pesticides, infiltration of saline soils, effluents from industries affect the quality of ground water.

5.69 Artificial recharge and rainwater harvesting are the best-suited and cheapest methods to overcome this situation. The sources of pollution have to be properly surveyed and identified. The Central Ground Water Board's Pollution Cell has undertaken studies to find out the ways and means to check the effect and spreading of pollution.

5.70 As per the latest groundwater estimation carried out by the Central Groundwater Board, Government of India and Groundwater Department, Government

of Kerala based on Groundwater Estimation Committee norms (1997), 15 blocks of the State fall under overexploited, critical and semi critical categories and 33 blocks show more than 70% development. Blocks were categorised based on the stage of development and long term trend of groundwater levels during pre and post Monsoon seasons. The details of the groundwater resources of the State and list of blocks in overexploited, critical and semi critical categories are given in Tables 5.8 & 5.9 respectively.

Table 5.8:
Ground Water Resources of Kerala

Total replenishable Ground water resource	6840 MCM
Net ground water potential	6229 MCM
Gross ground water draft	2693 MCM
Net ground water availability for future irrigation	3221 MCM
Overall stage of development - State	43%

Source : Water Resources Department (GWD)

Table 5.9
Details of Over-exploited, Critical and Semi-critical Blocks in Kerala

Sl. No.	Category	Block	District
1	Over exploited	Chirayinkil	Thiruvananthapuram
2		Kasaragod	Kasaragod
3		Kodungallur	Thrissur
4	Critical	Tellichery	Kannur
5		Parassala	Thiruvananthapuram
6		Adiyannur	Thiruvananthapuram
7		Mukhathala	Kollam
8		Anchalamoodu	Kollam
9		Balusseri	Calicut
10	Semi Critical	Pampaguda	Ernakulam
11		Paravur	Ernakulam
12		Mulenthuruthi	Ernakulam
13		Mala	Thrissur
14		Calicut	Calicut
15		Nemom	Thiruvananthapuram

5.71 The systematic approach to the management of ground water requires a sustainable legal frame work. Government of India has also pointed out the necessity of legislation by the State Governments for the regulation of ground water exploitation. In this circumstance, in order to regulate the over exploitation of groundwater resources Government of Kerala have brought in a law The Kerala Ground Water (Control and Regulation) Act 2002 which envisages conservation of ground water and regulation and control of its use.

5.72 The Act is to be implemented by an authority named 'State Ground Water Authority' consisting of 13 members and the Secretary (WRD) as the Chairman and Director, GWD as the Secretary. The salient features of the Kerala Ground Water (Control and Regulation) Act, 2002 are given in BOX: 5.6.

5.73 The Central Ground Water Board has prepared a master plan for artificial recharge to ground water in India in February 2002. The master plan gives a brief outline on the artificial recharge structures that can be implemented in Kerala. The areas of priority for artificial recharge are the over exploited, critical and semi critical blocks. Based on our analysis of the water level trends and physiographic features, areas for artificial recharge has been demarcated. Areas identified for artificial recharge structure fall in 15 out of the 44 watersheds, covering an area of 4650 sq. km. The details of the schemes are given in Table 5.10

Box -5.6

• KERALA GROUNDWATER (CONTROL AND REGULATION) ACT 2002

Salient Features

- Formation of a State Ground Water Authority
- Notifying areas for the Control and Regulation of groundwater Development.
- Grant or permit to extract and use groundwater.
- Registration of the existing wells of the notified area.
- Registration of user of groundwater.
- Protection of public drinking water sources.
- Power to make changes to the conditions in the permit or certificate of registration.
- Cancellation of permit or certificate of registration.

Table 5.10.
Artificial Recharge to Ground Water by Suitable Principal Recharge Schemes using Surface Water Resources.

Sl. No	Name of Basin	Volume of surface water considered for planning artificial recharge to ground water	Check dams (Average gross capacity - 0.1MCM)		Subsurface dykes (Average gross capacity 0.03 MCM)		Gully plugs (Average gross capacity (0.02 MCM.))		Nalah bunding (Average gross capacity 0.02 MCM)	
			MCM	Nos.	MCM	Nos.	MCM	Nos.	MCM	Nos.
1	Neyyar	115	46	460	23	766	23	1150	23	1150
2	Karamana	136	54.4	544	27.2	906	27.2	1360	27.2	1360
3	Vamanapuram	95	38	380	19	633	19	950	19	950
4	Ithkikara	77	30.8	308	15.4	513	15.4	770	15.4	770
5	Kallada	82	32.8	328	16.4	546	16.4	820	16.4	820
6	Karuvannur	22	8.8	88	4.4	146	4.4	220	4.4	220
7	Ponnani	29	11.6	116	5.8	193	5.8	290	5.8	290
8	Bhavani	74	29.6	296	14.8	493	14.8	740	14.8	740
9	Kadalundi	134	53.6	536	26.8	893	26.8	1340	26.8	1340
10	Kabini	70	28	280	14	466	14	700	14	700
11	Valapatanam	39	15.6	150	7.8	260	7.8	390	7.8	390
12	Kuppam	15	6	60	3	100	3	150	3	150
13	Kariangode	39	15.6	156	7.6	260	7.8	390	7.8	390
14	Chandragiri	84	33.6	336	16.8	560	16.8	840	16.8	840
15	Shiriyia	67	26.8	268	13.4	446	13.4	670	13.4	670
Total		1078	431.2	4312	215.4	7181	215.6	10780	215.4	10780

Source: Master Plan for Artificial Recharge to Ground Water in India, CGWB

5.74 The main recharge structures identified for artificial recharge to ground water are checkdams, subsurface dykes, gully plugs and nalah bundings. About 1078 MCM of subsurface water is considered for planning artificial recharge to ground water. Based on field situation it has been considered that 40 per cent storage (431.2 mcm) would be through checkdams, 20 per cent (215.4) mcm through subsurface dams, 20 per cent (215.4 mcm) would be through gully plugging and 20 per cent (215.4 mcm) would be through nallah bunds. Hence in the masterplan, it is envisaged to construct 4312 checkdams, 7181 subsurface dykes, 10780 gully plugs and 10780 nalah bundings. In Kerala, with the technical and financial support of CGWB, constructed 11 subsurface dykes.

5.75 The State Ground Water Department is the nodal agency assigned with the responsibility of ground water development and utilisation. The main activities of GWD is to locate potential ground water resources for construction of ground water structures like open wells,

bore-wells, tube wells and artificial structures like subsurface dykes and check dams. Technical guidance were given to local bodies for siting and construction of drilled wells and for the implementation of rainwater harvesting.

5.76 During the period under report (2002-03), an amount of Rs.26.68 crores has been invested for minor irrigation out of which the share of ground water development was Rs.11.68 crores ie. 44 per cent.

5.77 During 2002-03 the Department has imparted technical assistance to identify sites for 850 open wells, 3058 drilled wells and constructed 510 drilled wells. The additional area reported to be brought under irrigation was 1010 ha. Training was imparted to 108 personnel and analysed 2160 water samples, prepared 5 Ground water prospect maps from satellite imagery of Kerala under Rajiv Gandhi National Drinking Water Mission and developed new methodology for the detection of Fluoride content in drinking water, with

the assistance of CCCM of BARC, Hyderabad. With the help of the National Hydrology Project, the labs in the Department has been upgraded and water quality analysis were done for various institutes like Department of Surgery, Medical College, Thiruvananthapuram, (influence of well water consumed of Calcium Oxide nephrolithiasis), Pollution Control Board (effects of industrial waste on ground water for the major industries of Kerala like Trivandrum Titanium Products, Kerala Minerals and Metals and Cocoa Cola factory at Palakkad) and Vilappil Sala garbage processing factory etc. The details of physical achievement are given in Appendix: 5.5

Flood Management

5.78 Floods have been occurring frequently causing devastating damages to life and property. The high intensity of rains over a short spell of time combined with undulating terrain make the State highly prone to floods.

5.79 The flash flood occurs mostly in the Northeast Monsoon. The flood control measures operated in our State are more of a relief work for the affected areas. Even though a new approach for management for flood proofing after identifying the prone areas through basin wise studies were suggested during Ninth Plan period, it has not materialized.

5.80 Flood proofing and identifying the flood prone areas are more important in managing the flood. Basin wise studies are necessary for finding out the causes of occurrence, intensity, duration etc. of flood. A basin wise study has been initiated by the WRD in collaboration with KSREC, State Land use Board to find out the causes and intensity of flood. The study has been initiated in 3 basins viz., Neyyar, Pamba and Achancoil which are vulnerable to flood. The study in Neyyar basin has been completed and that in other basins are progressing. Traditional ways of construction of retaining walls, embankments, lay out of field channels etc. are followed even now for flood protection.

5.81 At the State level an amount of Rs 4.15 crores has been spent for protection of an area of 1061 ha. of land from the ravages of flood. The cumulative area brought under flood control was 58690 ha. as on 3/2003.

Coastal zone Management

5.82 Coastal erosion is a serious problem affecting the

sea coast of Kerala. Kerala has a long coastal stretch of 590 kms. and more than half of it is subjected to sea erosion. Unlike other parts in the country, Kerala sea-coast is thickly populated and as a result the loss due to sea erosion is relatively very high. The Centre for Earth Science Studies had conducted a study to identify economically important stretches of the coast from Thiruvananthapuram to Trichur districts. Field data covering the details of tourism location, mining, fisheries and industries in the coastal zone were collected and digitization of map in 1:12,500 scale has been prepared. Another study was also initiated to identify and map the coastal areas prone to erosion, siltation, bar formation, reclamation, salinity intrusion, pollution and other forms of degradation in the study area and suggest management options for the integrated management of those coastal areas. Detailed field data was collected between Kollamcode to Ponnani during September 2001 and March 2002. Beach profile, measurements, shoreline change monitoring and evaluation of the condition of the seawall were completed. Secondary data on pollution in the study area was compiled. Digitization of the maps was completed and final project report is under preparation.

5.83 Construction of sea walls continued to be the sole intervention for coastal zone protection. In the area of sea wall construction and protection, modern technologies like geo textiles, polyethylene fabrics/sheets, nourishment of foreshore with biomaterials, etc. are emerging. During 2002-03 an amount of Rs.998.05 lakh has been spent to construct 1.64 km. of new sea wall and for reformation works in 1.05 km. Out of the total coastal stretch of 590 kms, about 384.03 Kms were protected by constructing new sea walls and reformed 112.179 Km. of old sea walls spending an amount of Rs. 268.82 crores upto 31.3.2003. The Eleventh Finance Commission has provided Rs.50.00 crores for anti sea erosion works for constructing 15.89 km of new seawall and reformation of 20.14 km. for the period 2000-05. Out of this, 5.54 km of new sea wall were constructed and 13.629 km. of old sea walls were reformed as on 31.03.2003 spending Rs.13.06 crores. The physical and financial achievement under flood management and coastal zone management during 2002-03 are given in Table-5.11.

Command Area Development

5.84 The Command Area Development Programme

Table: 5.11
Financial and Physical Progress of Flood Management and Coastal Zone
Management Programmes during 2002-03
(Rs. In lakhs)

Sl. No	Item	Financial Achievement	Physical Achievement	Cumulative Physical achievement as on 3/2003
1	Flood Management	435.40	1061 ha.	58690 ha.
2	Anti-Sea Erosion Works			
	New sea-wall constructed	998.05	1.64 km.	384.03 km.
	Reformation of old & damaged sea-wall		1.05 km.	112.79 km

Source: Water Resources Department

was launched with the main objective of improving the utilisation of the irrigation potential created for optimising agricultural production and productivity from the irrigated areas by integrating various activities related to irrigated agriculture.

5.85 The main activities of Command Area Development Authority include construction of field channels, field drains, enforcement of warabandhi and reclamation of water logged areas. The Command Area Development (CAD) activities were carried out in the 16 completed irrigation projects, namely Malampuzha, Mangalam, Pothundy, Walayar, Cheerakuzhy, Vazhani, Peechi, Chalakudy, Neyyar, Gayathri, Pamba, Periyarvalley, Chithurpuzha, Kuttiyadi, Pazhassi and Kanhirapuzha with a total ayacut of 2.03 lakh ha. Agricultural activities like large scale demonstrations, adaptive trials, training to farmers, soil conservation, land leveling and shaping and formation of beneficiary activities are nearing completion in the first 12 projects. Government of India has decided to withdraw the central assistance of the Command Area Development Programme except reclamation scheme in the 12 projects with effect from 31.03-2003.

5.86 In the first generation of projects beneficiary farmers were expected to take up the construction and maintenance of field channels and water distribution below the sluice level. Beneficiary participation in almost all the projects was inadequate. Active and sustained beneficiary participation in construction, management and

maintenance came to be ensured in all the second generation projects. Though CADA has been introduced beneficiary participation is found to be poor in India as a whole. In this respect Kerala has been behind the all India performance level. A study has been conducted in Malampuzha Project to find out the causes for the failure of the Beneficiary Farmers Associations and the measures to be taken up and reforming them. The findings of study and the measures suggested to reform them are given in BOX 5.7 .

5.87 The performance of the implementation of Command Area Development Programmes during 2002-03 was not at all encouraging. The achievement recorded during 2002-03, include construction of field channels in 776 ha; drains to benefit 15580 ha; constructed warabandhies to benefit 678 ha. conducted large scale demonstration in 8045 ha; adaptive trials in 635 ha; 298 training programmes, bench mark and evaluation studies in 1167 ha. The work on reclamation of water logged areas were done in 3462 ha. disbursed subsidies to 456 small and marginal farmers; conducted detailed survey in 1320 ha., yield estimation survey on principal crops in 1111 ha. and four evaluation reports were also published. The physical and financial achievement is given in Appendix.5. The cumulative achievement of the main activities of CAD programmes of all projects are represented in Fig.5.3

Box -5.7

The Findings of Study and the Measures Suggested to Reforming BFAs

Findings: -

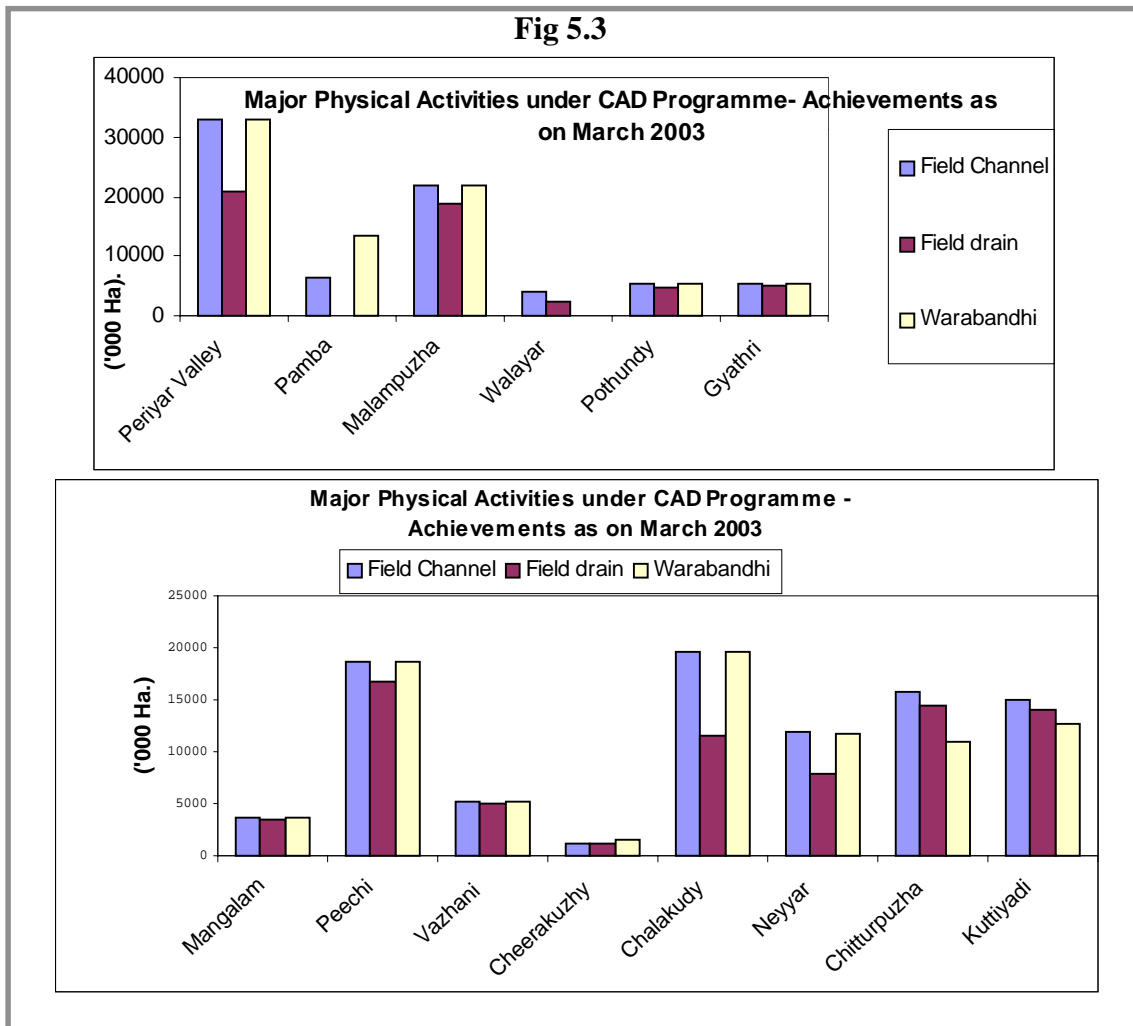
- BFAs collect and disburse the subsidies to farmers and other items of assistance but did not take any initiative in organising any other activity of the farmers.
- BFAs are not maintaining linkages with Government.
- Resolution of conflicts, attending Canal Committee meetings, disseminating the decisions of Canal Committee to BFA members, providing seed and seedlings, fertilizers and agricultural implements were performed only partially.

Measures suggested to reforming the BFAs: -

- Successful awareness creation among ordinary members of the Association.
- Economic and moral incentives to BFAs on the basis of performance.
- BFAs may be given a seed money to take up civil works under adequate safeguard.
- Simplification of procedure to avoid delays in the formation and working of BFAs.
- BFAs leadership should be assigned some powers in their selection and appointment as well as given supervisory powers in their everyday functioning.
- Proper legislation empowering BFAs legally must precede the earmarking of the source of funds to them.
- The scope of participation of BFAs may be confirmed to maintenance of canals in the first instance.
- The beneficiaries may be made to bear a part of the cost of maintenance of the project.
- BFAs may be made legally powerful and financially viable and strengthened with competent office bearers to function the BFAs properly.

Source: KRPLLD, 2002

Fig 5.3



Drinking Water Supply

5.88 In Kerala, piped water is provided to 204 lakh people which comes to around 64% of the population on July, 2003. Out of these, 138 lakhs (68%) are rural and 65.6 lakhs (32%) are urban people. It shows that 59% rural people and 79% urban people are covered under piped drinking water. Piped water coverage of total population varies from a high of 89.5% in Ernakulam to a low of 46.6% in Kozhikode district. Similarly the coverage under rural population also varies from a high of 90.5% in Ernakulam district to a low of 33% in Kozhikode district. With regard to urban population, highest coverage is in Kottayam district (97.6%) and lowest is in Wayanad district (50%). District wise rural-urban piped water coverage is shown in Appendix-5.9

5.89 During the last decade (1993-03) piped water has been provided to an additional population of 54.98 lakh. Out of these 8 lakhs belongs to SCs and 0.97 lakh to STs. According to a survey carried out for the Rajiv Gandhi National Drinking Water Mission, in Kerala, there are 9776 habitats. Out of these habitats by 2003 April, 2091 habitats (21.4%) have been fully covered with piped water and 7444 (76%) have been partially covered. Non covered habitats are 228. In 1788, habitats drinking water provided is below 10 lpcd whereas in 2091 habitats above 40 lpcd is provided.

5.90 Kerala Water Authority implement different category of water supply schemes like State Plan, Accelerated Rural Water Supply Programme, Accelerated Urban Water Supply Programme, Technology Mission, Rain Water harvesting etc.

Accelerated Rural Water Supply Programme (ARWSP)

5.91 Under Accelerated Rural Water Supply Programme, as on 31-3-2003, 519 schemes have been sanctioned and out of these 386 schemes have been commissioned. 121 schemes are ongoing and 12 schemes have not been taken up due to land problem/source failure. As on 31-3-2003, an amount of Rs. 24250 lakhs has been spent. Under Accelerated Rural Water Supply Scheme, the schemes are designed with a per capita demand of 40 lpcd.

5.92 Under Accelerated Urban Water Supply programme, six schemes are under implementation. Un-

der Technology Mission, Water Supply Schemes are implemented in water quality affected areas. 10 such schemes have been sanctioned with 50%/75% central assistance. Out of these one has been completed and 9 schemes are under different stages of implementation. Water supply schemes are also taken up in rural schools with 50% central assistance under ARWSP. Out of 355 schools taken under the scheme during 2002-03, 86 schools have been provided with water supply. During 2001-02 water supply was provided to 166 schools.

Rain Water Harvesting

5.93 During 2002-03, 623 units in 30 panchayats were sanctioned at a cost of Rs. 299.36 lakhs in 4 districts. 221 units have been completed and others are under different stages of implementation.

Issues under ARWSP

5.94 Under ARWSP, there are several issues starting from the identification of the project till the completion of the project. 100% assistance is provided under ARWSP. But under drinking water supply schemes in rural schools, only 50% of the cost is shared by Government of India. Water Supply Scheme under ARWSP has to be completed within the estimated cost and within the stipulated time to avoid cost over run. However, majority of the schemes are not completed in time which cause cost over run. The excess amount has to be met by the State Government for the completion of schemes taken up under ARWSP.

5.95 Kerala Water Authority could not avail the full grant for Water Supply Schemes from Government of India, during 2000-03 (3 years) due to inadequate project expenditure. Government of India grant is released in advance and based on its utilisation further releases are made. When expenditure falls short of the released amount, the shortage is disallowed from future releases. During 2000-03, disallowance from Government of India grant for ARWSP was Rs. 3687 lakhs (Rs.602+1286+1799 lakhs).

LIC Aided Schemes

5.96 Kerala Water Authority has been implementing rural and urban water supply schemes with LIC loan since 1967-68. An amount of Rs. 319.57 crore has so far been received as LIC loan for water supply and 278 schemes have so far been completed with LIC assistance. There are now 80 rural water supply schemes and 41 urban water supply

schemes under different stages of implementation with LIC loan. Out of these 27 schemes were sanctioned during 2003 March. During 2002-03 Rs. 50 crore has been received from LIC. Outstanding loan to LIC as on 9/2003 is Rs. 231.05 crore.

HUDCO Aided Schemes

5.97 HUDCO has provided loan for 18 urban water supply schemes so far and out of these, 13 schemes have been commissioned. Total loan sanctioned for these 18 schemes was Rs. 157.27 crores and Rs. 119.71 crore has been released. During 2002-03, only Rs. 29 lakh has been received from HUDCO. Total loan outstanding with HUDCO for water supply schemes as on 9/2003 is Rs. 59.87 crore.

Production, Distribution and Leakage of Pipe Water

5.98 Production of water during 2003 was 1260 to 1360 million litres per day against the capacity of 1720 to 1820 million litres per day. This shows that only 73% to 75% capacity is utilized. Out of the water produced water supplied was only 756 to 856 million litres per day which indicates that water supplied is only 60 to 63% of water produced. This shows that unaccounted for water is 37 to 40%. During 2002, unaccounted for water was only 17 to 22% of production. It shows that the leakage of water was at higher rate during 2003 compared to previous years. Table 5.12 shows production and supply of piped water in Kerala.

5.99 Distribution loss is due to very old pipes and lack of maintenance as well as unauthorised connections. Several Water Supply Schemes commissioned years ago requires replacement of pipe lines, pumps and motors, improvements to treatment plant and electrical installations. But this requires significant investment. Therefore thrust has to be given for rehabilitat-

ing old rural water supply schemes and for time bound metering of all connections to reduce distribution loss to the minimum.

Ongoing Water Supply Schemes

5.100 There are 1655 Water Supply Schemes under different stages of implementation. Out of these ongoing schemes, 1558 are under rural water supply schemes and 54 are under urban water supply schemes. Within the rural water supply schemes, 811 are under ARWSP and 349 are under State Plan and 72 are LIC aided. Similarly under urban water supply schemes 17 are under State plan and 34 are LIC/HUDCO aided. Table 5.13 shows category-wise ongoing water supply schemes in Kerala. District-wise and category-wise details are given in Appendix-5.10

TABLE – 5.13
Category-wise ongoing Water supply Schemes

Sl. No.	Ongoing Water Supply Schemes	Numbers
1	2	3
	Rural Water Supply Schemes	
1	Accelerated Rural Water Supply Schemes	811
2	Technology Mission	10
3	PMGY	316
4	State Plan	349
5	LIC Aided	72
	Sub Total	1558
	Urban Water Supply Schemes	
1	Accelerated Urban Water Supply Schemes	3
2	State Plan	17
3	LIC/Hudco Aided	34
	Sub Total	54
	Others	43
	Grand Total	1655

TABLE – 5.12
Production Distribution and Leakage of pipe water

Year	Capacity (MLD)	Production (MLD)	Distribution (MLD)	Unaccounted for water (% to production)
1999	--	1030-1050	770-800	25-30
2000	--	1030-1050	770-800	25-30
2001	1200-1300	NA	1000-1100	20-25
2002	1700-1800	NA	1400-1500	17-22
2003	1720-1820	1260-1360	756-856	37-40

Water Supply Schemes in Operation

5.101 There are 1916 water supply schemes in operation by the end of March 2003. During 2002-03, 15 water supply schemes were completed and out of it 2 were urban water supply schemes and 13 were rural water supply schemes. Table -5.14 shows the number of water supply schemes in operation by the end of March 2003. District-wise details of water supply schemes in operation are given in Appendix-5.11.

TABLE - 5.14
Water Supply Schemes in operation

Sl. No.	Category	Schemes in operation		
		As on 31-3-02	Completed during 2002-03	Total as on 31-3-03
1	Urban	56	2	58
2	Rural	1845	13	1858
	Total	1901	15	1916

Service Connections and street Taps

5.102 Kerala Water Authority has given 8.71 lakh service connections by 1-4-2003 as against 8.51 lakhs on 1-4-2002. Out of the total service connections, 8.04 lakhs (92.3%) are domestic and 0.66 lakhs (7.6%) are non-domestic. Similarly service connections are provided to 1.72 lakh street taps and out of it 1.28 lakhs (74.4%) are rural and 0.44 lakhs (25.6%) are urban. In other words, out of total service connections, 1.72 lakhs (16.5%) are street taps. Table 5.15 shows category wise service connections. District-wise details of service connections and street taps are given in Appendix-5.12.

TABLE - 5.15
Service Connections and street tap connections as on 1-4-2003

Category	Number
Service Connections	
Domestic	803706
Non-Domestic	66323
Industrial	1208
Sub Total	871237
Street Taps	
Rural	128297
Urban	44084
Sub Total	172381
Grand Total	1043618

Water Tariff and Revenue

5.103 Water Tariff rate in Kerala was revised last on April 1999. Consumers are classified into four categories (i) domestic, (ii) non-domestic, (iii) industrial and (iv) local bodies. Cost of production of water is given in Table -5.16. The existing water tariff rate in Kerala from 1st April 1999 is shown in Appendix-5.13.

5.104 Total revenue collected from water charges during 2002-03 is Rs. 105.8 crore as against Rs. 95.4 crore during 2001-02. Out of the total revenue from water charges during 2002-03, 27% was from street taps and 73% was from other categories. Similarly out of the total revenue from water charges, revenue from urban schemes amounted to Rs.68 crores (64.5%) and Rs. 37.6 crores (35.5%) from rural schemes. Details of revenue collected from water charges from 1998-99 to 2002-03 are given in Appendix-5.14

Arrears of Water Charges

5.105 Total arrears of water charge amounts to Rs. 320.3 crores by the end of March 2003. Out of the total arrears, 25% are from non-domestic consumers and 57% (Rs.184.61 crore) are said to be from local governments. Arrears from Grama Panchayats is Rs. 88.18 crore (27.5%) from Municipalities Rs. 51.13 crore (16%) and from Corporations Rs.45.3 crores (14%). Table 5.17 shows, category wise arrears of water charge as on 31st March 2003.

TABLE -5.16
Summary of cost of production of Water

Particulars	For the year 2002-03	
	mly	mld
Quantity produced	470,850	1800
Quantity sold	282,510	1080
	Total (Rs. in crores)	Per KL (Rs.)
Direct Variable Cost		
Operators Salary	43.64	1.11
Power charges	78.00	1.98
Chemicals	10.85	0.28
Total Direct Variable Cost	132.49	3.36
Indirect overhead cost		
Repairs & Maintenance	20.46	0.52
Administrative Overheads	34.95	0.89
Interest & Depreciation	133.71	3.39
Total Indirect overhead cost	189.12	4.8
TOTAL	321.61	8.16

TABLE -5.17
Arrears of water charge

Sl. No.	Category	Arrear Amount (Rs. lakhs)	Percentage
1	2	3	4
1	Domestic	4782	14.9
2	Non-domestic	7962	24.8
3	Industrial	825	2.6
4	Grama Panchayat	8818	27.5
5	Municipality	5113	16.0
6	Corporation	4530	14.2
	Total	32030	100.00

Plan and non-plan expenditure

5.106 During 2002-03, total expenditure of Kerala Water Authority was Rs. 377.19 crore. Out of the total expenditure Rs. 145.6 crore (38.6%) was under plan and Rs. 231.59 crores (61.4%) was under non plan. Under plan, expenditure incurred is for implementing water supply schemes under different category of schemes like State Plan, ARWSP, LIC/HUDCO aided etc. Under non-plan, major expenditure items are salary, energy charges, interest on loan and operation and maintenance. During 2002-03 expenditure on salary was 27% of total expenditure and 44% of non plan expenditure. In other words, nearly half the cost under non plan is for salary and establishment charges against 21% for energy and 13.5% for operation and

maintenance. Interest on loan accounted for about 15% of the total non-plan expenditure in 2003 against 13.8% in 2001. Category-wise expenditure of KWA is shown in Table 5.18.

5.107 Electricity charge could not be paid regularly due to paucity of funds. As on 1-4-02, amount due as electricity charge was Rs. 56 crore and the bill for 2002-03 was Rs. 78 crore. As against it only Rs. 48.10 crore was paid. Therefore as on 31-3-03, electricity dues increased to Rs. 86 crore. In 2002-03, gap between revenue and expenditure was Rs. 117.7 crore and the non plan grant was Rs. 61.86 crore. Therefore 2002-03 ended in a deficit of Rs. 55.84 crore.

5.108 Total anticipated revenue for 2003-04 is Rs. 143.50 and anticipated revenue expenditure is Rs. 398.05 crore which shows a deficit of Rs. 254.95 crore. As against it non-plan grant for 2003-04 is Rs. 68.04 crore. In order to meet all revenue expenditure, Rs. 186 crore will have to be diverted from plan funds. The diversion of increasing amounts of plan funds (from the state government, LIC etc and Government of India) for revenue expenditure has led to an untenable position of (i) increasing number of unfinished works which are dragging on for years and have to be financed by the state government fully (ii) decreasing receipts of funds from Government of India (iii) more and more schemes 'under implementation' but little

TABLE 5.18
Plan and Non-plan Expenditure (2000-01 to 2002-03)

Sl. No.	Category	Expenditure (Rs. Crores)		
		2000-01	2001-02	2002-03
	A. Plan			
1	State Plan	57.48	39.65	51.06
2	ARWSP	43.83	42.33	43.31
3	LIC/HUDCO Aided Schemes	33.46	41.40	37.07
4	Others (AUWSP/PMGY)	--	--	14.16
	Sub Total	134.77	123.38	145.60
	B. Non-Plan			
1	Salary and Establishment	100.69	104.33	102.59
2	Power	54.91	66.00	48.09
3	Operation & Maintenance	30.68	31.34	31.31
4	Interest on Loans	34.22	35.63	35.21
5	Repayment of Loans	21.77	20.26	8.73
6	Others	5.58	5.60	5.66
	Sub Total	247.85	263.16	231.59
	Grand Total	382.62	386.54	377.19

addition to water supply. Receipts of Kerala Water Authority from various sources from 1998-99 to 2002-03 are given in Appendix-5.15

JBIC Aided Water Supply Project

5.109 Agreement was executed with JBIC in 1997 by Kerala Water Authority to take up five major Water Supply Schemes under Kerala Water Supply Project at an estimated cost of Rs. 1787.45 crores. Implementation started only in September 2003. The project comprises of augmentation and rehabilitation of Water Supply Systems of two urban regions viz. Thiruvananthapuram and Kozhikode and construction of Water Supply systems of three rural regions viz. Meenad and adjoining villages (Kollam Dist.). Pattuvam and adjoining villages (Kannur Dist.) and Cherthala and adjoining villages (Alappuzha dist.). The project when completed will benefit 43 lakh people in 2021. The project is proposed to be completed by 2006-07. Details of estimated cost of the project and estimated loan component are given in Table 5.19.

5.110 The consultancy agreement has been executed on 4-8-2003 and consultancy contract came into effect from 7-8-2003. The Consultants have commenced the consultancy services from 1-9-2003. The work on topographical survey is nearing completion. Tenders for geo-technical survey have been invited and are being finalised. Treatability studies for designing drinking water treatment process will continue till January, 2004.

Land acquisition for Meenad project has been completed and acquisition work of the other four projects are nearing completion.

5.111 The cumulative expenditure for the project as on 30-11-2003 is Rs. 2132 lakhs and the anticipated expenditure for 2003-04 is Rs. 516 lakhs.

Modernisation and Computerisation of Kerala Water Authority

5.112 Kerala Water Authority has started computerisation and modernisation in phases. In the first phase, computer has been procured for Head Office, Regional Offices, 10 Circle Offices and 7 IPD Offices. In the second phase, emphasis is on the procurement of software and hardware and network implementation. Sanction has been obtained for phase II for Rs. 164 lakhs. Computerisation up to the sub division level is to be taken up at an estimated cost of Rs. 272 lakhs. It is also decided to introduce e-governance by building up a network infrastructure in head office connected to subordinate offices. Network components have been procured. Similarly it has been decided to develop and implement Management Information System. Project Management System and Material Management System are proposed to be implemented during 2004-05.

5.113 Computerised billing and collecting system has been introduced in major revenue centres (27 sites) and about 60% of 8 lakh consumers are covered by the

TABLE 5.19
Details of estimated cost of the project and estimated loan component

Sl.No.	Item	Estimated cost (Rs. Crores)	Loan portion (Rs. crores)
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
1	a. Thiruvananthapuram	215.12	199.47
2	b. Meenad	175.96	162.87
3	c. Cherthala	231.37	215.39
4	d. Kozhikode	430.59	410.20
5	e. Pattuvam	195.31	184.37
	Sub Total	1248.35	1172.30
6	Institutional Strengthening	34.18	34.18
7	Contingencies	128.25	128.25
8	Consultancy	100.01	100.01
9	Interest during Construction	84.64	84.64
10	Land Acquisition	19.86	--
11	Administration Charges	98.76	--
12	Taxes & Duties	73.40	--
	Grand Total	1787.45	1519.38

system in 4 Corporations and 8 municipalities. Computerization in other towns is proposed to be completed during 2004-05. Bi-monthly billing has been implemented in 3 Corporations and it is proposed to be extended to one Corporation and 8 municipalities during 2004-05.

White Paper and MOU

5.114 The Government of Kerala constituted, a Secretaries Committee with a view to suggesting concrete measures to improve the efficiency of Kerala Water Authority and to make it financially viable based on the detailed study made by the State Planning Board. The Committee prepared a White Paper on Kerala Water Authority.

5.115 The study is one of the major efforts to recognize hard facts, identify the weaknesses and suggest urgent remedies. Unless a serious thought is given and drastic steps are taken to overcome the situation, the position would further worsen in the coming years and KWA would not be able to incur any expenditure for Capital works. The critical financial condition of Kerala Water Authority and its diminishing image warns all concerned that unless something is done, the Authority would reach a point of no return. The employees of the Authority are now conscious of the situation and are willing to support any action to reform the Authority. The reforms should therefore aim not only at reducing expenditure by cutting down some posts, but should consider a complete restructuring of the entire organization for improving systems, simplifying procedures, introducing professional management, enforcing discipline, reducing the number of offices and the best utilization of all available resources in and outside the organization.

5.116 KWA has to take all out measures to restore normalcy and to build up public image. These measures include proper selection of schemes, careful monitoring for the implementation of the schemes without cost and time over-runs, reduction of expenditure by all conceivable methods, increase revenue collection and introduce own codes and manuals. The State Government has also to take a consistent set of decisions vis-a-vis KWA. The Committee advised to have an MOU signed between the Government and the KWA laying down short term and medium term objectives for 2002-07, the monitorable targets and the relative responsibilities. The implementation of MOU has to be moni-

tored every month as in the case of KSEB.

5.117 The Government accepted the white paper and decided to initiate further action except those relating to the tariff increase, functional restructure, reduction in the number of offices and staff. Government also decided to finalize and execute an MOU with KWA, laying down monitorable targets and goals and mutual responsibility.

Jalanidhi

Kerala Rural Water Supply and Sanitation Project

5.118 The World Bank supported Kerala Rural Water Supply and Sanitation Project (Jalanidhi) is being implemented in four districts: Kozhikode, Palakkad, Malappuram and Thrissur by Kerala Rural Water Supply And Sanitation Agency (KRWSA) through village panchayats. Total outlay of the project is Rs. 451 crore and will be implemented in six years (2001-2006). Project is expected to cover three lakh households, benefiting a population of over 15 lakhs in the selected 100 village panchayats of 4 districts through 2500 piped Water Supply Schemes.

5.119 Panchayats are covered in batches of approximately 15-20 panchayats per batch and each scheme has a project cycle of 27 months, divided into four phases: 3 months for Pre-Planning Phase, 12 months for Planning Phase, 8 months for Implementation Phase and 4 months for Post-Implementation Phase.

5.120 The Beneficiary Groups (BGs) plan, implement, contract and/or construct and take full responsibility for the continuous operation and maintenance of the structures created under this project. They contribute 15% of the capital cost and mobilise the full O&M expenses. There can be 25 or more BGs in a panchayat. Grama Panchayat (GP) is the Nodal Agency for this project. They have to contribute 10% of the capital costs of the water supply schemes and have to play different roles during the lifecycle of project ranging from that of a Co-ordinator to Mediator, Arbitrator and Monitor. GoK share of the project is channelised through the Panchayat. Panchayats are selected for the project based on the need for water and sanitation, the extent of poverty and proven efficiency in managing Plan Funds.

5.121 Socio-technical support required to mobilize the community and the GP is provided by a Support Organisation (SO) usually an NGO or a CBO selected by the GP itself. District Project Management Unit is at district level with multi disciplinary team and provides all necessary operational assistance, technical or otherwise, for the GPs and the SOs.

5.122 Project also ensures (i) Domestic and Environmental Sanitation to protect quality of water (ii) sanitation and hygiene promotion activities (iii) Sustainability of source (iv) economic empowerment activities and (v) Strong Capacity Building to empower people to ensure sustainability of the project.

5.123 Jalanidhi Project is into its third year of implementation and is working with the third batch of GPs. The Project covered 5 GPs in the first batch, 25 GPs with 26 projects in the second batch and has taken up 29 GPs with 33 projects in the third batch. Four GPs in Batch II and 2 GPs in Batch III come under Tribal Development Project. Thus 64 projects have already been taken up by the third year, which is 73.03% of the target by 2006.

5.124 Till end August, 2003, the Communities have contributed Rs. 634.78 (10%) lakhs to the Project fund, the Grama Panchayats have contributed Rs. 455.57 lakhs (7.07%) and the Government of Kerala contribution has been Rs. 5350 lakhs (83.07%).

5.125 Jalanidhi project has proved the success of a participatory and community based water and sanitation service delivery paradigm. Grama Panchayats, when give necessary socio-technical support, can develop and sustain rural water and sanitation delivery systems without the overheads that accrue in a monopoly service provision scenario, stands validated.

5.126 Rural people are building 966 small water supply schemes with a paid up capital cost contribution of Rs. 634 lakhs. They are collecting Rs. 18 lakhs as operation costs for running 150 commissioned schemes for the past 36 months. Middlemen have been avoided leading to a cost saving of 20%. Average commissioning time frame for a scheme is 32 months. 35 Non-governmental organizations have positioned about 900 community engineers and social animators in the selected panchayats delivering sustainable service.

TABLE 5.20
Present status of the project

Sl. No	Activity	Target till end 2003	Batch completed		To be completed only in October 2004	Total (upto end Sep. 03)
			I	II	III	
1	2	3	4	5	6	7
1	GPs Selected	46	5	25	29	59
2	No.of projects	46	5	26	34	65
3	Implementation Phase Quad. Agreements signed	500	133	731	--	864
4	Water Supply Schemes Functional	500	119	47	--	166
5	Population Covered by Functional WSS	2,50,000	46608	9506	--	56114
6	Estimated Coverage by completion	2,50,000	61350	205777	--	267127
7	Cash Contribution Mobilised (Rs.in lakhs)					
	BG	1656	137.46	391.89	161.52	690.87
	GP	966	113.29	316.58	181.09	610.96
	GOK	11178	746.62	2160.56	65.30	2972.40
8	San. Latrines Built	8000	1441	5236	--	6677
9	Unsanitary Latrines Converted	2000	28	429	--	457

TABLE – 5.21
Target and Achievements

Sl.No.	Activity	Target (Nos.)	Achievement (Sep. 2003)
	Batch-I		
1	Water Supply Schemes	118	107
2	Rehabilitation of KWA/ GP Schemes	13	8
3	Rain Water Harvesting Units	3	24
4	Environment Management Units		
	Soak pit		
	Compost pit	419	101
	Vermi Compost pit	1808	461
	Drainage (Mtrs)	99	7
	Latrines	4710	4154
	Latrine Conversion	2012	1441
		732	28
	Batch-II		
1	BGs Registered	375	1066
2	Functional Water Supply schemes	375	47
3	Environment works		
	Drainage(Mtrs)		
	Latrine	3400	550
	Latrine Conversion	7500	5236
		1500	429

Transfer and Rehabilitation of Single Panchayat KWA schemes

5.127 Government of Kerala has taken a policy decision to transfer all single panchayat KWA schemes that are currently managed by KWA to the respective grama panchayats. Such 1050 schemes were notified for transfer during August, 1998. However only 140 schemes have been transferred by July, 2003. The reasons for slow progress of transfer are (1) Absence of a protocol for transition on roles and responsibilities during and after transition (2) Reluctance of GPs to take over and their unwillingness to maintain the schemes through collection of user charges (3) Functional status of many schemes is unsatisfactory in terms of reliability, high distribution loss, poor service level and sub optimal efficiency (4) Absence of a comprehensive financial and technical package for rehabilitation with adequate incentives and disincentives. Table 5.22 shows district wise details of single panchayat KWA schemes listed for transfer to GPs.

5.128 Subsequently during June 2002, another 43 KWA schemes were added to the list for transfer

to GPs. Thus the total number of rural single panchayat schemes listed for transfer are 1093. The listed schemes for transfer include LIC aided, ARWSP, SCP Schemes, TSP Schemes and other RWS and drought relief schemes.

Advantages of Rehabilitation

5.129 Advantages of transfer of schemes to GPs are (i) Strengthening of Decentralisation and good governance (ii) help financial and institutional restructuring of KWA, (iii) reduce fiscal burden of KWA (iv) Improve efficiency of service delivery and satisfaction of consumers and (v) improve coverage with less household capital investment.

KRWSA Model transfer of KWA Schemes

5.130 KRWSA took over 13 KWA schemes in 5 GPs in Batch I as pilot project and rehabilitated and handed over to community. Rehabilitated status of the 13 schemes are shown in Table 5.23

5.131 Similarly 77 rural single KWA schemes in 56 GPs are under different stages of rehabilitation by KRWSA

TABLE – 5.22
District-wise Details of Single Panchayat KWA Schemes (No.)

Sl. No.	Name of District	Grama Panchayats	Total Schemes	Operators	Others engaged
1	2	3	4	5	6
1	Thiruvananthapuram	60	80	135	27
2	Kollam	32	57	126	11
3	Pathanamthitta	24	33	71	10
4	Alappuzha	48	72	155	48
5	Kottayam	51	99	110	NA
6	Idukki	25	88	55	1
7	Ernakulam	41	82	96	3
8	Thrissur	54	103	115	NA
9	Palakkad	54	92	128	10
10	Malappuram	42	66	65	1
11	Kozhikode	61	105	86	NA
12	Wayanad	16	29	18	3
13	Kannur	54	90	84	17
14	Kasaragod	26	54	32	NA
	Total	588	1050	1276	131

TABLE – 5.23
RWSA Rehabilitation status of 13 KWA schemes: Batch I

Sl.No.	Item	
1	Schemes Rehabilitated (Nos.)	13
A	Pre Rehabilitation Status	
1	Service level	Unsatisfactory
2	Household connection (Nos.)	250
3	Public stand posts	548
4	Total Household	5081
B	Rehabilitation projection	
	(i) Service level	70 lpd
	(ii) Household connection	3217
	(iii) Public stand post	356
	(iv) Total Household	5407
C	Estimated Cost (Rs. lakhs)	207

Rehabilitation of Single GP KWA Scheme:

KRWSA Model: Erimayur Experience

5.132 KRWSA selected seven single panchayat rural water supply schemes in Erimayur GP in Palakkad district during November, 1999. Total cost of seven schemes was Rs. 105.56 lakhs and valuation cost in 2001 was Rs. 47.97 lakhs. Rehabilitation cost was Rs. 123.19 lakhs. Table 5.24 shows the details of pre and post rehabilitation of these 7 schemes.

5.133 The take over and rehabilitation posed serious challenges. The demand was “Free water”. Divided opinion and vicious campaign resulted in a significant fall in the number of BGs and lukewarm participation in the remaining. With tremendous pressure and as takeover is a pre condition for the GP to get project funds for other new schemes as well, the GP signed

the STM in November 2000. The GP also showed significant courage in betting its side in favour of rehabilitation. KRWSA provided additional technical support to the SO (Support Organisation) and convened a series of meetings and training to all concerned along with flow of funds for rehabilitation. Like other SO in pilot GPs, the SO, Maithri in Erimayur showed exemplary courage, team spirit and sense of purpose. But for the concerted efforts of the GP and SO, the resolution, vision and statesmanship of the GP, it would not have come to a reality.

Key issues of Rehabilitation

5.134 Key issues associated with the transfer and rehabilitation of Single Panchayat KWA schemes is given in BOX 5.8

TABLE 5.24
KWA Schemes in Erimayur GP

Sl.No.	Parameters	Pre-rehabilitation status	Post rehabilitation status
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
1	Private Connections	376	1413
2	Public stand posts	280	209
3	Service Level	40	70
4	Pumping Hours 1 day	6	10
5	Household cost (New schemes Rs.)	12000	3700
6	Household cost sharing	1800	555

Box -5.8

Transfer and Rehabilitation of Single Panchayat KWA schemes : Key Issues

Technical Issues

- Non-availability of basic details including as laid maps, land transaction details etc. with KWA.
- Unauthorized connections/privileged connections and lack of authenticated list from KWA.
- Hardware imbalance (Over design) leading to excessive O&M.
- Lack of transparent valuation norms and participatory valuation to ensure ownership while transfer.
- Methodology for disposal of items/scrap after rehabilitation is over.
- Status report/pre feasibility study to be done and only those schemes that are viable for rehabilitation need to be taken up.
- Technical un-sustainability and high unaccounted flow (UAF)

Management Issues

- TMC formation and management of large schemes.
- Continued investment/expansion programmes and fresh connection on these schemes/KWA other than routine maintenance.
- Redeployment of existing operators who are highly paid.
- Scheme transfer to be effected only after the preparation of pre-feasibility /status report or shall be at a stroke.
- Whether TMC to be constituted with existing consumers alone or with prospective consumers.
- Strategic issues – Model A (TMC with existing consumers decided to give fresh connections) and Model B (prospective consumers build pressure on existing for rehabilitation)
- Drafting of bylaws and water sharing in federated BGs.
- From the divided stand of public policy, expectations of continued free provision act as a strong barrier to rehabilitation.

Social Issues

- Rehabilitation of public stand post.
- Water sharing issues intra GP and inter-GP.
- Social tension and conflict in sharing of water, procurement, new connections in large multi BG schemes.
- Exclusive SC/ST schemes.

Financial Issues

- Sharing of capital cost by existing consumers.
- Electricity arrears and transfer of ownership.
- Valuation should separately show the investments made by GP/GOK in the schemes and amount so apportioned.
- Payment of O&M expenses including electricity charges during the transition period.

Policy Issues

- Though the GO has been issued in 1999 the take over and cost recovery not taking place in non-project districts.
- KWA continues to go ahead with expansion/giving new connections in single panchayat schemes, even after GO came into force.
- Who will be the nodal agency for implementing the rehabilitation/ensure co-ordination and commonality of approach.