

CHAPTER 5

WATER RESOURCES

Water has been a key issue on the domestic and international agenda for the last 30 years starting with the 1st International Conference on water in 1977. The total water resources in the world are estimated in the order of 43750 km³/year. At the continental level, America has the largest share of the world's total freshwater resources with 45 per cent, followed by Asia with 28 per cent, Europe with 15.5 per cent and Africa with 9 per cent.

5.2 Nine countries are the world giants in terms of internal water resources accounting for 58 per cent of the world's natural fresh water (Table - 5.1). India has the ninth place in terms of internal water resources. Thirty three countries depend on other countries for over 50 per cent of their renewable water resources.

Table -5.1:

Total internal water resources of selected countries

Country	Total Internal water resources: (km ³ /year)
Brazil	5418
Russian Federation	4313
Canada	2850
Indonesia	2838
China, Mainland	2812
Colombia	2112
United States of America	2000
Peru	1616
India	1261

Source: FAO, 2003

5.3 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 share for agriculture is 71 per cent.

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 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 5.2.)

5.5 Water sector has undergone basic changes in recent years due to perceived scarcity.

While focus in the past was mainly on investment in physical structures, recent developments are associated to a great extent with improved management, conservation and institutional changes. "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.

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.

Table 5.2.

Purpose-wise Annual Fresh Water Withdrawals

Sl. No	Country/Catagory	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

Global Water outlook

5.7 Demand for the world's increasingly scarce water supply is rising rapidly, challenging its availability for food production and poultry global food security at risk. Agriculture is competing with industrial, household and environmental uses for water supply. Even as demand for water by all users grows, ground water is being depleted, other water ecosystems are becoming polluted

and degraded, and developing new sources of water is getting more costly. Based on a global model of supply and demand for food and water, the global water outlook report shows that if current water policies continue, farmers will find it difficult to meet the World's food needs. Herdert hit will be the world's poorest people. The salient findings of the global water outlook 2025 are shown in Box-5.1.

BOX-5.1

Global Water Outlook 2025

- ◆ Globally withdrawals for domestic and industrial uses quadrupled between 1950 and 1995 compared with agricultural uses for which withdrawals slightly more than doubled.
- ◆ By 2025 water withdrawal for most uses (domestic, industrial and livestock) is projected to increase by atleast 50 percent from 3906 cubic kilometres in 1995. This will limit irrigation water withdrawal which will increase by only 4 percent constraining food production in turn.
- ◆ If the current trend continues, (Scenario I) the global water withdrawals in 2025 are projected to increase by 22 percent above 1995 levels to 4772 km³. Projected withdrawals in developing countries will increase by 27% over the 30 years period, while developed country withdrawals will increase by 11 percent. Use of irrigation water is projected to rise under more slowly than other sectors.
- ◆ Potential irrigation demand will increase 12 per cent in developing countries while it will actually decline in developed countries by 1.5 per cent.
- ◆ In the crisis situation (Scenario II), the developed World will pay the highest price and total global water consumption will be 261 km³ higher than the 1st scenario of normal use by 13 per cent. The average cereal yield will be 6 per cent lower than scenario I due to unreliable water supply.
- ◆ In the sustainable water scenario (Scenario III), governments will transfer water rights and the responsibility for operation and management of irrigation systems to communities and water user associations, farmers will increase their onfarm investment in irrigation and water management technology, river basin organisation will be established in many water scarce basins and many planned storage projects will be cancelled due to high costs including environmental costs. World consumes less water but reaps greater benefits than under Scenario I, and total global water consumption would be 20 per cent lower than under Scenario I (-408 km³)

IFPRI, IWMI 2002

Water Resources in the Country

5.8 India, which has 17 percent of the world's population, has only 2.45 percent of world's land resources and 4 percent of the world's fresh water resources. The water resources are unevenly distributed in time and space. In the prevailing Monsoon hydrometeorology, about 85 percent of annual precipitation takes place in four months June to September of the South West Monsoon. A major part of the South West Monsoon precipitation is concentrated in two of the four months with down pour accounting for almost half of its occurring in isolated spells of various durations aggregating to about 15 hours. 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. It is estimated that only 70 percent of the people in urban areas have access to basic sanitation services. A large number of rural habitations remain without any identified source of safe drinking water. The rising consumption will aggregate the water scarcity further. The total consumption in India is expected to rise by 20-40 percent over the next 20 years. The projected consumption of water for different categories of use is given in **Table: 5.3**

Table- 5.3:
Projected Water Consumption

Purpose	1997-98	2020 BAU
Irrigation	560	640
Domestic	30	50
Industries	30	57
Power	9	28

*Source: Report of the Committee on India Vision 2020, Pfg Commission, GOI
BAU: Business as Usual*

5.9 Agriculture accounts for 89 percent of the total water consumption and domestic consumption accounts for 4.8 per cent. Subsidised or free supply of power and water has resulted in over exploitation and inefficient use of water in agriculture, leading to water-logging and salinity on 5.76 million hectares. Tremendous wastage occurs as a result of evapostranspiration, distribution loses, seepage through unlined channels and excess application. Canal-irrigation efficiency in India is estimated at around 35 to 40 per cent, which is below international standards. Government policies need to be revised to provide

incentives for efficient use of water, including appropriate water pricing and more effective institutional mechanisms for water management.

5.10 The annual precipitation including snowfall is estimated to be of the order of 4000 cu km. The resources potential of the country which occurs as natural run off in the rivers is about 1869 cu km; as per the basin-wise estimates of Central Water Commission, considering both ground water and surface water as one system. Due to various constraints in the topography, even distribution of resources over space and time, it has been estimated that only about 1122 cu km of the average run off of 1869 cu km is utilisable. The percapita availability of water is reducing progressively owing to increasing population. In 1999, the national average percapita availability in India was around 2200 cubic meter per year, which has gone down to 1829 cu m in 2001. With the projected population it may go down to 1340 and 1140 cubic meter by the year 2025 and 2050 respectively. According to the international agencies, any basin having per capita availability less than 1700 cubic metre is categorised as water stressed and less than 1000 cubic metre as water scarce. According to these norms six river basins of the country have already fallen into water scarce category, and five more to become water scarce in 2025 and by 2050. Only three to four basins would be water sufficient. Hence management of water becomes a challenge. Redistribution of water through inter linking of rivers, desalination of water and rainwater harvesting should be taken up on priority basis. About 97 percent of the world's water were present in oceans and seas and therefore, there is an urgent need to desalinise water for public use. As water could not be manufactured, conservation and management of water is the only way out for the growing demands.

5.11 Integrated management of water resource assumes importance and 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 not to contribute to the deterioration of water quality.

5.12 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.

5.13 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 and development 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.

BOX-5.2

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 (2001) 1829 Cu.m.
- Estimated Utilizable Water Resources 1122 BCM.
- (i) Surface Water Resources 690 BCM.
- (ii) Ground Water Resources 432 BCM.

5.14 The water resources potential of the river basins of India is given in Appendix-5.1

Pricing of Water

5.15 The costs of providing irrigation water include a fixed cost of operation and maintenance and a variable cost, which depends on the quantity of water supplied. In addition, there is a capital cost of constructing a water project. There are many pricing systems used for recovering some or all of these costs. In most countries, the revenue receipts fall far short of the costs of

supplying irrigation to users and often do not attempt to recover the initial capital costs. Recovery of operation and maintenance costs range from a low of 20-30% in India and Pakistan to a high of close to 75 per cent in Madagascar.

5.16 Water Pricing Systems can also work as an incentive for water users to adopt water conserving technologies, or to alter the amount of land under cultivation. A volume fee provides an incentive to limit water use, while a per ha. fee provides an incentive to cultivate agricultural land more intensively. Many systems combine these, for example, charging a per hectare fee for access to water and then reduced volumetric fee for water delivered. This is the type of pricing system used in Brazil for irrigation water. Irrigation water is mostly metered in Brazil and the irrigation land requires that the price of irrigation water be the sum of two charges. The first charge is annexed per hectare and is designed to repay the capital costs of the project. These are calculated using a 50 year repayment period and a subsidised interest rate. The other charge is volumetric fee, and is designed to repay the operation and maintenance costs of the water project. However in practice, the revenues have failed to cover the costs of water projects.

5.17 Developing countries use a per hectare water fee. Pakistan uses per area pricing. In Pakistan water charges are levied on a per unit area basis and varies across region, crop and season. However the variation across crops is not related to either the water requirement or the profitability of the crop. Other countries such as Egypt and Indonesia don't charge farmers anything for the water they use but require farmers to maintain and operate the irrigation canal system.

5.18 A study in 1996 reported that in India from 1983-86, the estimated working expenses of major water projects was 2.2 times the gross revenue collected from the water users (Saleth, 1996). Using 1987 data, another study of six Asian countries showed that the irrigation charges

as a percentage of total cost ranged from 1.0 per cent to 22.5 per cent.

5.19 Water rates should be such as to convey the scarcity value of the resource to users and to foster motivation for economy in water-use. They should be adequate to cover the annual maintenance and operation charges and a part of the fixed costs. Efforts should be made to reach this idea over a period, while ensuring the assured and timely supplies of irrigation water. The water rates for surface water and ground water should be rationalised with due regard to the interests of small and marginal farmers. There are wide variations in water rate structures across the states. In some states the irrigation charges vary from project to project, type of system, type of crops etc. According to the report of the Committee on Pricing of Irrigation water of the Planning Commission of 1992, water rates are a form of user charge and hence the users of public irrigation must meet the cost of the services. The water rates are levied for its proper and beneficial

use. The water rates are not uniform in all the states/Union Territories in the country. No water rate is levied for agricultural purposes in most of the North Eastern states. The existing water rates in the major states of the country is given in Table: 5.4

5.20 The expenditure on Irrigation are dominated by maintenance and administrative costs. The proportion of working expenses on administrative cost have been continuously increasing while the share of repair and maintenance showed a declining trend. Though latest information on these breakups of expenditure are not available, an observation of budgetary data is presented in Table 5.5. The share of direction and administration in working expenses has gone up considerably. On the other hand the share of expenditures on repairs and maintenance in the total working expenses has gone down. Therefore, revising water rates so as to recover the maintenance cost has to be carefully examined and recurring expenditure need to be properly audited and scrutinised.

Table -5.4:
Canal Water Rates for Irrigation in Major States

States	Rate (Rs./ha)		Few Crops Specific Rates (Rs./ha)			Year in which Rates Revised Last
	Minimum	Maximum	Paddy	Wheat	Sugarcane	
Andhra Pradesh	99	370	222		370	1986
Bihar	30	158	89	51	158	1983
Gujarat	40	830	110	110	830	1681
Haryana	20	99	74	62	99	1975
Karnataka	37	556	99	54	556	1985
Maharashtra	100	1750	100	200	1750	1990
Madhya Pradesh	99	741	198	247	741	1992
Orissa	6	185	40	32	100	1981
Punjab	14	82	49	29	82	1974
Rajasthan	20	180	99	74	143	1982
Tamil Nadu	6	65	49		49	1962
Uttar Pradesh	15	410	143	143	237	1983
West Bengal	37	124	37	49	124	1977

Source: Government of India, 'Pricing of water in public system in India' CWC, 1993

Table - 5.5
Working Expenses of Certain Major Projects

(Rs. in lakhs)

Name of Project	1999-00			2000-01			2001-02			2002-03		
	Establis hment	Work	Total	Establis hment	Work	Total	Establis hment	Work	Total	Establis hment	Work	Total
1	2	3	4	5	6	7	8	9	10	11	12	13
Malampuzha	121.36	111.93	233.29	122.29	89.34	211.63	96.05	45.69	141.74	130.79	301.03	431.82
Mangalam	15.80	18.03	33.83	16.15	4.96	21.11	12.69	11.15	23.84	20.44	59.83	80.27
Walayar	23.99	23.09	47.08	24.52	27.37	51.89	18.44	6.74	25.18	33.21	98.34	131.55
Kanjirapuzha	215.59	404.36	619.95	220.90	246.12	467.02	204.57	846.67	1051.24	212.16	313.20	525.36
Pazhassi	180.91	882.09	1063.00	162.27	11.21	173.48	177.58	926.89	1104.47	149.50	56.22	205.72
Pothundy		24.63	24.63		22.34	22.34		32.78	32.78		36.34	36.34
Chitturpuzha	65.65	31.04	96.69	67.07	19.71	86.78	62.92	45.99	108.91		65.63	
Pamba		45.08	45.08	0.36	52.74	53.10		28.58	28.58		88.47	88.47
Kuttiyady	12.59	16.44	29.03	21.09	2.24	23.33	6.82	47.78	54.60	0.81	66.78	67.59
Kallada	1439.92	1191.38	2631.30	1424.84	1572.16	2997.00	1158.30	1632.70	2791.00	960.28	338.05	1298.33

5.21 In Kerala, the water rates now collected are based on the estimates of 1974. The rates are very low compared to the costs of maintenance of major irrigation projects. The WRD has a proposal to revise the water rates. The water rates existing and proposed are given in Table - 5.6.

Table : 5.6
Water Rates in Kerala

Item	Rate/ha (Rs.)	
	Existing	Proposed
Single crop land	37	250
Double crop land	62	400
Three crop land	99	550
Other lands	62	550

5.22 So far as irrigation projects in the public sector are concerned, user charges of water for irrigation constitutes the major portion of gross receipts from them. The various committees/groups constituted for suggesting ways and means to improve financial performance of projects have emphatically recommended for restructuring of irrigation water rates in the country. Costs including establishment and works and receipts of certain major Projects during the last five years are given in Table-5.7. From the table it is seen that the receipt is below 30% of the cost in most of the projects. During 2002-03 receipts ranged from 1.20 per cent of total cost for Pampa irrigation project to 12.40 per cent for Chittoorpuzha project. The share has come down during 2002-03 for all projects except Kanjirappuzha, Pazhassi and Pothundi. The water rates now levied from the projects has to be increased so as to cover the operational cost of the projects.

5.23 The major findings of a study conducted by the Kerala Agricultural University on Pricing of irrigation water using the concept of Willingness to Pay (WTP) in Peechi Irrigation Project (PIP) are shown in Box- 5.3. WTP is used to measure by creating a hypothetical market like situation and elicit consumers preference for the service. WTP is considered the best indicator of service demand as corresponds to the users' affordability and levels of services preferred.

5.24 In another study conducted in 2000, again in Peechi Irrigation project, the average Willingness to pay by farmers in head, middle and tail region were Rs. 107, Rs. 127 and Rs. 162 per ha respectively.

Participatory Irrigation Management (PIM)

5.25 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. The programme envisaged is to transfer the O & M of one branch canal each at Olathanni branch in Neyyar irrigation project with a total length of 6.4 km and an area of 501ha. with garden land crops and Kuthannur branch canal of Malampuzha project with a length of 14.63 km and 1669 ha. with rice crop are selected for implementing PIM. The duration of the programme is one year. The activities will be carried out in 5 different phases. The physical progress so far achieved includes formation

Table -5.7:
Cost and Receipts of Certain Major Projects

Name of Project	<i>(Rs. lakhs)</i>									
	1998-99		1999-00		2000-01		2001-02		2002-03	
	Cost	Receipt	Cost	Receipt	Cost	Receipt	Cost	Receipt	Cost	Receipt
Malampuzha	201.47	59.93	233.29	38.05	211.63	47.06	141.74	25.29	431.82	42.16
		(29.75)		(16.31)		(22.24)		(17.84)		(9.76)
Mangalam	40.58	3.67	33.83	4.10	21.11	2.94	23.84	3.29	80.27	3.53
		(6.04)		(12.12)		(13.93)		(13.80)		(4.40)
Walayar	59.91	3.32	47.08	3.46	51.89	14.72	25.18	6.99	131.55	2.65
		(5.54)		(7.35)		(28.37)		(27.76)		(2.01)
Kanjirapuzha	839.63	1.12	619.95	1.32	467.02	29.65	1051.24	0.60	525.36	24.90
		(0.13)		(0.21)		(6.35)		(0.06)		(4.74)
Pazhassi	1356.10	8.50	1063.00	13.69	173.48	17.46	1104.47	17.15	205.72	13.67
		(0.63)		(1.29)		(10.06)		(1.55)		(6.64)
Pothundy	28.42	3.49	24.63		22.34	2.56	32.78	3.00	36.34	3.61
		(12.28)				(11.46)		(9.15)		(9.93)
Chitturpuzha	80.32	5.89	93.96	6.24	19.67	10.47	45.98	6.84	65.63	8.14
		(7.33)		(6.24)		(53.23)		(14.88)		(12.40)
Pampba	83.16	3.48	45.08	0.77	53.10	0.45	28.58	0.71	88.47	1.06
		(4.18)		(1.71)		(0.85)		(2.48)		(1.20)
Kuttiyady	22.99	1.83	16.44	2.06	2.24	1.69	47.78	1.96	48.91	1.82
		(7.96)		(12.53)		(75.45)		(4.10)		(3.72)
Total	2712.58	91.23	2177.26	69.69	1022.48	127	2501.59	65.83	1614.07	101.54
		(3.36)		(3.20)		(12.42)		(2.63)		(6.29)

BOX-5.3**Pricing of Irrigation Water in Kerala with special reference to Environmental Management**

The study was undertaken to assess the value of irrigation water as a basis for pricing of irrigation water in Kerala for the viable performance of major irrigation projects. Data were collected from PIP covering head, mid and tail regions of LBC and RBC.

- Majority of the respondents (84%) was ready to pay, though the extent of payment and conditions varied.
- More than seventy per cent were ready to effect 25 per cent higher than existing rates of Rs. 62 ha if the supply is satisfactory. 9% alone expressed payment in the existing condition. All of them in the head region.
- People in other regions, were ready to pay higher even upto Rs. 153/ ha under satisfactory condition of supply.

Willing to pay in the present condition - 8.61%

Willing to pay in a better condition - 91.39%

Willing to pay upto 25% higher than existing rates - 71.06%

Willing to pay upto 50% higher than existing rates - 18.42%,

Willing to pay upto 100% higher than existing rates - 7.89%

Willing to pay upto 150% higher than existing rates - 2.63%

Kerala Agricultural University

of 2 outlet based Water User Associations and one branch canal based WUA in Malampuzha and 15 other WUAs and one branch canal based WUA in Neyyar. Ayacut maps and list of ayacutdars were made. PRAs are now being held for identifying and prioritising rehabilitation works needed in the filed channels and branch canals.

Rain water Harvesting

5.26 Kerala has 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.

5.27 In order to promote rainwater harvesting, Government of India advised the State Governments to provide certain provision in

building rules, pertaining to incorporation of rooftop rainwater harvesting arrangements in buildings. The Government of Kerala has amended the Kerala Municipality Building Rules, 1999 in 2004 to incorporate provision for rooftop rainwater harvesting. The government also launched a

state-wide awareness building and rain-water harvesting in public buildings, institutions and households.

5.28 The salient features of the Kerala Municipality Building Rules, 1999 (amended) are given in Box. 5.4:

BOX-5.4

Salient features of the Kerala Municipality Building Rules, 1999 (Amended in 2004)

1. The roof top rainwater harvesting arrangements shall be provided as an integral part of all new building constructions such as (i) residential buildings (with floor area of 100 sqm. or more and plot area of 200 sqm. or more). Special residential buildings, educational, medical/hospital, assembly, office/business buildings and industrial buildings. The floor area to be considered shall be the total floor area in all floors.
2. The minimum capacity of the storage tank of the roof water harvesting arrangement is 25 litres/sqm. for residential and special residential buildings and for other type of buildings, the capacity insisted is 50 litres/sqm.
3. The municipality shall enforce workable artificial ground water recharging arrangements as an integral part of all new building constructions through collection of roof top rainwater.
4. Wherever roof top rainwater harvesting arrangements are provided, additional arrangements for carrying the spill over water from storage tank to recharge well or percolation pit need to be provided.
5. The owner(s)/occupier(s) shall maintain the rooftop rainwater harvesting arrangements and artificial groundwater recharge arrangements in healthy working conditions.
6. The municipality may in exceptional cases such as water logging or impermeable subsoil conditions to considerable depths, except construction from the mandatory ground water recharging arrangements.

Live Storage Capacities of Irrigation Reservoirs

5.29 There are 18 dams intended for irrigation. Out of this 13 have storages and 5 are barrages.

The live storage position of the reservoirs during the beginning and end of the monsoon period during 2003-04 & 04-05 is given in Table: 5.8

Table 5.8
Storage Levels of Completed Projects in Kerala

Name of Reservoir	01.06.2003	01.10.2003	01.01.2004	01.06.2004	01.10.2004	01.01.2005
	Storage (Mm 3)	Storage (Mm 3)	Storage (Mm 3)	Storage (Mm 3)	Storage (Mm 3)	Storage (Mm 3)
Malam puzha	13.946	46.118	22.459	26.445	180.450	81.954
Neyyar	28.100	7.415	80.452	56.271	103.106	85.592
Kallada	96.800	241.550	387.600	177.400	417.250	408.8
Kanhirapuzha	19.818	57.414	50.604	25.414	60.214	48.101
Kuttiyadi	53.662	83.580	107.415	70.348	105.686	108.962
Pothundy	1.869	26.165	12.516	3.889	40.522	19.996
Mangalam	1.589	23.461	9.191	5.632	24.811	8.342
Vazhani	0.280	6.720	1.200	1.150	15.530	9.17
Peechi	4.940	36.420	27.200	5.819	73.306	41.309
Walayar	1.617	1.567	1.716	1.562	7.473	1.718
Meenkara	1.161	1.033	2.048	1.076	8.467	4.814
Chulliyar	1.344	0.920	1.090	1.004	11.723	4.997
Chimoni	67.952	120.150	113.320	35.819	140.100	147.400
Total	293.078	652.513	816.810	411.829	1188.638	971.155

Source: Department of Water Resources

5.30 Even though there is considerable increase in the rainfall during 2004, the rise in the water level of the various reservoirs in the state is not very high. In the beginning of the Monsoon (during the current year) the total storage was 412 Mm³ and at the end of the monsoon the level of the storage was 971.155 Mm³. This is against the level of storage of 293.078 Mm³ at the beginning of the Monsoon and 816.811 Mm³ at the end of the monsoon period during the previous year. The current year's storage of 971.155 Mm³ is greater than the ten year average of 857.04 Mm³ on the date. The storage capacities of reservoirs are deteriorating due to silting in reservoirs. Sedimentation or silt removal need be done periodically for the proper upkeep of the reservoirs.

Dam Safety

5.31 Safety of the existing dams is one of the items in the National Water Policy. Almost all of the 18 dams in the State 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:

- (i) Monitoring the post and pre-monsoon inspections of dams and maintenance and surveillance and safety activities of the dam.
- (ii) 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.

5.32 During 2003-04, Dam Safety Organisation along with Dam Safety Committee

inspected the dams in Neyyar, Malampuzha, Chimmomy, Vazhani, Kanjhirappuzha, Siruvani, Kallada and Peechi.

5.33 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

5.34 Keeping in line with the national approach, Kerala also relied upon surface water irrigation system operating gravitational force for distribution. A major chunk of the outlay on water resources sector was earmarked for Major & Medium Irrigation. Out of a cumulative investment of Rs.3402.06 crores made as on 03/04, Rs.2321.00 crores (68%) was for major and medium irrigation.

5.35 A financial appraisal of the mid term of the Tenth Plan indicates that the approved outlay for the sector during the Tenth Plan period is Rs. 930 crores which includes Rs. 600 crores (64.52%) for major and medium irrigation, Rs. 205 crores (22.04%) for minor irrigation, Rs. 75 crores for command area and local water resources development, Rs. 50 crores (5.38%) for flood control and anti-sea erosion works. This is against the outlay of Rs. 1028 crores and an expenditure of Rs. 1078.43 crores during the Ninth Plan period. The percentage share of outlay during Tenth Plan is 3.88% against that of 6.38 % in the Ninth Plan. The reduction is mainly due to the transfer of minor irrigation schemes to local governments, reduction in number of major projects and assistance from XIth Finance Commission Award for Anti-sea erosion.

5.36 During the first three years of the plan period, an amount of Rs. 435.95 crores have been budgeted and the expenditure for the first two years Rs. 312.66 crores. Over and above the State plan outlay, a substantial amount has been invested for minor irrigation and flood management from the local governments component of the Tenth Five Year Plan. For the first two years of the Tenth Plan an outlay of Rs. 76.90 crores has been budgeted for these two sectors.

5.37 Sub sector wise financial performance is given in Table 5.9.

Table -5.9
Sub Sector-wise Financial Performance during 2002-05

(Rs. Crores)

Sectors	Tenth Plan	Annual Plan 2002-03		Annual Plan 2003-04		Annual Plan 2004-05		BE 2002-05
		Outlay	Expdr.	Outlay	Expdr.	Outlay	Anti. Expdr.	
Major and Medium Irrigation	600	110	114.50	110	110.93	113.85	113.85	333.85
Minor Irrigation								
Ground Water Development	50.00	9.00	9.05	9.00	9.60	9.00	9.00	27
Surface Water Development	155.00	15.00	18.65	2.50	19.64	4.10	4.10	21.6
Sub Total	205.00	24.00	27.70	11.50	29.24	13.10	13.10	48.60
Command Area Development								
Command Area Development Programme	65.00	10.00	9.63	10.00	7.38	6.85	6.85	26.85
Local Level Water Resources and PIM	10.00	2.00	-	1.50		1.65	1.65	5.15
Sub Total	75.00	12.00	9.63	11.50	7.38	8.50	8.50	32
Flood Control & Anti Sea Erosion	50.00	6.00	13.69	8.00	9.51	7.50	7.50	21.50
Grand Total	930	152	155.6	141	157.06	142.95	142.95	435.95

5.38 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 to complete ongoing irrigation schemes. Allocations under this programme have been massively increased. The state wise details of release from 1996-97 to 2003-04 is given in Appendix- 5.2.

5.39 Upto 2003-04, Government of India had sanctioned Rs.14670.00 crores to various states. The assistance sanctioned to Gujarat was Rs.3622.42 crores (24.68 %), Karnataka Rs.1954.22 crores (13.31 %), Uttar Pradesh Rs.1788.37 (12.19 %), Madhya Pradesh 1505.00 crores (10.25 %) & Andhra Pradesh Rs. 869.00 crores (5.9 %) and Kerala Rs.89.09 crores (0.61 %).

5.40 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). The pattern of assistance was modified from 01/04/2004. In the modified pattern the central share will be 70% loan and 30% grant for general category states and 10% loan and 90% grant for special category states for projects under Fast Track Programme.

5.41 In Kerala, Kallada and Muvattupuzha Projects were assisted under the AIBP and the assistance received so far is Rs. 32.51 crores and Rs.56.58 crores respectively. The assistance was availed based on individual selected components of public works identified under each project.

Physical Performance

5.42 The ultimate irrigation potential of the state as per the earlier assessment is 25 lakhs ha. (gross) covering 16 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 4.27 lakh ha. (gross) The share of major and medium projects was about 49 per cent.

5.43 The target set for the realisation of additional irrigation potential during Tenth Plan was 1.40 lakh hectares (gross) comprising of 0.90 lakh hectares under major irrigation and 0.50 lakh hectares under minor irrigation. The cumulative target for the first 3 years was 0.75 lakh hectares, which includes 0.45 lakh hectares under major and 0.30 lakh hectares under minor irrigation. The actual achievement for the first two years aggregates to 0.26 lakh hectares. The physical targets and achievements under Irrigation during the first three years of the Tenth Plan period is given in Table-5.10.

Table - 5.10
Physical Targets and Achievements under Irrigation during the first 3 years of the Tenth Plan period.

Sl. No.	Sector	Unit	Cumulative coverage up the end of 9 th Plan	Tenth Plan Target	2002-05 Target	Actual Achievement 2002-04
1.	Major & Medium	'000ha gross	225	90	45	16
2.	Minor	'000 ha gross	207	50	30	10.38
	Total		427	140	75	26.38

Review of Major Projects

5.44 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

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).

5.45 As part of the strategy of time bound completion of major projects 6 projects were targeted for completion. Out of this, 5 projects were targeted for completion by 2004-05. Higher outlays were provided for these projects for speedy completion. Moreover, assistance from AIBP and RIDF were availed for two projects, Muvattupuzha (AIBP) and Thrithala (RIDF) for expediting the works.

5.46 The overall performance of the major and medium irrigation sector during 2003-04 was not encouraging. Additional irrigation facility could be extended only in Muvattupuzha project. The

additional area brought under irrigation by the project is only 8606 ha. (gross) The cumulative area brought under irrigation through major and medium irrigation projects is 2.38 lakh hectares. (gross). The details of the progress of implementation of ongoing projects as on 3/2004 is given in Table- 5.11.

Table - 5.11
Project-wise Details of Ongoing Projects

(Rs. lakhs)

Name of Project	Year of starting	Original estimate	Revised estimate	Year of revision	Cost escalation (%)	Expenditure upto March 2004	Target area to be irrigated		Physical achievement as on 3/03	
							Net	Gross	Net	Gross
2	3	4	5	6	7	8	9	10	11	12
Muvattupuzha	1974	2086	51500	1999	2368	45670	17737	34737	11585	22706
Idamalayar	1981	1785	41200	1999	2208	14522	14394	29036	-	-
Kuriyarkutty-Karappara	1987	1036	15830	1999	1427	2101	17488	34976	-	-
Karapuzha	1979	760	25300	1999	3228	20206	5221	8721	-	-
Banasurasagar	1979	800	5000	1999	525	1234	2800	4740	-	-
Chamravattom	1985	1327	12000	1999	804	1261	3106	9659	-	-
Thrithala	1998	1900	2660	1999	40	2032	1303	3997	-	-

Source : Department of Water Resources

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

5.47 As part of implementing the 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 seem beneficial, will be completed in a fast track method. Accordingly 4 projects Karapuzha, Banasurasagar, Muvattupuzha and Idamalyar were selected for review by a multidisciplinary team constituted for the purpose. The team after reviewing the present status by

field verification chalked out future course of action for the completion of the two projects Banasurasagar and Karapuzha project. The preparation of the reports of the other two projects are progressing.

5.48 Findings of the Multi disciplinary team on Karapuzha & Banasurasagar irrigation projects are given in Box. 5.5

BOX-5.5

Findings of the Multi disciplinary team

Karapuzha

- ◆ Nearly 85% of the headwork and 90% of the main canal are completed
- ◆ Land acquisition

Land acquisition of about 120 hectares for branches and distributories are pending.

- ◆ Rehabilitation of evicted tribal people.

Rehabilitation of project affected tribal people from the catchment area is pending.

- ◆ Design issues

Most of the design works of various components of the project are done by IDRDB. The delay in finalising the design of the irrigation structures had delayed the project execution.

- ◆ Prioritised action Plan

Phase I -

Headworks

Project is targetted for full commissioning by December 2006. The activities required for full commissioning are plugging of the river sluice and raising /deviating the road in the submersible position of the reservoir, completion of the model studies conducted by KERI, Peechi and the finalisation of the design by the IRDB, erection of radial shutters, service gates, emergency gate, catwalk etc. completion of the balance length of Irrigation conduit, construction of the aqueduct for a length of 280 M. etc.

Padinjareveedu Branch Canal - Completion of work from 0 m to 8.94 m.

- ◆ LBC

Land acquisition and construction of 6 distributories.

- ◆ In RBC, construction of aqueduct from 5.49 Km. to 5.77 Km. and sluices, forming Kariambady Branch from Ch. 4.10 km. to 7.95 km. Kolliyil branch from Ch. 1.945 Km. to 2.995 Km. and providing shutter arrangements for Head sluice for Kariambady & Kolliyil Branch.

Phase - II

Head works

River training counter fort, retaining wall from 300 m to 620 m, formation of belt road, construction of boundary wall, construction of dam top road and electrification and rehabilitation of 84 Adivasi families.

Phase III

Kolliyil branch - completion of the remaining work of the Kolliyil branch from Ch. 8.095 km. to 20,000 km. and Pallikkunnu distributory.

Works in Phase-III will be carried out after partial commissioning.

- ◆ Frequent transfer of project officials affect the execution of the project.

- ◆ Cropping pattern in the ayacut had changed with high value crops occupying a significant area, replacing paddy. Hence urgent steps are needed to investigate the canal system for arriving at proper design of Canals and their structures and detailed cost estimates.

Banasurasagar

- Construction of main canal is completed.
- Out of the 11 distributories from the branch canals and two distributories from the main canal, survey and investigation work were completed only in 10 distributories.
- Rehabilitation of all the project affected tribal people from the catchment area had already been taken up. However, nearly 25 families in the submergence area are now cutoff from the neighboring villages and town due to dam construction.
- For the completion of the project land acquisition to the tune of Rs.948.10 lakhs (80 ha.) and cost of construction of Rs.5123.84 lakhs is needed
- Change in design

The cropping pattern had changed with high valued crops occupying a significant area replacing paddy. Hence the design of the alignment of the canals has to be changed. Field investigations are necessary for identifying the proper design of the canals & structures and detailed cost estimates. This has to be expedited for making the design change.

Irrigation Status

5.49 The source-wise and crop-wise area irrigated as on March 2004 is given Tables: 5.12 and 5.13

irrigated during 2003-04 has declined to 3.81 lakh ha. from 3.93 lakh ha. in the previous year. Only 17.36 per cent of the net cropped area is under irrigation. The major source of irrigation is wells,

Table 5.12
Net Area Irrigated (Source wise)

	(in Ha.)			
Source	2000-01	2001-02	2002-03	2003-04 *
2	3	4	5	6
Government canals	100926	95270	101139	94859
Private canals	4041	4413	4272	5754
Tanks	49972	49945	66729	47856
Wells	115703	86297	117490	109360
Other sources	110399	110788	103541	123469
Total	381041	377162	393171	381298
Area irrigated more than once in a year	76824	55055		782892
Gross irrigated area	457865	432217	447490	426765
Net area irrigated to net area Sown(%)	17.27	17.20	17.83	17.36
Gross irrigated area to gross cropped area (%)	15.15	14.44	14.77	14.35
Irrigated area under paddy to total irrigated area	45.44	42.57	41.16	40.00

* Provisional

Source: Directorate of Economics & Statistics

5.50 As per the assessment of the Directorate of Economics and Statistics the net irrigated area in the state as on 3/04, was 3.81 lakh ha. and the gross area irrigated is 4.27 lakh ha. Compared to the last year a slight decline of 3.14% is noted in the area irrigated in 2003-04. The net area

which contribute 29 per cent followed by government canals 24.87 per cent, tanks 12.55 per cent and private canals 1.50 per cent. In the source wise irrigation, the contribution of private wells predominates. The area benefitted by lift irrigation schemes has declined to 0.07 lakh ha. from 0.27 lakh ha. in 2003-04.

Table 5.13
Gross Area Irrigated (Crop-wise)

Crops	(in ha.)			
	2000-01	2001-02	2002-03	2003-04*
2	3	4	5	6
Paddy	208047	183992	183703	169829
Tubers	979	972	1008	1020
Vegetables	8529	8972	9786	9657
Coconut	165957	158050	163550	159113
Arecanut	30501	31467	34205	32990
Nutmeg/clove	2466	2170	2948	2884
Other Spices and condiments	3074	3109	3212	3245
Banana	19448	24372	29209	28100
Betel leaves	990	944	990	947
Sugarcane	3367	3267	3426	3567
Others	14507	14569	15373	15413
Total	457865	432217	447490	426765

visional

ce: Directorate of Economics & Statistic

5.51 Among the crops, paddy continued to be the major crop supported by irrigation. It accounted for about 40 per cent followed by coconut (37%) arecanut (8%) banana (7%) and vegetables (2.3%). 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 17 per cent of the total area under coconut, 35 per cent of the area under arecanut and 54 per cent of the area under banana. Compared to last year the area irrigated under all crops has been decreased.

Minor Irrigation

5.52 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 enactment of the new Act 'Kerala Irrigation and Water Management Act 2003' the definition of minor irrigation has been changed and works benefiting an area less than 15 ha. only come under the category of minor irrigation and are vested with PRIs. All other works having cultivable command area greater than 15 ha. have 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 irrigation schemes. Construction of check dams, Vented cross bars, weirs, tanks etc are the various works executed under minor irrigation Class-I & II.

5.53 An amount of Rs. 56.94 crores have been expended for implementing minor irrigation schemes during the first two years of the Tenth

Plan. Besides this, an amount of Rs. 76.90 crores have been budgeted for implementing minor irrigation schemes by local governments during the first two years of the Tenth Plan. The additional area brought by implementing medium irrigation schemes aggregates 10380 hectares including ground water schemes.

5.54 During the year under review (2003-04) the Department has invested Rs.19.647 crores for implementing surface water minor irrigation schemes. The additional area reported to be brought under irrigation during 2003-04 was 4886 ha. Compared to the last year, an increase of 40 per cent has been reported.

5.55 The local governments are also investing a substantial amount for minor irrigation works. During 2003-04 an amount of Rs.36.83 crores has been budgeted for minor irrigation schemes by them, the major works being check dams, weirs, cross bars etc.

Local Water Resources

5.56 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. Lakes are the largest fresh water storages and from the time immemorial serve the human beings in non-raining season for all its water needs. Due to excessive withdrawal of water in command and

disposal of high nutrient content and polluted water from the catchment the very sustainability of lakes has become questionable. National Lake Conservation Programme to arrest further degradation of lakes and to review the water body to acceptable environmental standards to that water can be utilised for various purposes needs to be strengthened. Enlarged programmes of lake and wetland conservation need to be initiated and streamlined.

5.57 An investigation by CWRDM has identified 910 ponds and tanks in Kerala with a minimum of 0.5 ha. water spread area. About 50% of the water bodies call for rejuvenation. There has been a trend to reclaim these water bodies for construction purposes. There are more than 20 artificial reservoirs and less than half of a dozen fresh water lakes in the state having good quality of water. There are perennial springs, the quality of these springs are found to be good.

5.58 Since tank irrigation has been traditionally operated and managed by the user groups, their first-hand knowledge and experience about the tank are more than that of outside experts. Many studies have noted that the poor participation of farmers in the operation and management as well as lack of institutional support to farmers' participation are among the

main reasons for the decline of tank irrigation. Giving enough power to panchayats to exercise control over tanks will certainly help to improve the position. Modernisation of the existing tanks is also needed for better utilisation.

5.59 In order to promote the development of local water resources, particularly tank irrigation, Government of India has introduced a scheme 'restoration of water bodies' (renovation of tanks/ponds) with 75% central assistance under Command Area Development Programme. The implementation of the programme is on the anvil.

5.60 In order to have sustainability of water resources it is imperative to make use of traditional knowledge wherever possible. For this, CWRDM has conducted a study to document and utilise the indigenous technology knowledge on water management in Kerala. The study was conducted in 7 districts, Kasaragod, Thrissur, Thiruvananthapuram, Wayanad, Palakkad, Kottayam & Ernakulam representing 8 agro-climatic zones of Kerala. The information on identification/location of the ground water resources, development of water resources, water harvesting and conservation. Water diversion, irrigation, agronomic conservation practices were collected. The result of the study is given in Box-5.6

BOX-5.6

Indigenous Technical Knowledge on Water Management in Kerala

1. Identification/location of ground water resources.

- Location of the well is mainly north-east direction. The location of well is sited using Y shaped stem of Tamarind, forked stem of Neem, Kadlaavanaku, Pala, Vetti, Eala are used for locating the spring head of construction of wells.
- The natural existence of plants like Njaval, Palakappayyani, Neermaruthu, Paarakam, Athi, Kadamba, Kanjiram, Punna, Kanikonna, Elengi, Pullani, Koli, Manjapavatta, Arayaal and Peraal are the biological indicators of existence of ground water.

2. Development of water resources

- Kenis – shallow wells in Wayanad. The material used for construction is Panamkutty. The water in the Kennis are of good quality.
- Valkinar is a special type of well with a slopping walkway up to the water table on one side of the well. These wells are usually dug for irrigation purposes

3. Ponds and Tanks

Mathakkom – traditional rainwater harvesting structures in Kasaragod. The water from surangams also collected in the Mathakkams act as percolation tanks.

Surangams – tunnels dug through laterite hill slopes from the periphery of which water seeps out by gravity. Surangams are used mainly for domestic and irrigation purposes.

Springs -

Natural freshwater sources –mostly found in the high range district of Wayanad and in the Attappady block of Palakkad district.

4. Water Harvesting and Conservation Structures**Different types of Checkdams**

- (i) **Kattas** – Temporary check dams in Kasaragod
- (ii) **Anicut** – a type of check dam in Palakkad district constructed across rivers or streams using stone boulders and a material called ‘Kara’ and ‘Soorki’.
- (iii) **Sub-surface check dams** – In this type of dams water is drained from the aquifer through a gravel portion along the dam to a series of large diameter collector wells and used for irrigation.

Chirakkanadm – Commonly known as ‘Thalakkulam’, from which water is let into the paddy fields in the downstream as and when required.

5. Water Diversion Methods

Mathavus are control structures constructed at the downstream side of a farm pond/tank (yeri) seen in Palakkad district.

Mathum Poottum is a water controlling system installed in a *chira* to deliver water according to requirement.

Pulikannu is also a water controlling system.

Kalpathi is a water diversion and conveyance structure present in Wayanad district. It is made out of granite stone.

Irrigation

Kaalathekku (Kavala Kinar) – collects and store rainwater

Round Kavala – it is a type of Kavalakinar.

Etham or Thulan – is a water-lifting device used to irrigate coconut and arecanut plantations, vegetables and sometimes, paddy fields also.

Thekkukotta or Kayattukotta – is a conical shaped basket-like vessel used for lifting water from shallow ponds or channels.

Veth – is an effective and simple traditional irrigation method used to lift water from shallow ponds streams or channels to fields.

Kaipola – is a water-lifting device similar to *veth*. It is used to irrigate betel leaves and banana from small water pits and channels.

Kakkotta – is used for carrying water from the *Valkinar* for irrigating betel leaves.

Chakkram (Chakkram and Ara)- is used to drain the fields. *Chakkram* and *Ara* are two integral parts.

Petti and Para – is a system of low head, high discharge pumping to dewater the *padashekharm* in the Kuttanad-Kole wetland area.

Veeshu maram – is a method used for cleaning the wide wells using bullocks.

Pitcher irrigation – is an indigenous drip irrigation method.

Akampadam – is a small pit made in the middle of paddy fields under the cultivation of pea, gram, etc. Water from that pit is used to irrigate pea and gram.

Splash irrigation – is done for plantation crops, mainly arecanut, in Kasaragod district in areas where water cannot be diverted.

- CWRDM, 2004

5.61 Renovation of local water resources in the State must start with a clear recognition of the fact that government cannot 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, incorporated in the five year and annual plans of State and local governments and implemented with the participation of the beneficiaries.

Ground Water Development

5.62 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 collaboration 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. Nearly one third of the available replenishable groundwater resources (150 BCM) is utilized. Out of 7063 blocks in the country only 599 blocks (8.5%) are designated as dark (over exploited). The majority of dark blocks are located in the North & South of the country (32% & 34%) respectively. Stage of ground water development in the country is about 32%.

5.63 The CGWB has prepared a 'Water Map' for the entire country. The map contains information on water regions, quality and depth of water and even excessive contamination. The

map will also indicate the various kinds of rocks in different areas, fresh water supply and high concentration of fluoride, nitrate and iron content in water. 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.

5.64 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% which is greater than the national level. The ground water resources of Kerala as on 31.3.1999 is given in Appendix.5.4.

5.65 Monitoring and preservation of groundwater is an important aspect, which requires serious attention. 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. The State Ground Water Department is monitoring 440 piezometres and 303 observation dugwell stations across the state in different terrains under hydrology project. Monthly observed data for all the stations are analyzed and trend analysis reports were prepared. It is observed that 81 piezometres and 59 dug wells are showing falling trend when analyzed for pre monsoon and post monsoon seasons. This indicates that either overdraft or insufficient recharge is affecting these areas. These areas need special attention in the context of ground water recharge.

5.66 Artificial recharge and rainwater harvesting are the best-suited and cheapest methods to overcome this situation. A scheme for the construction of artificial recharge structures was introduced in the state with financial assistance from Government of India. Sub surface dams and dykes are the main structures built for the artificial recharge of ground water. Hydrogeologically suitable sites for sub-surface dams were located and works are in progress. For the rest of places detailed hydrogeological investigation are underway for the construction of suitable recharge structures. 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.

5.67 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, 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.

5.68 A comparative study conducted with respect to water levels during the post monsoon months of 2001 and 2002 indicated that an average of 20 to 25% depletion in rainfall during the year has resulted in a drastic fall of water level in majority of observation stations indicating a severe drought situation in Kerala. On an average 65% of the observation stations spread all over Kerala is showing a decline in water level

5.69 The systematic approach to the management of ground water requires a sustainable legal framework. 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.

5.70 The Act has 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.

5.71 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.

5.72 During the period under report (2003-04), an amount of Rs.29.24 crores has been invested for minor irrigation out of which the share of ground water development was Rs.9.60 crores ie. 39%

5.73 During 2003-04 the Department has imparted technical assistance to identify sites for 882 open wells, 5423 drilled wells and constructed 934 drilled wells. The additional area reported to be brought under irrigation was 2637 ha. Training was imparted to 41 personnel and analysed 2545 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. Under Rajiv Gandhi National Drinking Water Mission scheme, 36 bore wells were drilled in the non-covered/partially covered habitats. The IInd Phase of the National Hydrology Project has been initiated during the period under report. The financial and physical achievements of the first Phase of the project is given in Appendix-5.6 & 5.7.

Flood Management

5.74 India is prone to natural disasters. Due to its locational and geographical features, it is vulnerable to a number of natural hazards like cyclones, droughts, floods, earthquakes, fires, land slides & avalanches.

5.75 Natural disasters result in heavy economic losses, apart from the loss of human life and the hardship inflicted on the survivors.

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.

5.80 At the State level during the year under report, an amount of Rs 3.16 crores has been spent for protection of an area of 969 ha. of land from the ravages of flood. The cumulative area brought under flood control was 59657 ha. as on 3/2004.

Coastal Zone Management

5.81 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 seacoast is thickly populated and as a result the loss due to sea erosion is relatively very high.

5.82 Construction of sea walls continued to be the sole intervention for coastal zone protection. In the area of protection sea shore, modern technologies like geo textiles, polyethylene fabrics/sheets, nourishment of foreshore with biomaterials, etc. are emerging. During 2003-04 an amount of Rs.6.35 crores has been spent to construct 1.13 km. of new sea wall and for reformation works in 0.73 km. Out of the total coastal stretch of 590 kms, about 385.16 Kms was protected by constructing new sea walls and reformed 112.909 Km. of old sea walls spending an amount of Rs. 275.17 crores upto 31.3.2004. 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, 12.09 km of new sea wall was constructed and reformed 21.83 km. of old sea walls as on 31.03.2004 spending Rs.38.00 crores.

The physical and financial achievement under flood management and coastal zone management during 2003-04 are given in Table-5.15

Table: 5.15
Financial and Physical Progress of Flood Management and Coastal Zone Management Programmes during 2003-04

(Rs. lakhs)				
Sl. No	Item	Financial Achievement	Physical Achievement	Cumulative Physical achievement as on 3/2003
1	Flood Management	316.5.3	969 ha.	59657 ha.
2	Anti-Sea Erosion Works			
	a) New sea-wall constructed	634.59	1.13 km.	385.16 km.
	b) Reformation of old & damaged sea-wall		0.73	112.909 km

Source: Water Resources Department

5.83 The havoc caused by the tsunami towards the end of December 2004, has brought to focus the stable question of implementation of the coastal zone regulations, safe methods of rehabilitation, use of methods other than sea-wall for protection, as for example, promoting vegetation, mangroves, sand management etc.

Command Area Development

5.84 The Command Area Development Programme 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. CADA programmes are implemented with financial assistance from CADA 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 withdrawn the central assistance of onfarm development works except reclamation scheme in the 12 projects with effect from 31.03-2003.

5.86 Based on the recommendations of the Working Group of the Planning Commission on “Command Area Development Programme” and “Private Sector And Beneficiaries participation in Irrigation Water Management” and the views expressed by the State Governments the existing CAD Programme has been restructured and renamed as “Command Area Development and Water Management Programme”. The

restructured programme retains the components of the existing scheme which have been found to be beneficial to the farmers, include a few new components considered necessary for correction of deficiencies in the irrigation system and delete those components which have lost their utility overtime. The details of the components under the restructured programme are shown in Box: 5.7

BOX-5.7

Components of restructured CAD Programmes

- ◆ Survey, planning and designing of On Farm Development (OFD) works;
- ◆ Construction of field channels, now with a minimum of 10% beneficiary contribution;
- ◆ Full package OFD works including construction of field channels, realignment of field boundaries, land leveling and shaping also with a minimum of 10% beneficiary contribution;
- ◆ Warabandi (to be continued without central assistance);
- ◆ Construction of field drains, intermediate and link drains for letting out surplus water;
- ◆ Reclamation of waterlogged areas of irrigated commands using conventional techniques and including bio-drainage wherever applicable, now with a minimum of 10% beneficiary contribution;
- ◆ Software components such as training of farmers and field functionaries & officials, adaptive trials & demonstrations, action research for Participatory Irrigation Management, seminars/Conferences/workshops, monitoring and evaluation of the programme etc. through Water and Land Management Institutes (WALMI) and other institutions with hundred percent funding from Government of India;
- ◆ Institutional support to Water Users’ Associations;
- ◆ Establishment cost – 20% of OFD works
- ◆ R & D Activities, including training of senior level officers, conferences, workshops, seminars etc. arranged directly by the Ministry;
- ◆ Correction of system deficiencies above the outlet up to distributaries of 4.25 Cumec (150 Cusec capacity);
- ◆ Renovation of de-silting of existing irrigation tanks including the irrigation system and control structures within the designated irrigation commands with a minimum of 10% beneficiary contribution as maintenance fund, the interest from which has to be used for maintenance in future;
- ◆ Use of location specific bio-drainage techniques to supplement conventional techniques for reclamation of waterlogged areas.
- ◆ The restructured programs came into force from 1st April 2004 onwards.

5.87 Government of India had directed to restructure the CAD programme from the 3rd year of the Tenth Plan onwards in the ongoing four projects namely Pamba, Periyarvalley, Kanhirapuzha and Pazhassi. Detailed project reports for these projects for the restructured CADWM activities were submitted to Government of India for approval. Finalisation of the detailed project reports of Kallada and

Muvattupuzha projects are nearing completion. As part of reform initiative in the new CADWM programme new components like renovation of tanks and system correction are included.

5.88 Proposals for restoration of tanks of Palakkad and Pathanamthitta district are under the consideration of Government of India.

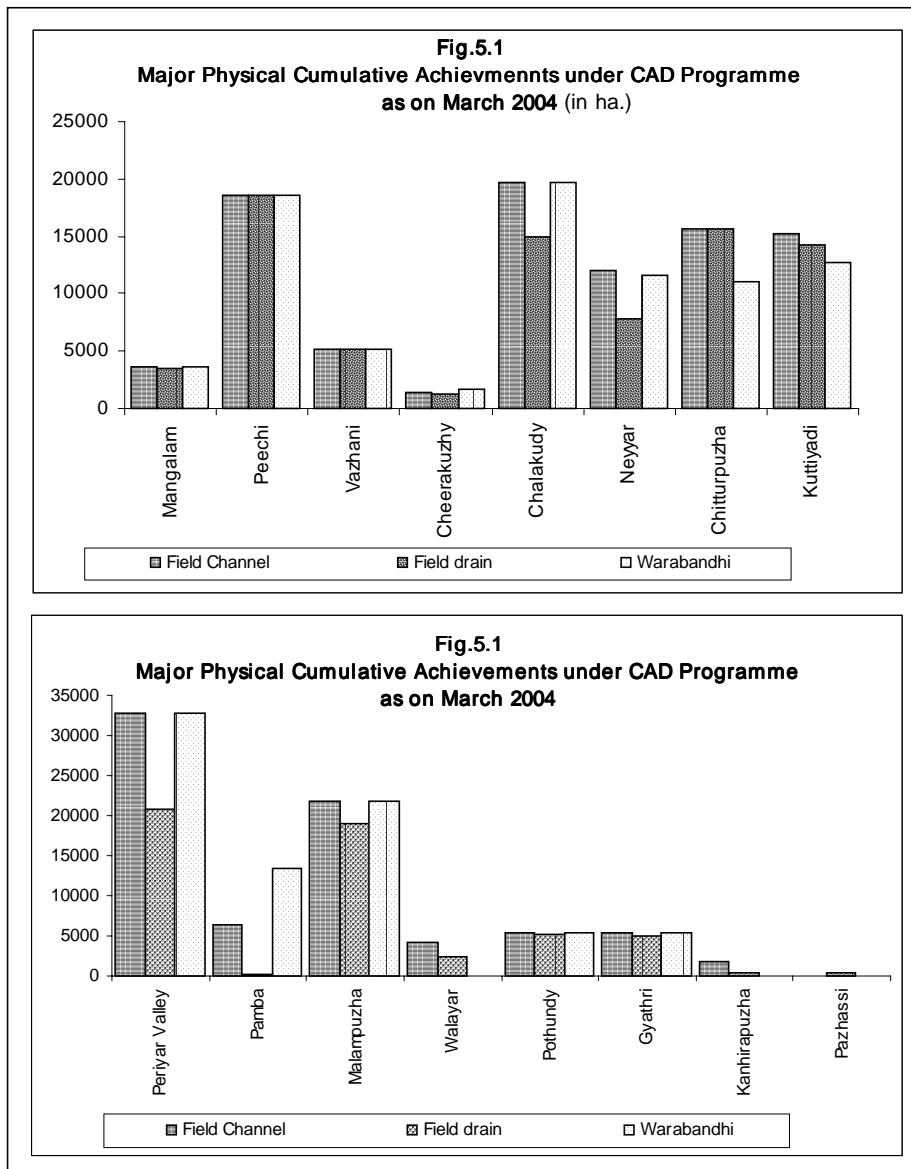
5.89 All the CADA works are executed through registered Karshaka Samithies (BFAs). Most of the samithies have not renewed their registration and hence the farmers have to be motivated for the renewal of registration.

5.90 Physical achievements of the existing CADA programme during 2003-04 are given in Appendix: 5.8

5.91 The progress during 2003-04 was not at all encouraging. The achievement recorded during 2003-04, include construction of field channels in 2171 ha; drains to benefit 8368 ha. conducted large

scale demonstration in 1994 ha; adaptive trials in 122 ha; 64 training programmes, bench mark and evaluation studies in 1692 ha. The work on reclamation of water logged areas were done in 4409 ha. disbursed subsidies to 456 small and marginal farmers; conducted detailed survey in 1320 ha., and four evaluation reports were also published. The major physical cumulative achievements are given in Appendix. 5.9. The cumulative achievement of the main activities of CAD programmes of all projects are represented in Fig.5.1

Major Physical Cumulative Achievements under CAD Programme as on March 2004



Drinking Water Supply.

Coverage.

5.92 In Kerala 80% urban and 60% rural people have been covered by piped water supply by 2003-04. The over all water supply coverage is 65.2% as against 64% during 2002-03. The rural-urban coverage during 2002-03 was 58.6% and 79.2%, respectively. During 2003-04 additional population covered with protected water supply was 3.73 lakhs.

Table-5.17

Distribution of Households by source of Drinking Water NFHS-2

Sl. No.	Source	Rural (%)	Urban (%)	Total (%)
1	Piped	11.4	37.6	17.7
2	Hand pump	2.2	2.2	2.2
3	Well	83.6	60.0	77.9
4	Surface water	1.1	0.0	0.8
5	Others	1.7	0.2	1.4
	Total	100.0	100.0	100.0

Source: National Family Health Survey India 1998-99.

5.93 District-wise overall coverage of drinking water vary from a high level of 89.9% in Ernakulam to a low level of 48.9% in Kozhikode. In rural coverage also Ernakulam stands top with 91.3% and Kozhikode is at the bottom with 34.4%. Urban coverage is highest in Kottayam district with 97.6% and lowest in Wayanad with 50.1%. District-wise rural-urban population covered by piped water supply as on 1.4.2004 is given in Appendix.5.10.

5.94 Drinking water coverage measured from supply side and demand side give different coverage data. Supply side coverage is based on the capacity of the water supply system while the demand side coverage is based on actual consumption from potable source. Demand side data on distribution of house holds by sources of drinking water in 2001 census and NFHS-2 are given in Tables 5.16 and 5.17.

5.95 There is large rural – urban difference in sources of drinking water. For instance, as per NFHS-2, households covered with piped drinking water is 38% in urban areas but only 11% in rural areas. But according to census 2001, 40% of urban and 14% of rural area is covered by pipe water. Again as per census 2001, in Kerala, 71.6% households have drinking water within premises, 16.4% have drinking water near premises and 12% households have drinking water away from premises.

5.96 As per NFHS-2 (1998-99) ninety percent of households either have a source of drinking water in their residence/yard or can collect drinking water in less than 15 minutes. Similarly significant proportion of households purify drinking water by some method (71% in urban areas and 58% in rural areas) and the most common method is boiling.

Table-5.16

Distribution of Households by source of Drinking Water in Kerala – Census 2001.

Sl. No.	Source	Rural (%)	Urban (%)	Total (%)
1	Tap	13.9	39.9	20.4
2	Hand pump	1.1	1.0	1.1
3	Tube well	1.8	2.0	1.9
4	Well	77.2	56.0	71.9
5	Others	6.0	1.1	4.7
	Total	100.0	100.0	100.0

Source: Census of India 2001.

Habitation-wise status of Water Supply.

5.97 According to a survey by the Rajiv Gandhi National Drinking Water Mission in 1992, out of 9776 habitations in Kerala, 2289 habitations were non-

covered, 7422 were partially covered and 52 were fully covered with drinking water. Also 13 habitations were in inaccessible forest areas and not covered with drinking water. In 2004, there are no non-covered habitations. Habitation-wise status of water supply coverage for the last five years is given in Table.5.18

Table-5.18
Habitation-wise status of Water Supply Coverage.

Year	Fully covered	Partially covered	Non covered	Forest Area
1999-2000	1994	6927	842	13
2000-01	1994	6964	805	13
2001-02	2091	6889	783	13
2002-03	2091	7444	228	13
2003-04	2112	7651	0	13

Source: Kerala Water Authority.

5.98 Though coverage of water supply has been extended to all habitations by 2004, in 7651 habitations, water supplied is less than the stipulated norm of 40 lpcd, Table.5.19. shows the supply level of water per day.

Table-5.19
Habitation-wise Water Supply level as on 1.4.2004.

Quantity of Supply	Habitation (Nos.)
Below 10 lpcd	1835
Between 10 lpcd and 20 lpcd	2975
Between 20 lpcd and 30 lpcd	2040
Between 30 lpcd and 40 lpcd	801
Above 40 lpcd	2112
Sub Total	9763
Non covered, Forest Area	13
Total	9776

Source: Kerala Water Authority.

Water Supply Schemes in Operation.

5.99 Kerala Water Authority has 1855 water supply schemes in operation as on 1.4.2004. It consists of 59 Urban Schemes, 909 Rural Multi Panchayat schemes and 887 Rural Single Panchayat Schemes. During 2003-04, 4 major schemes (1 Urban and 3 Rural) have been commissioned. District-wise details of water

supply schemes in operation are given in Appendix.5.11.

Service Connections and Street Taps.

5.100 Kerala Water Authority has 9.35 lakh service connections and 1.80 lakh street taps as on 1.4.2004. This is against 8.71 lakh connections

and 1.72 lakh street taps as on 1.4.2003. It shows that 0.64 service connections and 0.08 lakhs street taps were provided newly during 2003-04. Similarly out of the total service connections, 8.64 lakh (92.4%) are domestic and out

of the total street taps 75.8% are in rural areas. Category-wise water connections as on 1.4.2004 is given in Table.5.20. and District-wise details are given in Appendix.5.12.

Table-5.20

Service Connections and Street Taps by Kerala Water Authority as on 1.4.2004.

Sl. No.	Category	Number
1	Service Connections	
	(i) Domestic	864262
	(ii) Non Domestic	70019
	(iii) Industrial	841
	Total:	935122
2	Street Taps	
	(i) Rural	136616
	(ii) Urban	43552
	Total	180168

Water Tariff and Revenue.

5.101 Water Tariff rate in Kerala was revised last in 1999 and it is shown in Appendix.5.13. Total revenue collected from water charges during 2003-04 is Rs.115.68 crores as against Rs.105.78 crores during 2002-03. Out of the total revenue collected during 2003-04, 71.8% was from service connections and 28.2% was from street taps. Similarly Rs.74 crores (64%) was from Urban Schemes and Rs. 41.7 Crores (36%) was from rural schemes. Within rural schemes Rs.25.3 crores was from multi panchayat schemes and Rs.16.4 crores was from single panchayat schemes. Details of income from water charges from 1999-2000 onwards are given in Appendix.5.14.

5.102 There are about 9.5 lakh consumers. In four city Corporations and eight major Municipalities, water billing and revenue collection has been computerised. As a result consumers covered by computer billing is 65 percent. Bi-monthly billing has been implemented in 3 city Corporations and the target is to extend to eight major municipalities during 2005-06. Similarly computerised network system interconnecting all the eight revenue collection centres under P.H. Division Thiruvananthapuram and Government agency 'FRIENDS' is targeted for 2005-06.

Arrears of Water Charges.

5.103 Arrears of water charge is a major problem of the Kerala Water Authority. As on 1.4.2004, dues from various category of consumers amount to Rs.410.82 crore. Out of it 62% is from local governments. Table.5.21 shows category-wise arrears of water charges.

Table-5.21

Category-wise Arrears of Water Charge (as on 1.4.2004)

Sl. No.	Consumer Category	Amount (Rs. in crores)	Percentage
1	Domestic	49.03	11.93
2	Non-Domestic	91.53	22.28
3	Industrial	15.35	3.74
4	Panchayat	125.43	30.53
5	Municipality	69.25	16.86
6	Corporation	60.23	14.66
	Total	410.82	100.00

Plan and Non-Plan Expenditure of Kerala Water Authority.

5.104 Total expenditure of Kerala Water Authority was Rs.420.15 crores during 2003-04. Out of it Rs.140.58 crore (33.5%) was under plan and Rs.279.57 crore (66.5%) was under non-plan. Under non-plan 38% is spent for salary and establishment, 30% for power, 12% for operation and maintenance and 12% for interest on loans. Category-wise expenditure of Kerala Water Authority is given in Table.5.22

Table-5.22

Plan and Non-plan Expenditure (2001-02 to 2003-04)

Sl. No.	Category	Expenditure (Rs. crores)		
		2001-02	2002-03	2003-04
	A. Plan			
1	State Plan	39.65	51.06	51.63
2	ARP Schemes	42.33	43.32	41.97
3	LIC/HUDCO Aided Schemes	41.40	37.06	33.61
4	Others (AUWSP/PMGY)	--	14.16	13.37
	Sub Total	123.38	145.60	140.58
	B. Non-Plan			
1	Salary & Establishment	95.61	102.59	105.51
2	Power Charges	74.38	81.00	84.00
3	Operation & Maintenance	31.07	31.31	32.85
4	Repayment of Loans	20.26	9.29	18.58
5	Interest on Loans	35.67	35.21	32.90
6	Others	6.49	5.66	5.73
	Sub Total	263.48	265.06	279.57
	Total (A+B)	386.86	410.66	420.15

5.105 Non-plan grant from Government and water charges are the revenue of the KWA for meeting the operation and maintenance costs. These costs are going up due to increase in salary, pension, material costs and electricity cost. Repayment of HUDCO and LIC loans and interest also increase liability. There has been no increase in water rate since 1999 while electricity charge has been increased three times. More over, KWA is classified with industries by KSEB. KWA has somewhat improved revenue collection from Rs.78 crores in 1999-2000 to Rs.115 crores in 2003-04 but a great deal more remains to be done. Even now, Authority is unable to pay electricity charge to KSEB. Accumulated dues come to Rs.196.90 crores as on 30.9.2004. Receipts of KWA from various sources from 1999-2000 to 2003-04 are given in Appendix.5.15

5.106 Due to inadequacy of fund, operation and maintenance is poor and it ultimately result to breakdown and distribution loss. Several old water supply schemes need replacement of pipelines, motor pumps and improvement to treatment plants and electrical installation. There are 30 years old pumping mains and pipe lines which need replacement to protect road surface and control distribution loss. About 40 percent water produced is lost in distribution due to old and damaged pipes.

5.107 Increase in maintenance and operation costs, and high distribution loss increase the revenue deficit of KWA. The Revenue deficit of KWA since 1999-2000 is shown in Table below.

Table-5.23

Revenue Deficit of KWA

Year	Revenue Deficit (Rs.crores)
1999-2000	92.83
2000-01	109.80
2001-02	116.13
2002-03	106.39
2003-04	120.27

5.108 Revision of tariff rate and increase in non-plan grant are only short-term relief measures. What KWA needs is long term sustainable measures to overcome the crisis as recommended by the detailed study made by the Planning Board in 2002 and accepted by the Government. An MoU was to be signed between the government department concerned and KWA, but this has not been done so far. The measures to be taken include (i) identify the projects nearing completion and prioritise and commission these projects in as short a time as possible to avoid further cost over runs. (ii) Detect non metered supply and initiate appropriate measures to collect water charge, starting with all urban areas (iii) intensify arrear revenue collection including revenue from LSGS (iv) complete the transfer process of single panchayat KWA schemes to LSGs (which was ordered for about four years ago) (v) prioritise old major water supply schemes and effect needed replacement. (vi) Intensify reform measures and improve management system and control expenditure. (vii) Increase in tariff rate and non plan grant to bridge the deficit, if any on the basis of improvement of performance and MoU.

5.109 In addition to state plan schemes, Kerala Water Authority implements several other schemes such as centrally sponsored ARWSP/AUWSP, LIC, HUDCO and NABARD assisted schemes as also externally assisted projects. Under all these categories together there are 1609 ongoing water supply schemes which consists of 1555 rural and 51 urban. District-wise and category-wise details are given in Appendix 5.16..

Externally Aided JBIC Assisted Kerala Water Supply Project.

5.110 A package of five Water Supply schemes was approved for loan assistance by the Overseas Economic Co-operation Fund (OECF) of Japan (now the Japan Bank for International Co-operation). The project objectives are (i) augment and rehabilitate two Urban Water Supply Schemes in Kozhikode and Thiruvananthapuram and (ii) construct water supply systems for three rural regions (a) Pattuvam (b) Cherthala and (c) Meenad. The project when completed will ensure drinking water to 43 lakh people. The project originally envisaged to commence in 1997 started finally only in 2003.

5.111 The total estimated cost of the project is Rs. 1787.45crore. Out of it external assistance is Rs. 1519.38 crore and state share is at Rs. 268.07 crore. The revised year of completion is 2007. During 2004-05 an amount of Rs. 150 crore is provided. Government of Kerala have appointed the consultant, 95% of the required land has been acquired, surveys required for detailed engineering reports commenced, 90% of the detailed engineering design completed and preparation of tender documents have been completed. Government of Kerala has established a fast track project implementation mechanism to speed up various approvals and remove bottlenecks with a view to completing the project in the scheduled time by August 2007.

AUWSP Schemes

5.112 To provide safe and adequate drinking watery supply in census towns having population less than 20,000. Government of India introduced the Accelerated Urban Water Supply Programme (AUWSP) in 1993-94. Government of India grant is 50% of the original estimated cost and state government has to met the remaining 50% including excess cost if any. And the benefited community has to meet O&M of the project.

Accelerated Rural Water Supply Programme (ARWSP)

5.113 Under ARWSP 108 schemes are in progress. These schemes are designed with a percapita demand of 40 lpcd and implemented with 100% assistance from Government of India. But excess over the estimated cost has to be met by the state government. There are such 21 ongoing schemes to be completed with state funds. The number of schemes for which the state has to take on responsibility has increased due to non-completion within the period of three years (as required under the scheme) and cost over-runs.

5.114 Similarly for providing protected water supply to rural schools Government of India provide 50% of the cost under ARWSP and 50% has to be met under state plan. 749 schemes have been sanctioned and 136 schools have been provided with water supply by August, 2004. Remaining works are in progress.

LIC and HUDCO Aided Water Supply Schemes.

5.115 There are 40 Urban Water Supply Schemes in various stages of implementation taken up with the aid of LIC and HUDCO. Out of it, ten schemes are proposed to be commissioned during 2004-05. LIC provides 40% and HUDCO provides 85% of the estimated project cost as loan and the balance amount has to be met by State Government. Total government contribution for LIC/HUDCO aided water supply schemes is estimated at Rs. 30 crore.

5.116 HUDCO has so far provided loan for 18 schemes and out of these, 13 have been commissioned. Total loan sanctioned for these schemes is Rs.157.27 crores and out of it Rs.119.71 crore has been released. Outstanding loan to HUDCO in 2003-04 is Rs.51.31 crore.

5.117 LIC also provides loan for Rural Water Supply Schemes equal to 40% of the estimated cost. There are such 78 LIC aided schemes under various stages of implementation. Out of it one scheme was completed during 2003-04 and 10 are targeted for completion during 2004-05

itself. Since 1967-68 rural and urban water supply schemes were taken up with LIC loan. An amount of Rs.319.57 crores has so far been received as loan from LIC and 280 water supply schemes have been completed. Out standing loan to LIC by 2003-04 end is Rs.220.48 crores. In view of the revenue deficit, increasing portion of LIC loan in a year has to be adjusted against the instalment due for repayment, sharply reducing the funds available for schemes under implementation.

Kerala Rural Water Supply and Sanitation Project (Jalanidhi)

5.118 The Kerala Rural Water Supply and Sanitation Project has been designed based on the principles of the National Rural Water Supply Policy Reforms. The specific development objectives of the project are to:

1. Demonstrate the viability of cost recovery and institutional reforms by developing, testing and implementing the new decentralised service delivery model on a pilot basis and
2. Build the state's capacity for improved sector management in order to scale up the new decentralised service delivery model statewide.

5.119 Govt. of Kerala has created an autonomous institution, the Kerala Rural Water Supply and Sanitation Agency (KRWSA) to implement this project. Originally the project was introduced in the four districts of Kerala, Thrissur, Malappuram, Palakkad and Kozhikode. The project period is for six years from 2001. The total estimated cost of the project was Rs. 451 crore which was later down sized to Rs. 392 crore during the Mid Term Review. The project is expected to cover over 15 lakh people in 99 selected Grama Panchayats (GPs) of the four project districts. District-wise coverage of panchayats is given in Table.5.24.

Table-5.24
District-wise coverage of Panchayats

Sl. No	District	Total GPs in the District (Nos)	GPs covered by the Project	%
1	2	3	4	5
1	Thrissur	92	16	17
2	Malappuram	100	34	34
3	Palakkad	90	24	27
4	Kozhikkode	77	25	32
	Total	359	99	28

5.120 Panchayats under the project are selected in batches of approximately 15-20. Each batch has a project cycle of 27 months divided in to four phases. 3 months for pre-planning, 12 months for planning, 8 months for implementation and 4 months for post implementation.

5.121 The project tries to ensure sustainability through integrating relevant components with in the project framework itself. Four major components are;

- i) Institutional strengthening
- ii) Community Development and Infrastructure Building
- iii) State Sector Development
- iv) National Sector Development

Present Status

5.122 Jalanidhi Project is now in the fourth year of implementation and has worked with four batches of G.Ps. The project covered 5 GPs in the first batch, 25GPs with 26 projects in the second batch, 29 GPs with 33 projects in the third batch and 19GPs with 22 projects in the fourth batch. Thus 78 GPs are covered with 86 projects by fourth year, which is 78% of the end target of the project. Moreover, project is covering 8 out of the 9 Tribal projects targeted.

5.123 Batch I has completed its exit and Batch II will exit by the end of 2004-05. Batch III is in its implementation phase and will exit by mid 2005. But Batch IV is in its early planning phase. The coverage of BPL household is 44% in Batch-I, 65% in Batch- II and 47% in Batch- III.

5.124 There are already 788 functional water supply schemes covering 41859 households with the community bearing 100% of the operation and maintenance expense. At an average monthly amount of Rs. 39 per household, the community is paying a total amount of Rs.1.97 crore annually towards the operation and maintenance of these water supply schemes. Physical achievements in major components of the project are given in Table.5.25

Table-5.25

Physical Targets and Achievements as on 31-8-2004.

Sl. No	Major components	Unit	Target as on 31-8-04	Achievement as on 31-8-04	% of Achievement to target		
1	2	3	4	5	6		
i)	Institutional strengthening	1	Water Supply Schemes taken up	Nos.	1993	1733	87
ii)	Community Development and Infrastructure Building	2	Water Supply Schemes functional	Nos.	1993	767	38
		3	Latrins (new + conversion of unsanitary latrines)	Nos.	34167	46192	135
iii)	State Sector Development	4	Environment Management works (soak pits + compost pits)	Nos.	15185	32691	215
iv)	National Sector Development	5	Drainage	K.M	101	22.30	22

5.125 There are now 2347 Beneficiary Groups (BGs) . Of these 133 are in Batch I, 820 in Batch II, 1078 in Batch III and 316 in Batch IV. Similarly 815 water supply schemes are functional. Under sanitation 355354 latrines have been constructed and 13719 unsanitary latrines converted.

5.126 Project spent Rs. 114.71 crores by September end 2004 which is 70% of the target till date. Component-wise expenditure as on 31-10-2004 is given in Table.5.26

Table-5.26
Expenditure as on 31-10-2004.

Sl.No	Components	Expenditure (Rs. crores)
1	Operational Expenses	12.01
2	Sanitation and Hygiene Promotion	0.85
3	Capacity Building	1.52
4	Grama Panchayat Strengthening	3.26
5	Payment to support organisation	13.94
6	Women development Initiatives	1.01
7	Construction of physical schemes	
	i)Water supply schemes	64.03
	ii)Latrine	16.66
	iii)Drainage	1.66
	iv)Environmental Management schemes	2.51
	v)Ground water Management schemes	0.75
8	Tribal Development Programme	1.23
9	State Sector Development Programme	0.21
10	Rain Water Harvesting	0.59
	Total	120.23

5.127 Government of Kerala has adopted this approach and has approved the scaling up of this project to all fourteen districts of Kerala.

Reform Initiatives in the Rural Drinking Water Supply Sector

5.128 Government of India initiated a reform process in rural water supply sector in 1999 to gradually replace the government oriented, centralised and supply driven programme by people-oriented, decentralised, demand –driven and community based programmes. This reform initiative was implemented in 67 selected pilot districts across the country. Kollam and Kasaragod districts of Kerala are included in the selected pilot districts. Besides KWA is implementing community based Mini Water Supply Schemes as part of reform initiatives.

5.129 With the experience gained from the pilot districts, the reform initiatives are scaled up by the introduction of the programme called 'SWAJALDHARA' in December 2002 to cover the entire country. Swajaldhara scheme is implemented in the state by District Water and Sanitation Mission and the main elements of the programme are:

i) Demand driven and community participation approach

ii) Panchayats/ Communities to plan, implement, operate, maintain and manage all drinking water schemes.

iii) Partial capital cost sharing by the communities.

iv) Full operation and maintenance by the users/panchayat.

5.130 It is envisaged that gradually the entire rural water supply sector will switch over to the Swajaldhara model. As part of reform initiative Government Of Kerala had already taken action

to hand over all the single Panchayat rural water supply schemes maintained by KWA to local bodies. KWA has handed over 163 such schemes to Panchayats.

5.131 To institutionalize the reform agenda throughout the country the RGNDWM proposes to execute an MoU with each state government. The MoU will provide the frame work for all funding arrangements with government of India and also with external support agencies. Action had been initiated by the state government for finalising the MoU.

Local Government Institutions and Drinking Water Supply

5.132 Under Panchayathi Raj Act 1994/ Nagarapalika Act 1994, Local Government Institutions actively involve in providing drinking water to people. During 2003-04, all Local Government Institutions in Kerala together have set apart Rs. 4512 lakhs for drinking water. Under drinking water supply Local Government implement activities like source development, construction of source, water quality

improvement, extension of pipe line, development of existing drinking water projects, digging of new wells and renovation of old wells. During 2004-05, Local Governments have set apart Rs. 4680 lakhs for drinking water projects and out of it, Rs. 4361 lakhs have been set apart by three tier Panchayats and Rs. 319 lakhs by Urban Local Governments. Out of the total outlay for drinking water, Grama Panchayats' share is Rs. 3008 lakhs (64%) followed by Rs. 770 lakhs (16%) by District panchayats. Table-5.27 shows tier-wise outlay earmarked for drinking water projects during 2003-04.

5.133 Details of achievement under water supply, available for 2002-03 shows that Local Governments have taken up 9798 drinking water projects benefiting 1.81 lakhs people during 2002-03. Similarly 4816 projects have been implemented with beneficiary contribution. During 2002-03, 9764 new public water taps were installed and water tap connections were provided to 8133 households. To provide drinking water, 9894 wells were digged and 899 were renovated.

Table-5. 27
Local Government Institutions and outlay for
Drinking Water Supply (2004-05)

Sl.No.	LSGs	Outlay (Rs.lakhs)
1	District Panchayat	770
2	Block Panchayat	583
3	Grama Panchayat	3008
	Sub Total	4361
4	Municipalities	258
5	Corporation	61
	Sub Total	319
	Grand Total	4680