

**TECHNICAL COMMITTEE ON THE
ONGOING MAJOR AND MEDIUM
IRRIGATION PROJECTS IN KERALA**

FINAL REPORT

KERALA STATE PLANNING BOARD

AUGUST 2018

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PREFACE

In an office order dated 16-05-2017 (see Annexure 1), the Kerala State Planning Board constituted a Technical Committee to review four long-pending major and medium irrigation projects of Kerala. These four projects were (a) Muvattupuzha Valley Irrigation Project (MVIP); (b) Idamalayar Irrigation Project (IIP); (c) Karapuzha Irrigation Project (KIP); and (d) Banasurasagar Irrigation Project (BIP). The constitution of this Committee followed a high-level meeting in this regard attended by Shri Mathew T. Thomas (Minister for Water Resources), Dr. T. M. Thomas Isaac (Minister for Finance) and Dr V. K. Ramachandran (Vice-Chairman, Kerala State Planning Board) on 12-04-2017. This was part of a larger initiative of the Planning Board to evaluate large-scale infrastructure projects characterised by time- and cost-overruns. The Technical Committee was constituted as follows:

1. Chairman: Professor R. Ramakumar, Member, Kerala State Planning Board
2. Secretary (Water Resources Department)/Officer nominated by Secretary
3. Professor E. J. James, Distinguished Professor, Karunya University, Coimbatore
4. Dr. Indumathi M. Nambi, Professor, Indian Institute of Technology, Chennai
5. Chief (Agriculture Division), Kerala State Planning Board: Convenor, Member Secretary

The terms of reference of the committee were specified as follows:

1. To assess the status of implementation of the four ongoing projects – Muvattupuzha, Idamalayar, Karapuzha, Banasurasagar – and frame a schedule for their completion.
2. To assess the need and justification for ongoing works under each project and to suggest a priority based action plan (including dropping selected works that are in the preliminary stage or other works that are of relatively low benefit to agriculture and farmers).
3. Examine the possibility of categorizing the projects into three – (1) completion of the project by additional funding (2) closure of a project with minimum budgetary support so as to get full benefit of investment (3) complete closure of works/components.
4. To suggest sources of finance for completion of projects.
5. To suggest a monitoring mechanism for the time-bound completion of identified works.
6. The committee can slightly modify the scope of assessment as per requirement with the approval of State Planning Board.

Beginning from July 2017, the technical committee made at least one physical visit of each project site. Each bottleneck of the project was separately visited and studied. Discussions were

held with officials of the Irrigation Department, as well as farmers, *padasekbara samithies* and people's representatives in the regions covered.

This report of the Technical Committee is focussed on a set of objectives.



- 1) It attempts to analyse the reasons for the cost- and time-overruns in the specified irrigation projects;
- 2) It attempts to provide a plan of action and a time-frame to achieve a set of concrete objectives in the specified major irrigation projects by 2021-22;
- 3) It attempts to suggest a monitoring mechanism that could help to achieve a set of concrete objectives in the specified irrigation projects by 2021-22;
- 4) It attempts to provide recommendations that could help avoid cost- and time-overruns in the specified irrigation projects to be undertaken in the future.

The Committee would like to thank the officials of the Irrigation Department and Dr K. P. Reghunatha Menon, Director of the Kerala State Remote Sensing and Environment Centre (KSREC) for their help and assistance in the preparation of this report.

The Committee is happy to submit the draft report to the Kerala State Planning Board.

Dated 09-08-2018

Professor R. Ramakumar (Chairman)

	Ms Tinku Biswal (Member)
	Dr E. J. James (Member)
	Dr Indumathi M. Nambi (Member)
	P. Shaji, Former Chief (Agriculture Division), In-charge (Member Secretary)

CHAPTER 1

IRRIGATION PROJECTS IN KERALA

Kerala is well endowed with different water resources such as rivers, streams, ponds, lakes and springs. The State has an abundance of rainfall and 44 monsoon-fed rivers (41 west-flowing rivers and 3 east-flowing rivers). The total average annual yield of all the 44 rivers is estimated as 70323 mm³. The total utilisable yield from all these sources is estimated at 36,300 mm³.

Irrigation plays an important role in the growth of agriculture. Nationally, planned development of irrigation was initiated since the first five year plan. Irrigation development in Kerala has mostly centred on the development of surface water resources. The net irrigation water utilisation in the State is estimated as 3532 mm³ and the gross irrigation water utilisation is estimated as 8830 mm³. This is supplied from both surface and ground water resources. The groundwater usage for agriculture is estimated as 1300 mm³ (14.7 per cent) and the remaining 7530 mm³ (85.3 per cent) is the quantity utilised from surface water sources, which includes major, medium and minor irrigation structures.

River basins of Kerala

The river basins of Kerala may be categorized into different categories as below:

1. Major basins with more than 1000 sq.km area -- *Bharathapuzha, Muvattupuzha, Periyar, Valapattanam, Chaliyar, Karuwanur, Chalakkudi, Meenachil, Pamba, Achankovil, Kallada and Kabani.*
2. Basins having more than 500 sq.km area but less than 1000 sq.km area -- *Chandragiri, Kuttiyadi, Manimala, Ithikkara, Vamanapuram, Karamana and Bhavani.*
3. Basins extending over less than 500 sq.km area but more than 100 sq.km area -- *Shiriy, Chittari, Neeleswar- Kariangode, Kavvayi- Peruvamba, Kuppam, Anjarakandy, Thalassery, Mabe, Tirur, Kecheri, Neyyar and Pambar.*
4. Small coastal basins with less than 100 sq.km area -- *Manjeswaram-Uppala basin.*

Various sources of irrigation

The most important source of irrigation in the State is wells, which accounts for about 31 per cent of the total area under irrigation, followed by government canals contributing around 20 per cent. Despite the important investments made over the years in canal irrigation, the area under canal irrigation has not increased much. Data on the area irrigated by different sources of irrigation in Kerala are given in Table 1. The dependence on canal irrigation is highest (in terms of area) in Palakkad, Thrissur and Ernakulam districts. Dependence on wells (open and bore) is highest in Palakkad, Thrissur and Kasragode districts.

Table 1
Share of area irrigated by different sources of irrigation in Kerala, 2011-12 to 2015-16, in %

Sl. No	Source of irrigation	Area irrigated (ha)				
		2011-12	2012-13	2013-14	2014-15	2015-16
1	Government canals	20.0	20.4	20.1	20.7	21.5
2	Private canals	0.5	0.6	0.4	0.3	0.2
3	Tanks	11.5	11.0	11.4	11.4	11.7
4	Wells	33.6	30.9	31.4	32.2	32.3
5	Other sources	34.5	37.1	36.7	35.5	34.4
6	Total	100.0	100.0	100.0	100.0	100.0

Source: Department of Economics and Statistics, GoK

Investment in irrigation

As mentioned, irrigation development policies in Kerala are mainly centred around the development of surface water resources. Irrigation development in Kerala started with investments in major and medium irrigation projects and has since received significant fund flow throughout the Five Year Plans. About 60 to 70 per cent of the investment under irrigation in each plan of the State was earmarked for major and medium irrigation projects. However, the long term returns that could be realized from this investment have been called into question, both in terms of financial recovery of the projects and in terms of the intended crop benefits.

Irrigation projects are classified according to the ayacut served by the schemes. The irrigation schemes having a command area greater than 10,000 ha are classified as major irrigation schemes; a medium irrigation scheme is expected to serve a command area spread between 2000 ha to 10,000 ha; and the irrigation schemes with a command area below 2000 ha are categorised as minor irrigation schemes. Till date, Kerala has completed 19 irrigation projects and 4 projects (the four under the consideration of this committee) are under different stages of execution. The

gross ayacut area of completed projects is 517,532 ha and net ayacut area of completed projects is 277,888 ha.

Table 2
Completed Irrigation Projects in Kerala, area in ha

Sl. No.	Name of projects	Districts	Year of Start	Year of completion	Ayacut net area	Ayacut gross area
1	Neyyar	Thiruvananthapuram	1951	1973	15380	23480
2	Pampa	Pathanamthitta	1961	1992	21135	49456
3	PeriyarVally	Ernakulam	1956	1994	32800	65600
4	Chalakkudy	Thrissur	1949	1966	19690	39380
5	Vazhani	Thrissur	1951	1962	4226	4647
6	Cheerakuzhy	Thrissur	1957	1973	1620	3240
7	Malampuzha	Palakkad	1949	1966	20553	41106
8	Peechi	Thrissur	1947	1959	18759	28080
9	Mangalam	Palakkad	1953	1966	3440	6616
10	Walayar	Palakkad	1953	1964	3997	6872
11	Meenkara (Gayathri Stage I)	Palakkad	1956	1964	3035	6070
12	Chulliyar (Gayathri Stage II)	Palakkad	1961	1970	2430	4860
13	Pothundy	Palakkad	1958	1971	4685	9370
14	Chitturpuzha	Palakkad	1963	1992	15700	29202
15	Kuttiady	Kozhikode	1962	1993	14570	35850
16	Chimoni	Thrissur	1976	1996	13000	26000
17	Kallada	Kollam	1961	2004	61630	92800
18	Kanjirapuzha	Palakkad	1961	1995	9713	21853
19	Pazhassi	Kannur	1961	1992	11525	23050

Source: Department of Water Resources, Government of Kerala.

Rationale for the Technical Committee

The four ongoing irrigation projects in Kerala - Muvattupuzha, Idamalayar, Karapuzha and Banasurasagar – were started in the 1970s and 1980s. However, their construction is still continuing with time and cost overruns (see Tables 3 and 4).

Table 3
Details of the ongoing major/medium irrigation projects in Kerala

Sl. No	Name of project	Districts covered	Year of commencement	Targeted gross area to be irrigated (in ha)
1	Muvattupuzha Valley Irrigation Project	Ernakulam, Idukki	1974	35,619
2	Idamalayar Irrigation Project	Ernakulam, Idukki, Thrissur	1981	29,036
3	Karapuzha Irrigation Project	Wayanad	1978	8,721
4	Banasurasagar Irrigation Project	Wayanad	1979	3,825

Source: Department of Water Resources, Government of Kerala.

As Table 4 shows, the four projects were initiated between 1974 and 1981 with an original estimate of less Rs 21 crore each. The total original estimate of these four projects together was Rs 54.31 crore. However, by March 2017, the total expenditure on the four projects (still incomplete) had reached a staggering level of Rs 1661 crore. Such a diversion of resources raises serious questions on governmental efficiency in the conception and completion of large-scale irrigation projects. These amounts could be better utilized in the development of other major/medium irrigation projects and also minor irrigation projects. It is in this context that the Kerala State Planning Board appointed this Technical Committee.

As per the suggestion of the Minister for Water Resources, the Kerala State Planning Board organised a meeting on 12-04-2017 with the objective of undertaking a concurrent and retrospective evaluation of these four ongoing long pending irrigation projects. It was decided at the meeting to examine the circumstances under which these projects were initiated and benefits expected from the projects, and evaluate the present position of these schemes by exploring the need for redesigning the project objectives. Accordingly, the Kerala State Planning Board constituted a five member Technical Committee (vide order No. 99/2017/Agri/SPB, dated 16-05-2017) for evaluating these four projects.

Table 4
Cost estimates for the four irrigation projects under consideration

Name of Project	Year of starting	Original Estimate (Rs crore)	Revised Estimate (Rs crore)	Expenditure as on 31.03.2017 (Rs crore)
Muvattupuzha Valley Irrigation Project	1974	20.86	945.00 (2015 DSR)	958.00
Idamalayar Irrigation Project	1981	17.85	107.00 (1992 SOR)	333.00
Karapuzha Irrigation Project	1978	7.60	560.00 (2014 DSR)	315.90
Banasurasagar Irrigation Project	1979	8.00	185.50 (2010 SOR)	54.01

Source: Department of Water Resources, Government of Kerala.

CHAPTER 2

BANASURASAGAR IRRIGATION PROJECT

The Banasurasagar Irrigation Project (BIP) is a medium irrigation project in Wayanad District. The BIP is located in the basin of Karamanthodu, which is a tributary of Panamaram River, which in turn is a tributary of Kabani River, which ultimately joins with the Kaveri River. Karamanthodu originates from two hills viz. Kakkanmalai and Modgiri in the Western Ghats.

Wayanad District is mostly hilly in terrain. The major crops grown are paddy (in the valleys), and pepper, coffee, banana, vegetables, ginger and other cash crops (in the plains as well as hill slopes). Only a single crop of paddy is raised in the district. The terrain being hilly, rainwater flows quickly and floods the rivers; as soon as the rain recedes, rivers become dry. Hence the only solution was to build a storage dam and distribute water through canals.

The Banasurasagar dam was constructed by the Kerala State Electricity Board (KSEB) in 1973 mainly for the Kuttiyadi Augmentation Scheme. Out of the 6.7 TMC of water storage capacity in the reservoir, 5 TMC of water is diverted to the Kuttiyadi Hydro-Electric Scheme. The remaining 1.7 TMC water is available for the BIP. The entire project lies within the boundaries of Kerala State.

The BIP was originally proposed to irrigate 1900 ha of paddy during the first crop and 1900 ha during the second crop in the Vythiri and Mananthavady taluks of Wayanad district. The aim was to enhance the then productivity of paddy from 2850 kg/hectare to 4800 kg/ha in the first crop and 5800 kg/ha in the second crop. It was also aimed at expanding banana, ginger and vegetable cultivation to 800 ha, 60 ha and 40 ha respectively. For such an expected cropping pattern, the expected total water requirement was 1.70 TMC.

The first revised project report was submitted to the Government of India (GoI) in 1977. On scrutiny, GoI raised certain comments on the DPR citing Kaveri water disputes and forwarded it to the GoK in 1986. The Project Report was placed before the Kaveri Water Disputes Tribunal by GoK with a requirement of 1.70 TMC ft of water. The Kaveri Water Disputes Tribunal in its award on 5th February 2007 allocated only 0.84 TMC ft of water for 2800 ha of 1st crop of paddy and 500 ha of 2nd crop of paddy. This 0.84 TMC ft of water is the amount of water available for distribution through the BIP. The total ayacut area of 2800 ha of the project falls into 6

panchayats: Padinjaraathara (1025 ha), Panamaram (780 ha), Vellamunda (710 ha), Kottathara (210 ha), Thariyode (25 ha) and Vengapally (50 ha).

Figure 1 and 2 show the canal network of the BIP. While Figure 1 is a satellite map of the canal network, Figure 2 is a cut-off diagram of the canal network. The main canal originates from the reservoir, and is about 2.73 km long. From a collection chamber located at the tail end of the main canal, the main canal splits into two branch canals: the Padinjaraathara branch canal (which is about 9.03 km long) and the Venniyode branch canal (which is about 5.39 km long).

In all, 14 distributories are planned in the BIP. Two of these distributories (Kappumkkunnu and Peral) take off from the main canal itself. The rest 12 distributories take off from either of the two branch canals. Of these 12 distributories, 6 distributories take off from the Padinjaraathara branch canal and 6 distributories take off from the Venniyode branch canal.

Figure 1 *Satellite diagram of the canal network of the Banasurasagar irrigation project*

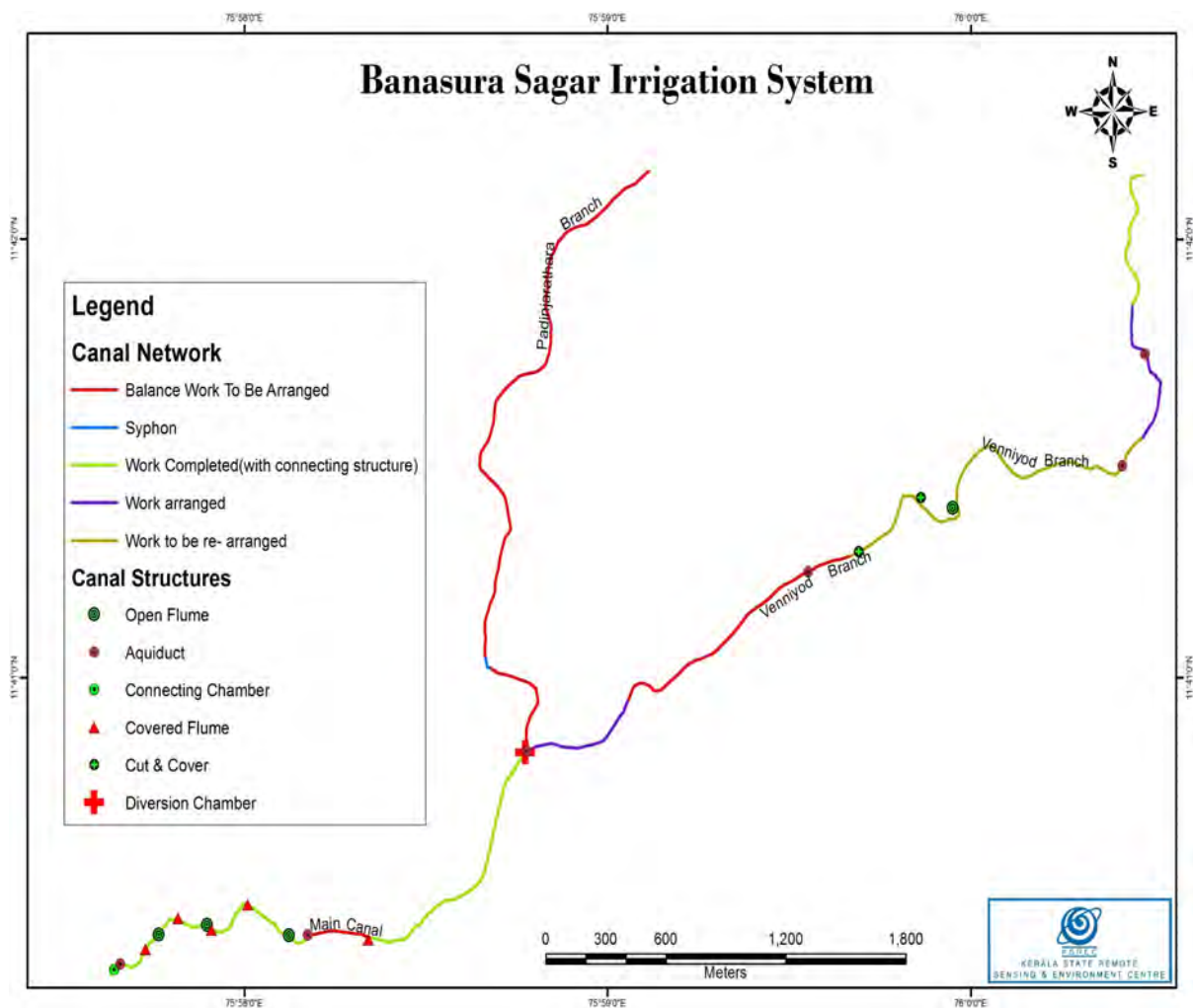


Figure 2 Cut-off diagram of the Banasurasagar irrigation project

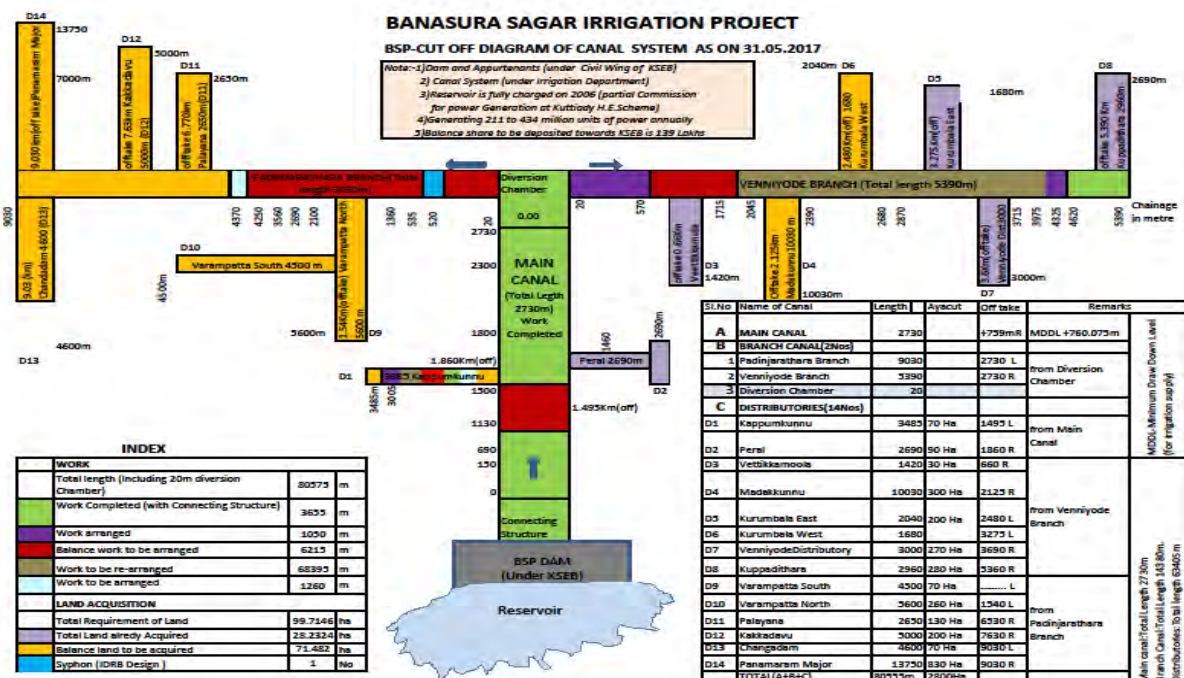


Figure 3 and Table 5 show the distribution of command area across the canal network. Figure 3 provides a satellite-generated diagram that shows the catchment area under each branch canal. The Venniyode branch network has the largest command area of 3,190,336.61 m² and the Padinjarethara Branch has a lower command area of 420,805.21 m². The Main Canal command area is about 615,625.55 m².

Table 5 Distribution of command area in the canal network of the Banasurasagar irrigation project

Sl. No.	Name of the canal	Command Area (ha)
1	Venniyode Branch	319.03
2	Main Canal	61.56
3	Padinjarethara Branch	42.08
4	Total area	422.67

Source: Kerala State Remote Sensing and Environment Centre, Trivandrum.

Figure 3 *Command area under the branch canals of the Banasurasagar irrigation project*

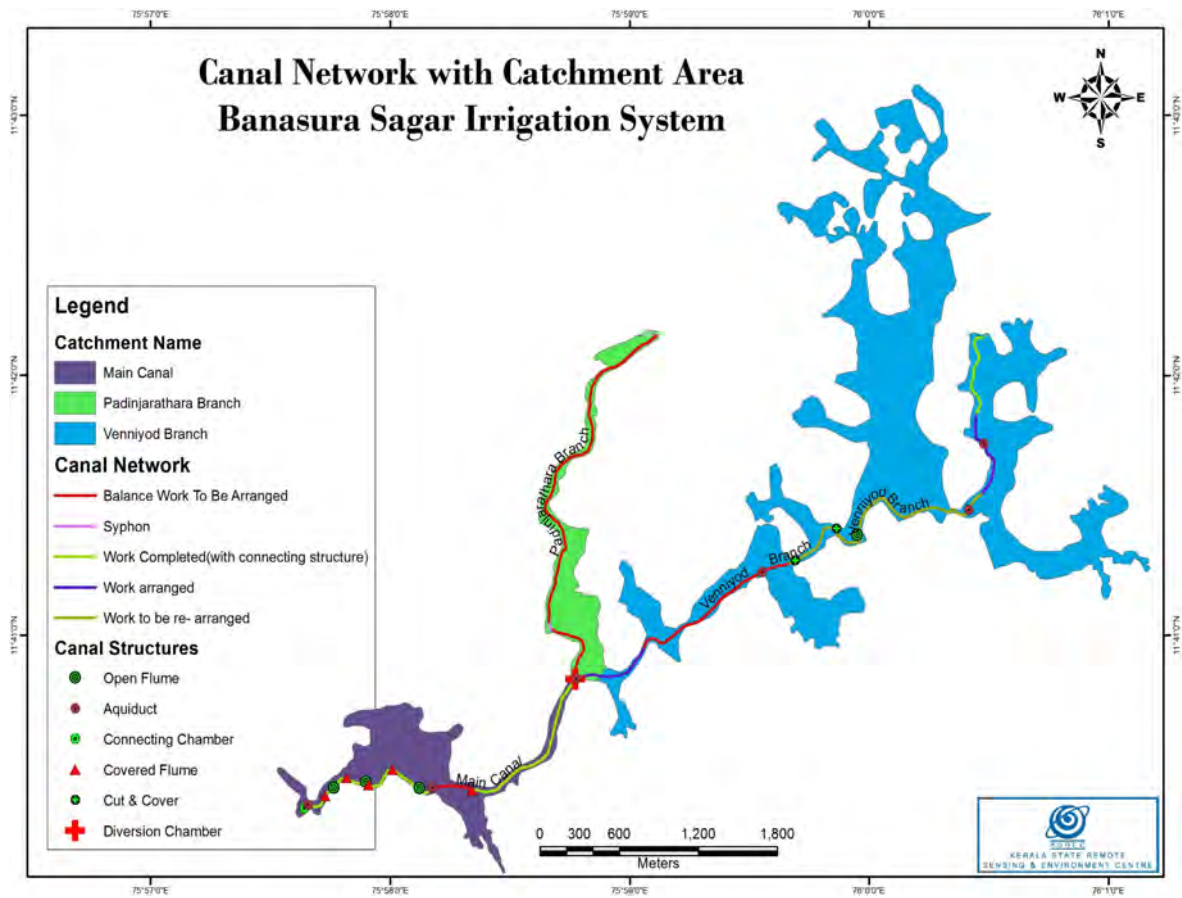


Figure 5: *Canal Network with*

Table 6 shows details of the total paddy area within the command area. The Venniyod Branch command has the largest paddy area of about 1,969,673.5 m². Padinjarathara Branch command has a lower paddy area of about 318,117.13 m². The remaining Main Canal command area has about 356,820.85 m² paddy area.

Table 6 *Distribution of paddy area within the command area of canals in the Banasurasagar irrigation project*

Sl. No	Name of the canal/branch canal	Paddy Area (ha)
1	Main Canal	35.68
2	Padinjarathara Branch	31.81
3	Venniyod Branch	196.96
4	Total Command Area under Paddy	264.46

Source: Kerala State Remote Sensing and Environment Centre, Trivandrum.

The details of the command area under each distributary are provided in Table 7.

Table 7 *Distribution of command area under the canal system of Banasurasagar irrigation project, in m and ha*

SI No	Name	Length (m)	Command area (ha)
1	Main canal	2730	-
2	Padinjarathara Branch canal	9030	-
3	Venniyod Branch canal	5360	-
4	Kappumkunnu Distributary	3485	70
5	Peral Distributary	2690	90
6	Veettikkamoola Distributary	1420	30
7	Madakkunnu Distributary	10030	300
8	Kurumbala East	1680	200
9	Kurumbala west	2040	
10	Venniyode Distributary	3000	270
11	Kuppadithara Distributary	2960	280
12	Varampatta South	4500	70
13	Varampatta North	5315	260
14	Palayana Distributary	2650	130
15	Kakkadavu Distributary	5000	200
16	Changadam Distributary	4600	70
17	Panamaram Major	6950	830
	Total Ayacut Area		2800

Source: Department of Water Resources, Government of Kerala.

PROGRESS AND ISSUES

The main canal

Despite years of construction work and spending, the BIP remains a non-starter. Not a drop of water has flown through the main canal because the work on the main canal itself has not been completed. Construction of the main canal has been completed only between 0 m and 1130 m and between 1500 m and the diversion chamber. The stretch of the main canal between 1130 m and 1500 m has remained incomplete over many years. This has meant that the water cannot be taken to even the two distributaries that originate from the main canal at 1500 m (Kappumkunnu) and 1860 m (Peral).

The non-completion of a 370 m stretch in the main canal, across which an aqueduct has to be constructed and which passes on top of two major roads, has been for the following reasons. The work for the main canal had been arranged with M/S Chandragiri Construction Company based on the design approved by the IDR. The work began on 21-10-2004 and the time frame provided was 18 months. After the initiation of the work, the company was given an extension till 31-03-2008. The work was not completed even by March 2008. However, the company has not submitted any application for the renewal of the contract afterwards. In letters written to the Irrigation Department, the company stated that the market prices of cement and steel had

increased considerably, and that the ban on sand mining in Wayanad district had raised the cost of sand considerably. The company demanded a revision of costs due to the higher prices of steel, cement and sand based on the latest SOR, without which it would terminate the work without risk and cost. The department has not yet approved the revised estimate demanded by the company.

Discussions with officials of the Irrigation Department have revealed that there was much to be desired in the way the department too dealt with the work. First, between 2004 and 2008, extension of time was awarded to the contracting company even though it had not completed many stipulated works within the time frame provided. Secondly, a change of foundation design (related to the height of piling) was introduced within the 370 m stretch under consideration. In this stretch of the main canal, the Tharuvana-Vythiry Road passes between the piers P10 and P11. In the original design, the span between the piers was 15 m and the structure was to be an “open foundation”. However, this 15 m span between the piers was found insufficient to accommodate the proposed widening of the road by KSTP (PWD). Accordingly, the span between P10 and P11 was increased to 20 m. In the new design issued by the IDR, the structure was to be “pile foundation” in place of “open foundation”. Alongside, the counterfort abutment also changed, as the road needed deepening and reformation works as per road specifications. All these changes, approved by the IDR, were incorporated into a revised estimate and submitted to the Chief Engineer (P1) in Kozhikode. However, even before the revised estimate was approved, in anticipation of approval, the contracting company was allowed to continue work as per the new design. By March 2008, all the foundation works were completed, and the pier construction between piers 12 and 20 was partially completed.

These issues have led to a case in the court between the government and contractor, which remains unsettled till date. Due to the delays in the completion of work, the department terminated the contract at the risk and cost of the contractor (vide order number D5-300/08 dated 22-03-2016). Challenging the order, the contractor filed a petition before the High Court of Kerala (vide WP[C] 16685/2017). Due to this pending case, where the court has ordered the maintenance of *status quo*, the construction over the 370 m stretch in the main canal has stopped since the year 2008.

This is an extremely unfortunate situation because this small bottleneck in the main canal has meant that not a drop of water has flown through the main canal since the project began. The Technical Committee would like to express its deep anguish at the way this issue has been allowed to persist without resolution for over a decade. Neither have satisfactory steps been taken to resolve the outstanding issues with the company, nor has there been any urgency displayed in approving the revised project design.

We recommend that the government should urgently settle the outstanding issues related to this stretch in the main canal. In our view:

(a) Government should take steps to ensure early disposal of the case with M/S Chandragiri Construction Company; and

(b) The Department should approve the revised estimate for the stretch between 1130 m and 1500 m so that the work can be completed.

(c) We also recommend that work on the Kappumkunnu and Peral distributaries from the main canal be completed at the earliest after completing the formalities of land acquisition in Kappumkunnu.

When these tasks are completed, the main canal of length 2730 m will be ready and water can flow up to the diversion chamber.

Padinjarathara branch canal

As mentioned, the Padinjarathara branch canal has, relatively, less command area compared to the Venniyode branch canal. This branch canal has a total envisaged length of 9030 m with six distributaries. Land acquisition has been completed for a total length of 4370 m. Land acquisition remains to be completed for the remaining 4660 m.

Work on the Padinjarathara branch canal has only been partially complete from 20 m (when the branch canal actually begins after diversion) till 4250 m (see Figure 2). The fully completed stretches within the branch canal are: (a) from 43.50 m till 174.60 m; (b) from 1486.40 m till 1536.90 m; and (c) from 1545.40 till 1561.40 m. This constitutes a total length of aqueducts of about 197.60 m. This apart, work on another 181.70 m has also been completed under cut and cover or flume (a) between 2093.60 m and 2185.30 m; and (b) between 2407.80 m and 2497.80 m. The rest of the work is largely in the nature of partial constructions of mass piers and trestle piers.

There are two major bottlenecks in the Padinjarathara branch canal. The first bottleneck is between 543.30 m and 568.30 m. The Padinjarathara-Kuppadithara road was constructed by the panchayat across the alignment of the branch canal after the design of the branch canal was approved. As a result, the Irrigation Department has suggested a new syphon-based design for the branch canal to cross the road. This new design, which is absent in the original design, has been sent for approval to the IDR, but the approval has not yet been received.

The second bottleneck is between 2100 m and 2690 m. In the original design of the branch canal, the portion from 2100 m to 2515 m (415 m) was proposed to be covered flume and from 2515 m to 2690 m (175m) was proposed to be open flume. This work was assigned in 2006 to M/S Chandragiri Construction Company and was to be completed in 18 months from February 2007. However, in an unfortunate incident, there was a landslide accident at the site on the 26th of January 2008 in which three workers died. After examinations of the site by the Chief Technical Examiner, the government decided to terminate the contract with M/S Chandragiri Construction Company under the risk and cost of the contractor. The Chief Engineer (P1) has since then submitted a new proposal that has two components: (a) dismantling the partially constructed covered flume at 2100 m; and (b) proceeding with the balance work between 2100 m and 2690 m consisting of covered flume and open flume. This new proposal was submitted as per the suggestions made by the Technical Sanction Committee of Chief Engineers held on 09-03-2015. Technical sanction for this new proposal was received (vide order number D5-

509/2013, dated 12-06-2015) from the Superintending Engineer, Project Circle, Kannur. However, the demolition work has not yet begun.

The Technical Committee visited the bottleneck sites and had detailed discussions with the officials of the Irrigation Department. Based on these discussions, we recommend the following.

(a) The approval for the revised syphon-based design of the Padinjarathara branch canal needs to be urgently accorded by the IDRIB and the work has to be completed at the earliest.

(b) Work on the Padinjarathara branch canal may be terminated at the site of the accident viz., at 2300 m. In our view, dismantling the partially constructed portions of the branch canal and completing construction of the branch canal up to 2690 m is an extremely complicated and difficult task to achieve. Moreover, our analysis of the command area in the Padinjarathara branch canal network shows that the area that could be irrigated is also likely to be small (see Figure 4).

(c) In line with our larger recommendation of not acquiring any additional land, we recommend scrapping of the following distributaries as well: Varampatta North distributary, Varampatta South distributary, Palayana distributary, Kakkadavu distributary, Panamaram Major distributary and Changadom distributary.

(d) Between 20 m and 2100 m in the Padinjarathara branch canal, the department should explore the construction of maximum numbers of sluices to ensure that water can be diverted into the natural waterways on either sides.

Venniyode branch canal

The Venniyode branch canal has an originally envisaged length of 5390 m with six distributaries. All the works in the Venniyode branch canal are currently incomplete. Given that significant command area exists within its ambit, the focus on completing the remaining work on the canal is of paramount importance.

The first stretch of work in the branch canal is from 20 m till 1730 m. Here, on the stretch between 20 m and 570 m, while land acquisition is complete, only the foundation work has been completed till now. Between 570 m and 1715 m, which essentially includes covered flume and CD works, work has been obstructed because a section of the households living in the vicinity have been protesting against the blasting of hard rock during the construction process. As a result, work on the stretch extending from 20 m till 1730 m has been withheld. In particular, this withholding of work is in line with a state government circular (number 60/2008 dated 08-10-2008).

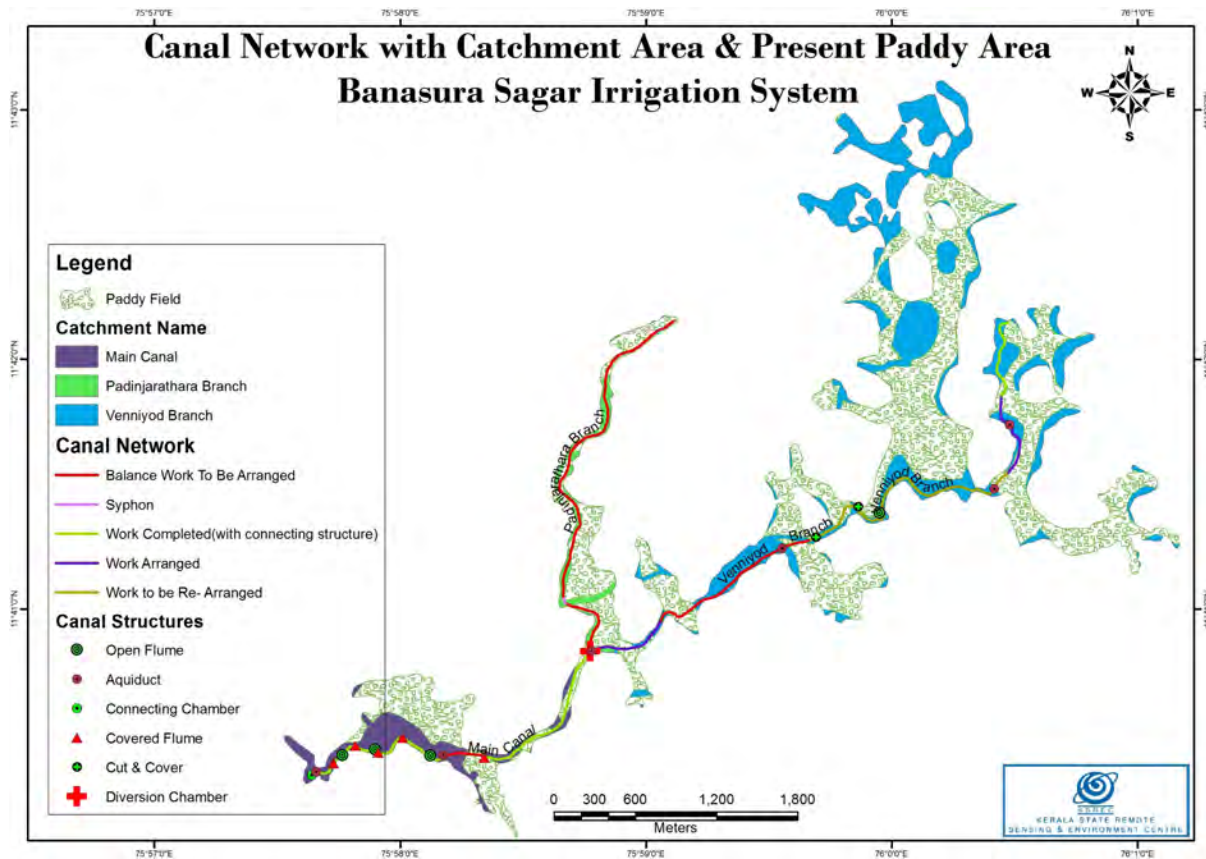


Figure 4 Canal network with catchment area and paddy area, Banasurasagar irrigation project

The second stretch of work in the branch canal is between 1730 m till 4620 m. Land acquisition is complete, and no work has begun. This has been primarily because of the obstruction of work between 570 m and 1715 m.

The third stretch of work in the branch canal is between 4620 m and 5390 m. The major source of obstruction in this stretch has been related to opposition from the households living in the vicinity. The branch canal is designed to cross the Bankukunnu-Kottukulam road, and there is a need to reduce the height of the road to allow the canal to pass through. Households living near the road have not allowed the work to proceed. As a result, the department has proposed a new alignment design for the canal after consultations with the public and the panchayat authorities. This revised estimate is still under preparation.

The Technical Committee regards the lack of progress of work in the Venniyode branch canal as deeply disappointing. There has to be a sense of urgency to complete the work based on a strictly followed timeline. The Committee would like to recommend the following.

- (a) **The department has to immediately initiate discussions with the households opposing the hard rock blast in the stretch between 570 m and 1715 m. If persuasion does not succeed, the department should explore ways to bear the costs of relocating the affected households for the period of the blast, with the written assurance that any potential damage to the houses will be compensated for. Based on this, work on the stretch between 20 m and 1715 m should be completed.**

(b) The work on the stretch between 1715 m and 4620 m should also be completed as and when work on the previous stretch is completed.

(c) The new design for the stretch between 4620 m and 5390 m has to be approved at the earliest and work should be initiated as soon as the work on the stretch till 4620 m is completed.

(d) In line with our larger recommendation of not acquiring any additional land, we recommend scrapping of the following distributaries: Madakkunnu distributary and the Kurumbala West distributary.

Gains from our recommendations

As per the DSR 2016, the revised estimate for the project was Rs 390 crore. The proposed command area of the project is 2800 ha. If our recommendations are accepted, we assess the following gains. These are approximations but are indeed close to reality.

The total financial gain from accepting our recommendations is estimated at Rs 303.61 crore. Of this, Rs 190.82 crore is from avoiding land acquisition and Rs 112.79 crore is from avoiding construction work including investigations. If our recommendations were accepted, the total command area for the project would be 840 ha. This estimate of the command area does not include areas that could be irrigated from sluices opened from the Padinjarathara branch canal.

CHAPTER 3

KARAPUZHA IRRIGATION PROJECT

The Karapuzha Irrigation Project (KIP) was the first medium irrigation project in the Kabini sub-basin of Kaveri river; Kabini river is a tributary to the Kaveri river. The Kabini originates in the confluence of the Panamaram river and the Mananthavady river, and flows eastward to join the Kaveri river in Karnataka. Karapuzha, an east flowing river, joins the Panamaram river. The catchment areas of Karapuzha and Panamaram rivers are entirely within the State of Kerala.

The KIP begins with an earthen dam with a concrete spillway at Vazhavatta across the Karapuzha river. The reservoir of the KIP is originally designed to store 76.5 mm³ of water with a live storage capacity of 72 mm³ of water. The project was envisaged to irrigate a net ayacut area of 5221 hectare across the Vythiri, Sultan bathery and Mananthavady taluks of Wayanad district. In addition, the KIP also caters to the drinking water requirements of the Kalpetta municipality and a set of adjoining panchayats.

The Government of Kerala had first included the KIP in the Fifth Five Year Plan. The project started in 1974 and was approved by Planning Commission in April 1978. Accordingly, the Government of Kerala, in July 1978, accorded administrative sanction to the KIP for an amount of Rs 7.6 crore envisaging irrigation to a command area of 5600 ha, with an ultimate irrigation potential of 8721 ha. The total amount spent on the project as of 31st March 2017 was Rs 318.08 crore, and the revised estimate of the project stands at Rs 560 crore.

The Kaveri Water Disputes Tribunal has awarded a total of 30 TMC of of Kaveri water to Kerala, out of which 2.80 TMC is from Karapuzha. Due to the non-completion of the KIP, Kerala is unable to fully utilise the 2.80 TMC of water that belongs to it.

Figure 5 and 6 show the canal network of the project. While Figure 5 is a satellite map of the canal network, Figure 6 is a cut-off diagram of the canal network. The KIP does not have a distinct main canal. The Right Bank Canal (RBC) and the Left Bank Canal (LBC) originate from a distribution chamber located near the spillway itself.

The RBC of the project is designed to be of length 8805 m with one distributary, the Arimunda distributary branching out at 3700 m (see Figure 5). The RBC, after 8805 m, branches off into two branch canals. To the left, the Kariambadi branch canal extends to a length of 8500 m with

five distributaries. To the right, the Kollyil branch canal extends to a length of 18600 m with three distributaries.

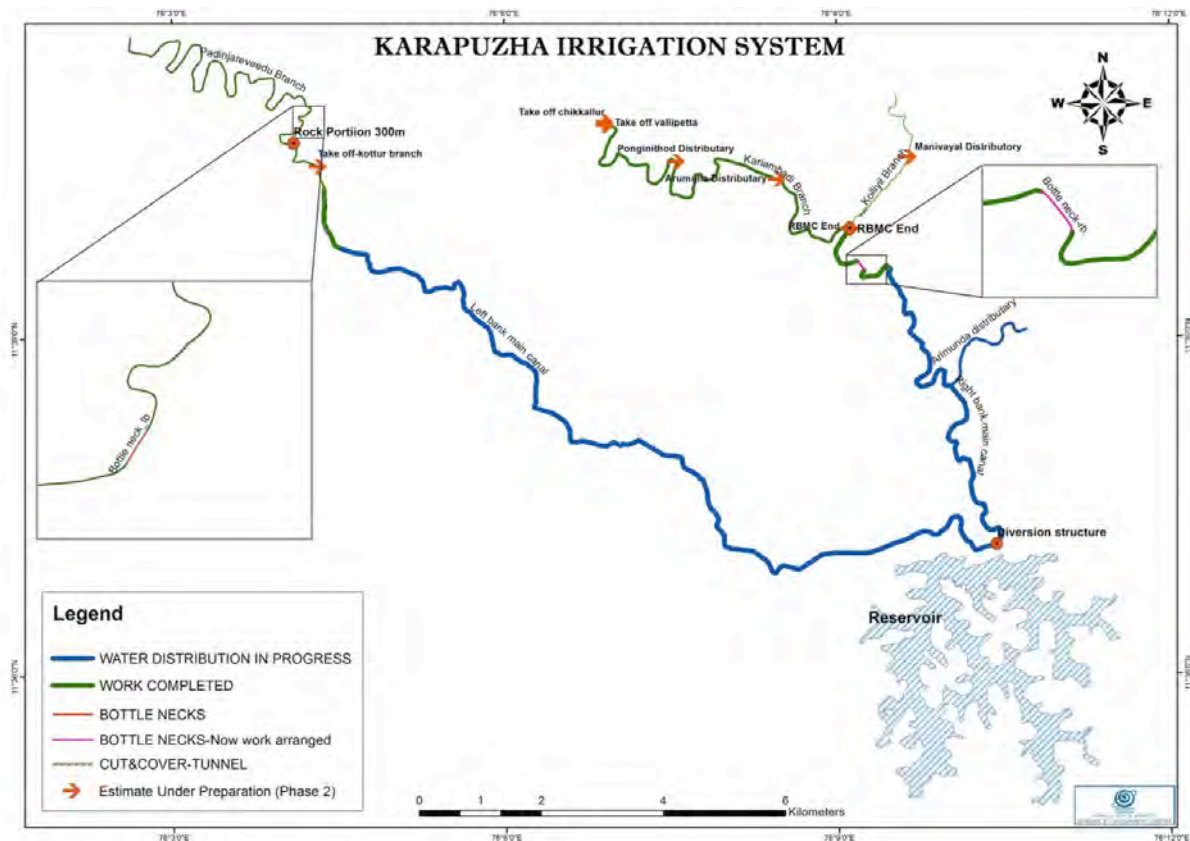


Figure 5 Satellite map of the canal network of the Karapuzha irrigation project

The LBC of the project is designed to be of length 16740 m. Three branch canals are designed to originate from the LBC: Thondipally, Kottoor and Padinjareveedu. Together, these three branch canals are to cover a total distance of 16140 m. There are four distributaries that also originate from the LBC: Manakkat, Muranikkara, Alurummal and Pallikkunnu. This apart, a series of distributaries also originate from the Thondipally, Kottoor and Padinjareveedu branch canals.

The total command area under the RBC and the LBC are depicted in Figure 6 and Table 8. Together, the total command area under both the canals is about 3588 ha. Of the 3588 ha command area, majority viz., 2268 ha is drained by the RBC. The rest of 1320 ha is drained by the LBC.

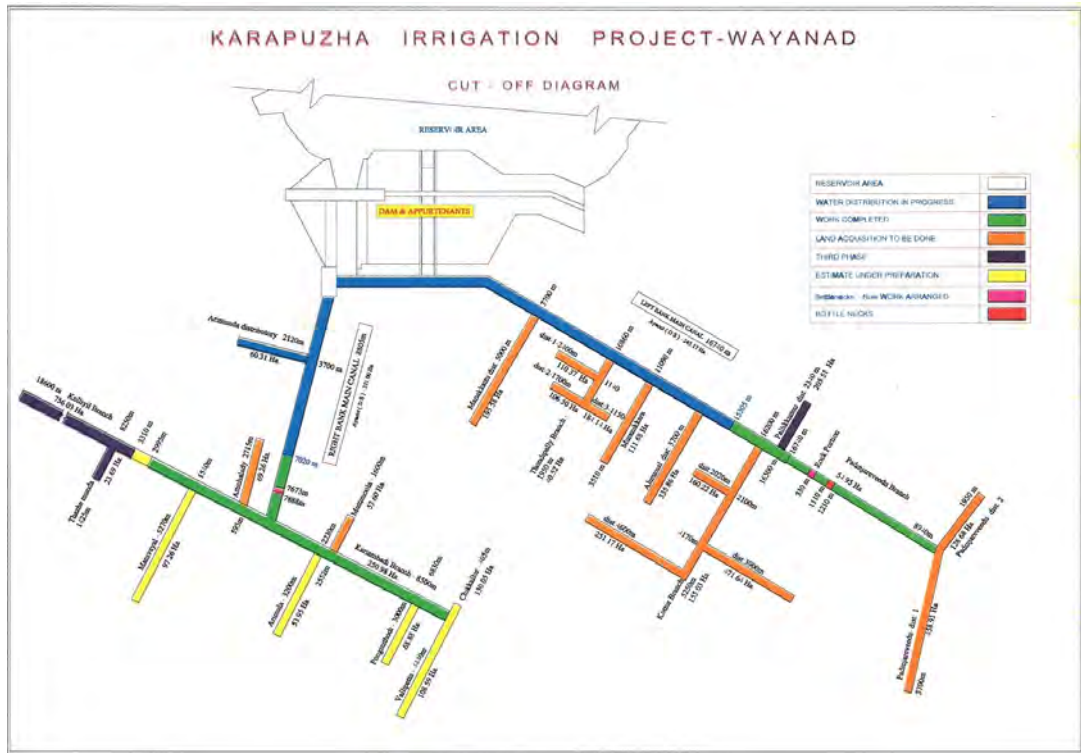


Figure 6 Cut-off diagram of the Karapuzha irrigation project

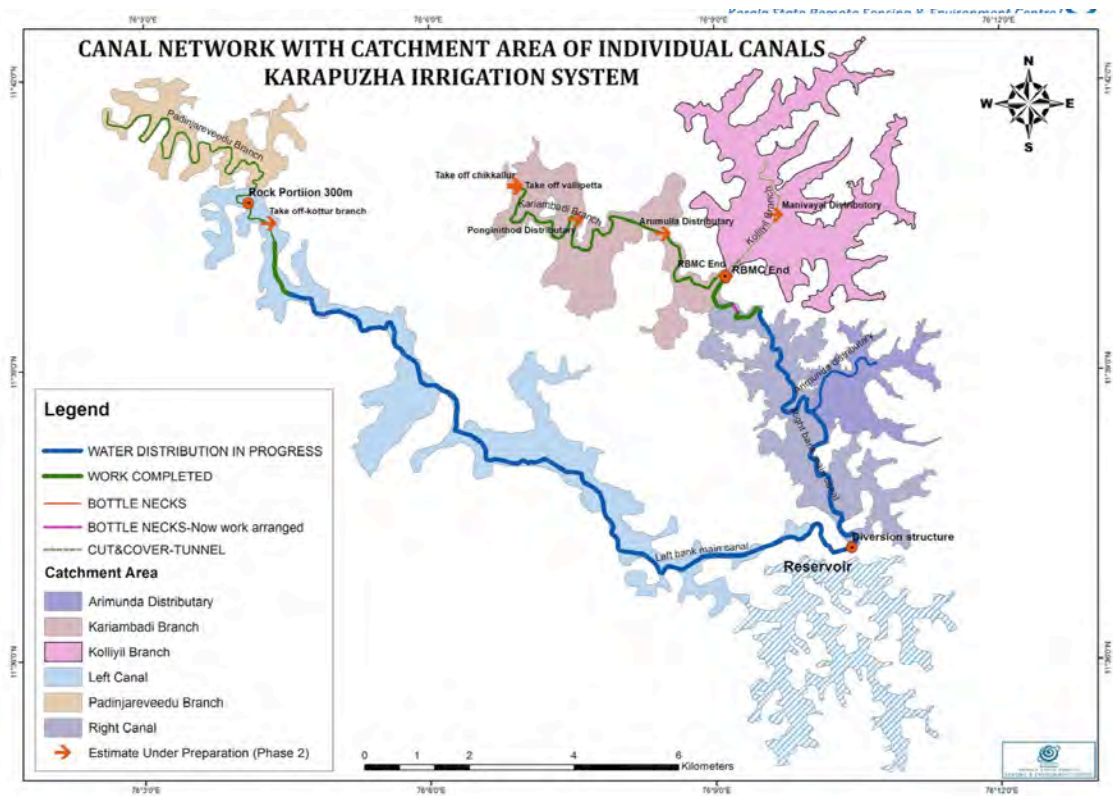


Figure 6 Satellite map of the catchment area under the LBC and RBC of the Karapuzha irrigation project

The total paddy area that could be irrigated by the RBC and LBC are depicted in Figure 7 and Table 9. Here again, it is clear that the RBC drains more paddy area compared to the LBC.

Table 8 Details of the command area under the Karapuzha irrigation project

Sl. No	Main Canal	Branch canal	Area (ha)
1	Right Bank Canal	Kolliyil Branch	848.3911
2		Kariambadi Branch	577.299
3		Right Canal	592.9129
4		Arimunda Distributary	249.0816
5	Left Bank Canal	Left Canal	1013.254
6		Padinjareveedu Branch	306.9887
Total Area			3587.9273

Source: Kerala State Remote Sensing and Environment Centre, Trivandrum.

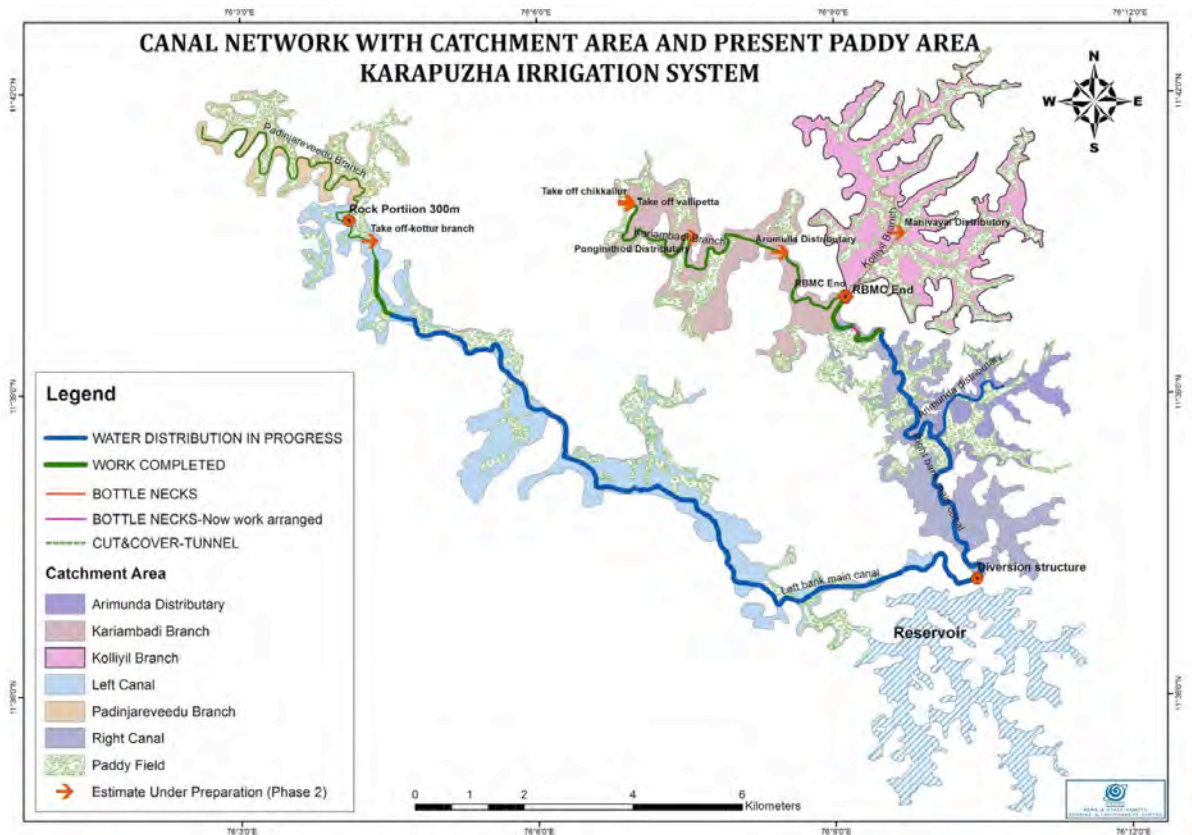


Figure 7 Satellite map of paddy command area under the LBC and RBC of the Karapuzha irrigation project

Table 9 Details of the paddy command area under the Karapuzha irrigation project

Sl. No	Main Canal	Branch canal	Paddy Area (ha)
1	Right Bank Canal	Arimunda Distributary	128.7
2		Kariambadi Branch	155.3
3		Kolliyil Branch	317.3
4		Right Canal	115.2
5	Left Bank Canal	Left Canal	353.2
6		Padinjarevedu Branch	94.9
Total Paddy Area			1164.5

Source: Kerala State Remote Sensing and Environment Centre, Trivandrum.

PROGRESS AND ISSUES

The KIP was partially commissioned on 20th June 2010. Water began to be stored in the reservoir from February 2005 and began to be released through the canals for irrigation from June 2010. Currently water is released through the LBC and the RBC, but the full potential of the project is yet to be achieved.

The Reservoir

Before we move on to a description of the LBC and the RBC, it is important to mention that the reservoir located behind the spillway is itself only partially developed. As mentioned earlier, the capacity of the reservoir, as originally envisaged, was 76.5 mm³ of water. However, due to delays in acquiring adequate land to develop the reservoir, the current capacity of the reservoir is only 34.297 mm³ of water. An additional area of 8.121 ha is yet to be acquired. It is notable that when this 8.121 ha is also acquired, the capacity of the reservoir of the KIP can be raised by more than double, from 34.297 mm³ of water to 76.5 mm³ of water.

Hence, **the first recommendation of the Technical Committee is to urgently complete the acquisition of this 8.121 ha of land so that the capacity of the reservoir can be expanded.**

This will also allow new drinking water projects to be commissioned from the KIP to benefit

villages like Meppadi, Moopainad, Noolpuzha and Muttill as well as parts of Sultan Bathery municipality.

The Left Bank Canal (LBC)

The construction of the main channel of the LBC may be termed complete. The main channel of the LBC is designed to be of length 16740 m. Water distribution, on a trial basis, was carried out on 24th February 2012 up to chainage 6100 m. From February 2017, water distribution is in progress till the length of 15305 m on a once-weekly basis. The ayacut area achieved comes to 592 ha with corresponding irrigation potential of 922.71 ha.

The LBC was designed to have three branches and four distinct distributaries, apart from distributaries of the branches. The most important of them is the Padinjarevedu branch, which takes off from the very end of the LBC. The Padinjarevedu branch is supposed to be of length 8940 m. Out of this, work has been completed for 8510 m. Yet, water has not been released through this branch because of two bottlenecks. At 330 m, and at 1110 m, there are two bottlenecks. First, at 330 m, work is pending on the clearing of a rock portion and the construction of a canal. The work on this stretch began in February 2017 and is expected to be completed soon. Secondly, between 1110 m and 1210 m, the branch canal has been breached. This stretch has to be repaired. The Committee has learnt that a design proposal was submitted to the department, which is as yet not approved by the IDR. This lack of approval has meant that the Padinjarevedu branch canal is not used to its full potential.

It is important that these two bottlenecks are removed at the earliest so that water can flow through the Padinjarevedu branch canal right up to its full length of 8940 m.

Apart from Padinjarevedu branch canal, there are to be two more branch canals: Kottoor and Thondipally. The Committee analysed the data on the extent of catchment area as well as the potential for land acquisition across the stretch. **The Committee recommends that land acquisition may be permitted for the construction of the Kottoor branch canal and its proposed distributaries based on a strict timeframe. The construction of the Thondipally branch canal and its distributaries may be scrapped.**

The Committee also perused records and visited the sites of other proposed distributaries of the KIP. In line with the general principle adopted by the Committee, which was waived for the

Kottoor branch canal, those distributaries where land acquisition is yet to be complete may be scrapped. As such, **the Committee recommends that the construction of the following distributaries in the LBC may be scrapped: Manakkat, Muranikkara, Alurummal and Pallikkunnu. Further, the construction of further distributaries for the Padinjareveedu branch canal, viz., the Padinjareveedu distributary 1 and 2 may also be scrapped.**

Thus, as per the recommendations of this Committee, the LBC of KIP will consist of the main channel of length 16740 m, the Padinjareveedu branch canal of length 8940 m (without its distributaries) and the Kottoor branch canal (with its three distributaries). We hope that all the works on the LBC will be completed by March 2021.

The Right Bank Canal (RBC)

As mentioned, the command area under the RBC is larger than for the LBC. Water distribution for irrigation through the RBC up to 7390 m, its direct sluices and the Arimunda distributary have commenced from 10th February 2011. However, during water distribution through RBC, heavy seepage was noticed in certain areas and nearby areas were water logged. From 9th January 2012 onwards, water distribution upto 3700 m of RBC, including Arimunda distributary, have been started on a regular basis serving an ayacut area of 236.15 ha. From January 2014 onwards, water distribution through the RBC up to 7020 m has started on a twice-a-week basis considering the leakages at certain chainages.

Water distribution has stopped at 7020 m because of a bottleneck between 7673 m and 7888 m. There has been a major breach between these chainages, at Edakkaravayal. Rectification work on this breach started on in March 2017, but are yet to be completed. It is important to note that this single bottleneck has held up water distribution not only upto the entire length of the main channel of the RBC, but also up to 8500 m length in the leftward Kariambadi branch canal and up to 2995 m in the rightward Kolliyil branch canal (see Figures 5 and 6).

As mentioned, the two branch canals of the RBC are the Kariambadi branch and the Kolliyil branch. Work on the Kariambadi branch canal is complete with a total length of 8500 m. However, due to the bottleneck at the main channel of the RBC, water distribution has been withheld. About 250.98 ha of ayacut area would be benefited if water distribution begins on the Kariambadi branch canal. **The committee feels that work on the RBC bottleneck needs to be completed at the earliest.**

The Kariambadi branch canal is designed to have 5 distributaries. Land acquisition has been completed for four out of five distributaries. **In line with the view of the Committee that further land acquisitions may be disallowed, we recommend the scrapping of the Muttamoola distributary. Work on the remaining viz., Arimula distributary, Ponginithodi distributary, Vallipetta distributary and the Chikkallur distributary may be completed according to the timeframe provided in this report.** The State Planning Board has allocated adequate amounts in the annual plan for 2018-19 for the completion of the Arimula and Ponginithodi distributaries. It is expected that the work will be completed by March 2019, which would benefit an ayacut area of 122.83 ha. The State Planning Board has also decided to allocate adequate amounts for the completion of the Vallipetta and Chikkallur distributaries in the annual plan of 2019-20. Work on these two distributaries is expected to be completed by March 2020, which would benefit an ayacut area of 234.68 ha. Thus, work on the Kariambadi branch canal can be fully wrapped up by March 2020 benefiting a total ayacut area of 608.49 ha.

The Kolliyil branch canal is designed to have three distributaries. The Committee, in line with its view that **further land acquisitions may be disallowed, recommends that the Attichalady distributary be scrapped. The Committee approves of the design of the Kolliyil branch canal that includes the main canal of 3310 m, with one distributary: Manivayal. The Committee also recommends that the third phase of the KIP, designed to expand the Kolliyil branch beyond 3310 m be also scrapped, including Thazhemunda distributary.**

There is one important bottleneck in the Kolliyil branch canal just before the Manivayal distributary is to begin. The Committee notes the case of this bottleneck with utmost concern. We have visited the site of the bottleneck as well as perused the report of an expert committee within the Irrigation Department, led by Superintending Engineer C. K. Radhamani, and submitted as a letter to the Additional Chief Secretary, WRD (A) dated 17-07-2009. This report is a glaring expose of a series of bunglings by the officers of the Irrigation Department in the construction of the Kolliyil branch canal. We shall summarise the matter below.

As per the original approved design of the Kolliyil branch canal, the canal between chainage 0 m to 1550 m was to be as follows:

- Open concrete canal between chainage 0 and 35 m;
- Cut and cover between chainage 35 m and 720 m, with a bed slope of 1:1000;

- Open concrete canal between chainage 720 m and 1205 m, with a bed slope of 1:1500;
- Open canal between chainage 1205 m and 1550 m, with a bed slope of 1:4000;
- An aqueduct between chainage 1550 m and 1945 m, with a bed slope of 1:1000.

Thus, the open canal between chainage 1205 m and 1550 m was to deliver water to the aqueduct that begins at 1550 m. However, the expert committee found that the entire distance between chainage 0 m and 1550 m was constructed as a cut and cover canal. No documents or work files could be submitted by the officials of the Irrigation Department to explain why and how the original design was changed and the full chainage was constructed as cut and cover. In fact, the expert committee had expressed extreme dissatisfaction at the Department not submitting required documents despite persistent requests.

The expert committee also collected observations of the bed level of the canal from the observation wells constructed at chainages 181 m, 235 m, 345 m, 447 m, 580 m, 710 m, 904 m, 993 m, 1087 m and 1307 m of the alignment. Three shocking observations were made by the expert committee, which we reproduce below:

- “Between chainage 0 to 720 m, the observed levels are more or less in conformity with the approved levels except for a slight variation between chainage 235 m to 560 m, which can be rectified;
- Between chainage 720 m to 1307 m, the canal is found to be constructed with a much higher bed slope and the bed has gone down up to 150 cm, which is about 94.50 cm below the existing bed level of the already constructed aqueduct at chainage 1550 m;
- Between chainage 1307 m to 1550 m, the canal is found to be constructed with an upward slope and is found to be constructed to the existing bed level at chainage 1550 m.”

In other words, after chainage 720 m, the bed level is sloping down and the difference in bed slopes between the 720 m and 1307 m is about 150 cm. After chainage 1307 m, the bed level is sloping upwards till the point where it is to meet the aqueduct i.e., at chainage 1550 m. The difference in bed levels between chainages 1307 m and 1550 m was about 74 cm. Clearly, something really was wrong with the way construction was executed. There are allegations of financial misappropriation and the Vigilance wing of the State Police is currently investigating the case.

The expert committee had also given three concrete suggestions, to which we broadly agree with. These recommendations may be considered by the government without compromising on the ongoing criminal investigation.

- Between chainages 0 m and 720 m: rectification methods may be adopted to correct for the minor variations found between chainages 235 m and 560 m;
- Between chainages 720 m and 1307 m: the portion may be entirely dismantled and reconstructed;
- Between chainages 1307 m and 1550 m: the portion may be entirely dismantled and reconstructed.

A tentative budget estimate of Rs 1 crore was also suggested by the expert committee for the entire stretch.

The Technical Committee concurs with these recommendations and suggests to the Irrigation Department that a revised proposal for the stretch between 0 m and 1550 m be prepared and passed at the earliest, so that water can reach the Manivayal distributary when it is ready. The Vigilance Department may be approached by the Irrigation Department to explore the possibilities of completing the investigation and hearings of the case, so that repair work can begin.

Gains from our recommendations

The revised estimate for the project as per the 2014 DSR is Rs 560 crore. The total command area originally targeted was 5221 ha.

If our recommendations are accepted, the government could save an approximate amount of Rs 42 crore. This does not include savings from excluding the third phase canals from the project. The targeted command area would be 2537.85 ha.

CHAPTER 4

IDAMALAYAR IRRIGATION PROJECT

The Idamalayar Irrigation Project (IIP) is based in the Periyar river basin. The reservoir is behind the Ennakkal dam. The Ennakkal dam is constructed across the Idamalayar, which is a tributary to the Periyar. This dam, controlled by the Kerala State Electricity Board, has a live storage capacity of 1017.80 mm³. Water from this reservoir is released in a controlled fashion and is intercepted by the Periyar Barrage at Bhoothathankettu. From the Bhoothathankettu barrage, water is released into two irrigation projects: the Periyar Valley Irrigation Project (PVIP) on the left bank and the IIP on the right bank. The PVIP is designed to irrigate 32,800 ha while the IIP is designed to irrigate 14,394 ha. While the estimated ayacut area under the IIP is 14,394 ha, the gross command area is estimated at 22,800 ha. The IIP's catchment areas lie both in the Periyar river basin (Aluva and Paravur taluks of Ernakulam district) as well as the Chalakudy river basin (Mukundapuram taluk of Thrissur district).

The IIP was started in 1981 at an initial approved cost of Rs. 17.85 crore. The project was approved by the government in November 1994 at a total cost of Rs 107 crore as per the 1994 SoR. The total expenditure up to 31 March 2017 is Rs 433 crore.

The IIP essentially consists of a main canal that originates from the right side of the Bhoothathankettu barrage and runs for about 32.278 km. Figure 8, 9 and 10 show the canal network of the project. Figure 8 is a satellite map of the completed canal network of IIP and the Chalakudy River Diversion Scheme (CRDS); Figure 9 is a cut-off diagram of the canal network of both IIP and the CRDS; and Figure 10 is a satellite map of the canal network of the CRDS. The ayacut under the main canal of IIP was to be 999 ha. The main canal travels through forests for a length of 20.629 km (from 0 m to 16612 m; and 27255 m to 31272 m). Another 4.341 km (from 22914 m to 27255 m) passes through forest land and revenue land. Yet another 6.302 km (from 16612 m to 22914 m) passes through purely revenue land. Land extending to 115.046 ha was allotted by the Forest Department for the IIP with a reciprocal agreement to initiate compensatory afforestation in 117.75 ha of land under the KIP and MVIP.

The main canal, after 32,278 km, bifurcates into a Low Level Canal (LLC) and a Link Canal. The LLC was designed to extend to a total length of 27.25 km, with three branch canals originating from it: Kanjoor-Theckumbhagom, Vappalassery and Nedumbassery. The ayacut area under the

LLC and its distributaries was estimated at 4672 ha. The Link Canal of length 7.575 km was designed to link the main canal of the IIP with the Chalakudy Left Bank Canal (CLBC), which is a part of the Chalakudy River Diversion Scheme (CRDS). At 4025 m, the Link Canal joins the Bhoothamkutty branch canal of the the CLBC (at chainage 3550 m of the CLBC). The 4025 m of the IIP and the 3550 m of the CLBC are designed to join together to form a single Link Canal of length 7575 m (or 7.575 km).

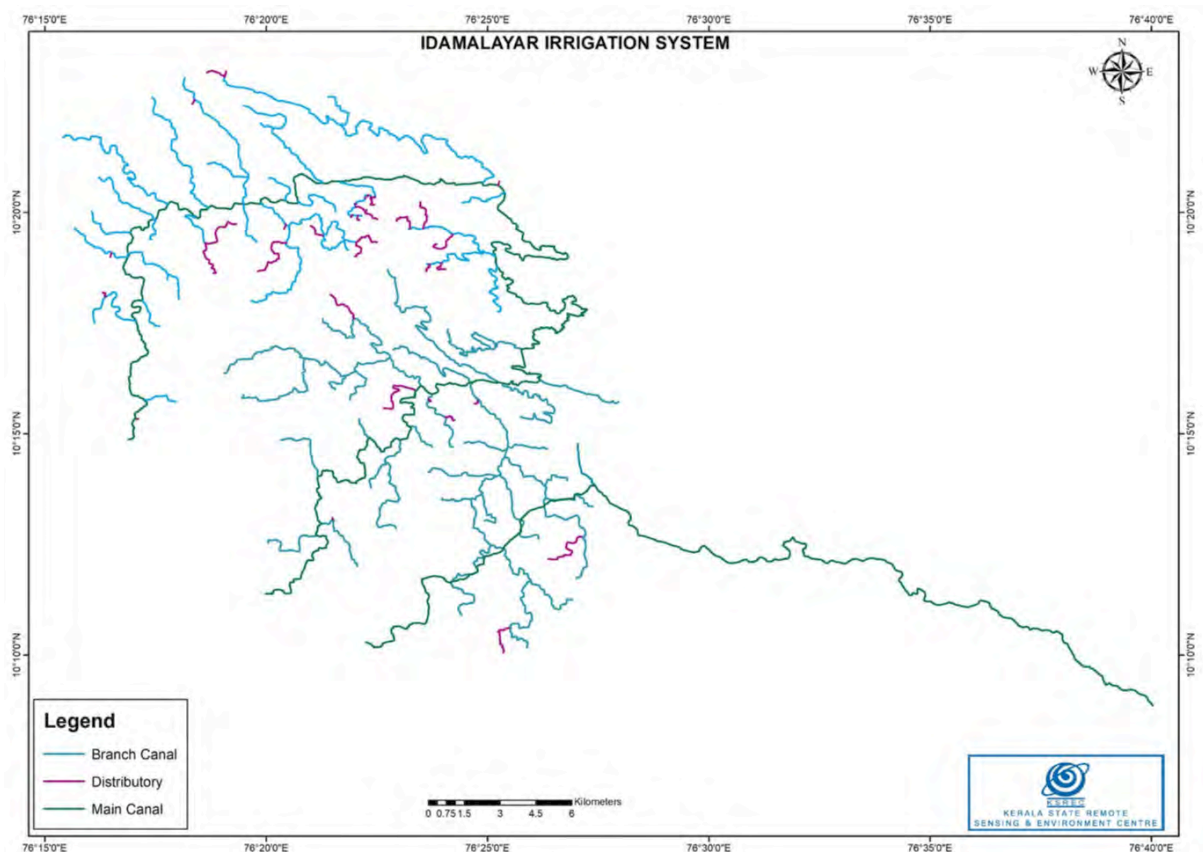


Figure 8 *Satellite map of the canal network of the Idamalayar irrigation project and the Chalakudy River Diversion Scheme*

There is a reason why water from the Periyar basin is diverted in this way to the Chalakkudy basin via the CLBC of the CRDS. According to the Parambikulam-Aliyar Project (PAP), the Government of Tamil Nadu is to provide Kerala with 12.3 TMC ft of water every year from the reservoir in the Sholayar river. Accordingly, from 1st of July every year, Tamil Nadu is to fill the Kerala Sholayar reservoir to a level of up to 5 ft below the Full Reservoir Level (FRL) viz., +2658 ft. On the 1st of September, Kerala Shoyar reservoir is to be kept at the FRL of +2663 ft. Between 2nd September and 31st January, the level in Kerala Sholayar reservoir is to be kept at 5 ft below the FRL, or +2658 ft. On the 1st of February, again, the level is to be brought back to the FRL of +2663 ft.

According to the Irrigation Department, even if Tamil Nadu were to supply the whole of 12 TMC ft water, there would be a deficit of water to supply both the CLBC and the CRBC. The CLBC and the CRBC require 12.75 TMC ft of water *each*. Hence, a supplement is necessary so that the Sholayar water can be fully utilised to meet the needs of the CRBC (with a length of 48.2 km and an ayacut area of 8514 ha) and the needs of the CLBC (with a length of 33.2 km) can be met from water transferred from the Link Canal of the IIP.

Table 10 *Required water and available water (including water from Tamil Nadu and inflow in catchment of Kerala Sholayar/Poringal)*

Year (December 1 to May 31)	Water released from Kerala Sholayar including inflow from catchment (TMC ft)	Requirement of water for CRDS (TMC ft)	Deficiency of water (TMC ft)
2007-08	6.56	14.13	7.57
2008-09	7.79	14.13	6.34
2009-10	7.79	14.13	6.34
2010-11	10.46	14.13	3.70
2011-12	8.07	14.13	6.05
2012-13	6.75	14.13	7.38
2013-14	8.22	14.13	5.91
2014-15	9.87	14.13	4.25
2015-16	7.60	14.13	6.53
2016-17	5.57	14.13	8.56

Source: Department of Water Resources, Government of Kerala.

In order to make the linking of IIP and CRDS work, further changes are included in the design. The Link Canal is to join the CLBC at a point 9.9 km downwards from the Thumburmuzhi Weir. As the Periyar basin lies at a lower elevation compared to the Chalakudy basin, at the point of joining, the bed level of the Link Canal (at 25.804 m) lies 1.231 m below the level of the CLBC (at 27.035 m). As a result, the original design includes a component of work to deepen the CLBC over a distance of 4.1 km viz., from 9.9 km up to 14 km in the chainage. Modifications are also required in the canals that branch off within this stretch.

The above description is with regard to the original design of the IIP. The main canal of the IIP is designed to have an ayacut of 999 ha. The LLC and its branches/distributaries are designed to achieve an ayacut of 2424 ha. The CLBC and its branches/distributaries have an ayacut of 1490 ha. The CRBC and its branches/distributaries have an ayacut of 8514 ha.

PROGRESS AND STATUS

The completed parts of the IIP are shown in Figure 10.

The main canal

The construction of the main canal of length 32 km has been completed. There is some ayacut area that has already been achieved under the main canal. This includes a wet ayacut area of 195 ha and, in addition, an additional wet ayacut area of 128 ha at Manappaattuchira that is drained by the main canal.

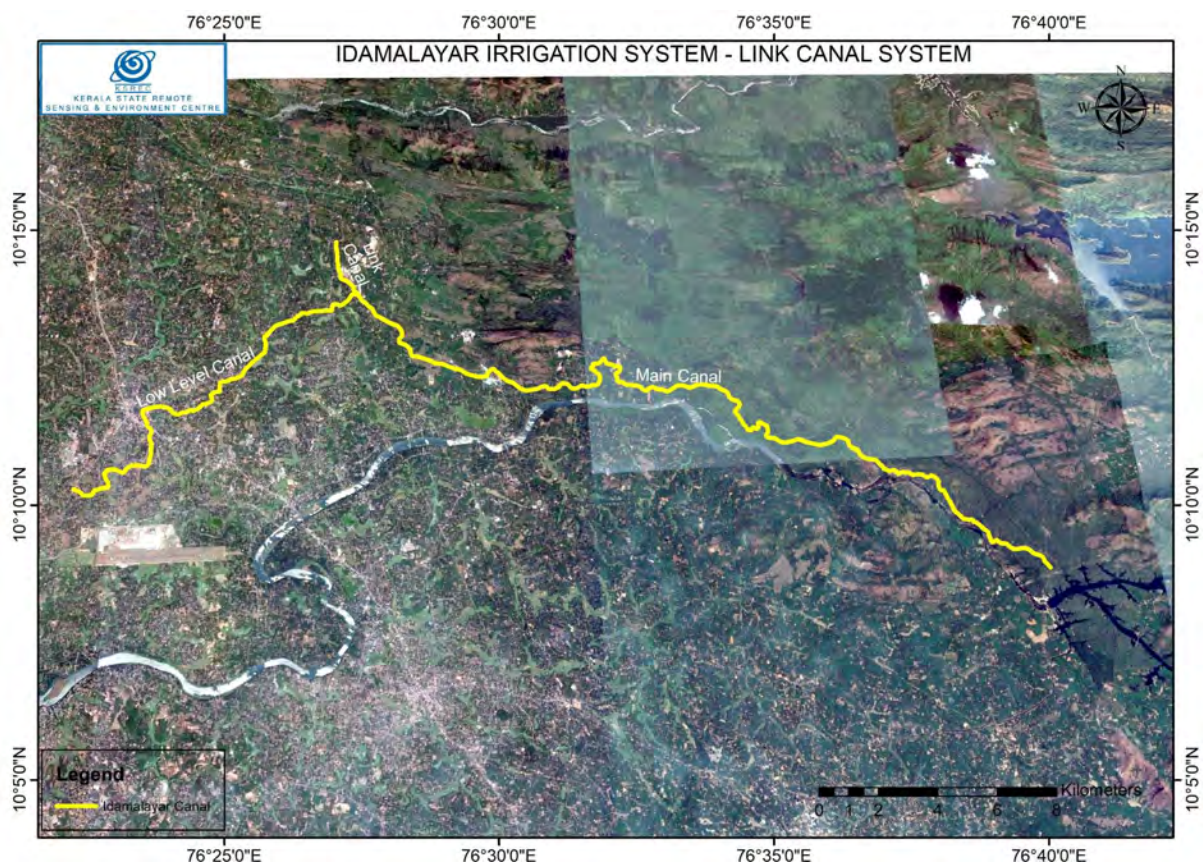


Figure 10 *Completed canals/ portions of the IIP*

The Low Level Canal (LLC)

As mentioned, the LLC was originally of a length of 27.25 km. However, the construction of the Nedumbassery airport near Angamaly has narrowed down the scope of the LLC considerably. In addition, no land acquisition has been initiated for the project near Nedumbassery yet. As such, the Irrigation Department itself has restricted the scope of the LLC from 27.25 km to 15 km. In other words, the LLC would end at the 15th km. The Technical Committee concurs with this decision of the department. In fact, the Technical Committee suggests that the LLC should be terminated at 14.863 km, which is the point where the LLC hits the National Highway. The LLC need not cross the National Highway.

However, water has not reached the point where the LLC touches the National Highway yet because of two important bottlenecks. First, between 10.490 km and 10.599 km of the LLC, the Main Central (MC) Road is passing across. Currently, the LLC stops before the MC Road and restarts after the MC Road. The work to construct a “push through” across the MC Road is pending. We understand that the technical sanction for this work has been obtained, and the work was tendered twice, but the rate quoted was higher and hence not accepted. **The Technical Committee suggests that this work be completed before March 2019.**

Secondly, between 13.818 km and 13.876 km, there is a railway line passing by. An aqueduct has to be constructed above the railway line. Currently, the LLC stops before the railway crossing and restarts after it. We understand that the necessary funds have been deposited with the Ministry of Railways. The Ministry has informed the department that work could begin only after October 2018 because of track re-laying work that is ongoing. Any construction work here would require occasional blocking of electricity and the railway line itself, along with speed restrictions for three weeks. **It is important that the Irrigation Department follows-up with the Ministry of Railways and ensures that construction of the aqueduct is completed before March 2019.**

If these two bottlenecks are completed by March 2019, water can flow on the LLC up to 14.863 km, which has a direct command area of 164 ha. But in addition to the direct ayacut under the LLC, the department has constructed eight sluices from the LLC to nearby water channels, which presently brings in an additional ayacut of 177 ha. Four of these eight sluices lie after the MC Road crossing and two of these four sluices lie after the railway line crossing. In other words, much new command area can be brought under the LLC if the two bottlenecks are removed at the earliest.

Branch canals from the LLC

As per the original plan, the LLC's three branch canals were to be Kanjoor-Theckumbhagom, Vappalassery and Nedumbassery. After restricting the LLC to 14.863 km, the construction of the Nedumbassery branch canal automatically stands cancelled. Of the two remaining branch canals - Kanjoor-Theckumbhagom and Vappalassery – the Technical Committee found that land acquisition for both the branch canals has not begun as yet. The Kanjoor-Theckumbhagom branch canal has a length of 11 km and an ayacut of 2135 ha, while the Vappalassery branch canal has a length of 2 km and an ayacut of 72 ha. **In line with the view of the Committee that further land acquisitions may be disallowed, we recommend that the Vappalassery branch canal be dropped from the design of the project and only the Kanjoor-Theckumbhagom branch canal be retained. Land acquisition for the Kanjoor-Theckumbhagom branch canal should begin at the earliest and work should be completed by March 2020.** A strict time frame is being suggested by this Committee, which also needs to be monitored at the department level.

The Link Canal

As we have explained earlier, the Link Canal is to link the IIP with the CRDS. It is supposed to begin at the end of the main canal and meet the CLBC after a distance of 7.575 km, which includes 4.025 m of the IIP and the 3.550 m of the CLBC. As of now, only 2.793 km of the Link Canal has been completed and another 4.782 km is yet to be completed. In other words, the IIP and CRDS are not yet linked through the Link Canal.

The Technical Committee undertook a detailed examination of the progress of the Link Canal and the nature of work yet to be completed. Land acquisition has not even begun on the incomplete stretch. The Committee travelled through the full distance to be covered by the Link Canal till the joining point of CLBC. This trajectory is composed of extremely uneven topography and mountaineous terrain. At many points, long aqueducts have to be constructed to connect hilltops. At other points, 66 KV lines of the KSEB (which were erected after the design of the IIP) pass across the planned paths of the Link Canal, which make the construction of aqueducts next to impossible. While large syphon structures can be envisaged to address some of these issues, the Committee would like to register its skepticism on whether the Irrigation Department can complete the Link Canal within a specific time frame.

On the whole, the Technical Committee remains unconvinced on whether the Link Canal is either *technically feasible* or *economically viable*. We recommend that the Irrigation Department undertakes a serious internal discussion on the economic-technical feasibility of the Link Canal. We also recommend that such a feasibility plan should be submitted to the Kerala State Planning Board, which in turn, if it deems fit, may pass on the proposal to this Technical Committee for final consideration and approval. Such a process may be completed within a month of the submission of this report.

Proposed changes to the CLBC and CRBC

The Technical Committee has reviewed the proposals submitted by the Irrigation Department for further extensions and expansions of the CLBC and CRBC. At this point, the Committee feels that the focus of the Irrigation Department needs to be on the completion of existing works, including organising discussions on whether and how the Link Canal is required or can be re-envisaged. **We recommend that no new branch canals or distributaries outside the original plan be allowed for the CLBC and CRBC. If any new branch canals or distributaries have to be approved in the future, it should be on the basis of a detailed water basin-based plan submitted to, and approved by, the Kerala State Planning Board.**

Gains from our recommendations

We do not have estimated savings from reducing the length of the LLC from 27.25 km to 15 km. If we drop the Link Canal, there would be a savings of Rs 71.7 crore; there would be an additional savings of Rs 14 crore from dropping the deepening of the CLBC. An amount of Rs 4.50 crore can be saved from dropping one distributary from the CLBC. An amount of Rs 433 crore can be saved from dropping the 4 distributaries of the CRBC. In all, an amount of Rs 523.2 crore can be saved in the project if our recommendations are accepted.

We would need to allocate Rs 3 crore for the remaining work in the LLC, and Rs 50 crore for the Kanjoor-Theekumbhagam branch canal in the LLC. If the Link Canal is implemented, we would need to allocate an amount of Rs 74 crore.

CHAPTER 5

MUVATTUPUZHA VALLEY IRRIGATION PROJECT

The Muvattupuzha Valley Irrigation Project (MVIP) was envisaged as a major irrigation project that would utilise the tail race discharge from the Moolamattom Power House in Idukki Hydro Electric Project as well as run-off from the catchments of the Thodupuzha river. Its reservoir is located at Malankara in the Thodupuzha taluk of Idukki district, which is behind the Malankara dam. The Malankara dam is a straight gravity masonry dam, which is 16 km downstream from the tail race of the power house. The area covered by the project lies in the Thodupuzha Taluk in Idukki District, Kothamangalam and Muvattupuzha Taluks in Ernakulam District and Vaikom and Kottayam Taluks in the Kottayam District.

The MVIP was initiated in 1974 and approved by the Planning Commission in June 1983 at an estimated cost of Rs. 48.08 crores. The project was partially commissioned in 1994. The estimated total cost of the project, based on 2015 DSR, is Rs. 945 crore.

The MVIP was planned to irrigate a cultivable command area (CCA) of 17,737 ha in Idukki, Ernakulam and Kottayam districts. MVIP canals pass through water-scarce areas, where most of the CCA is for paddy and vegetables and farmers are totally dependent on canal water. A number of components were added to the original scheme over the years. The Palakuzha and Koothattukulam lift irrigation schemes were attached to the MVIP in 1999, which added an additional CCA of 1500 ha. In 2008, certain canals were deleted from the scheme of the project, which reduced the CCA by 1608 ha. In all, the total CCA stood at 18,417 ha. In 2011, two more canals were excluded from the project, thus reducing the proposed CCA to 18,173 ha (See Table 11). In addition, the MVIP was also proposed to supplement the canal water for drinking water supply schemes, provide water for industrial uses in the Hindustan Newsprint Factory, generate 10.5 MW electricity as well as provide indirect benefits to the Ernakulam, Idukki and Kottayam districts. For example, along with irrigation, the canal network was to recharge the groundwater and contribute to the availability of drinking water in the nearby areas.

The MVIP does not have a main canal. The Right Bank Main Canal (RBMC) and the Left Bank Main Canal (LBMC) originate from the Malankara dam itself (see Figure 11). The RBMC is of a total length of 28.3 km and the LBMC is of a total length of 37.1 km. All the branches of the LBMC and the RBMC come to a total length of 57.154 km, while all the distributaries come a

total length of about 213 km. More detailed cut-off diagrams of the RBMC and LBMC are provided in Figures 12 and 13.

Table 11 *Cultivable command area (CCA) and gross ayacut in the MVIP*

Sl.No	Description	CCA (ha)	Gross ayacut (ha)
1	Main Canal	3896	7637
2	Branch Canal	2306	4520
3	Distributaries	11971	23462
4	Total	18173	35619

Source: Kerala State Remote Sensing and Environment Centre, Trivandrum.

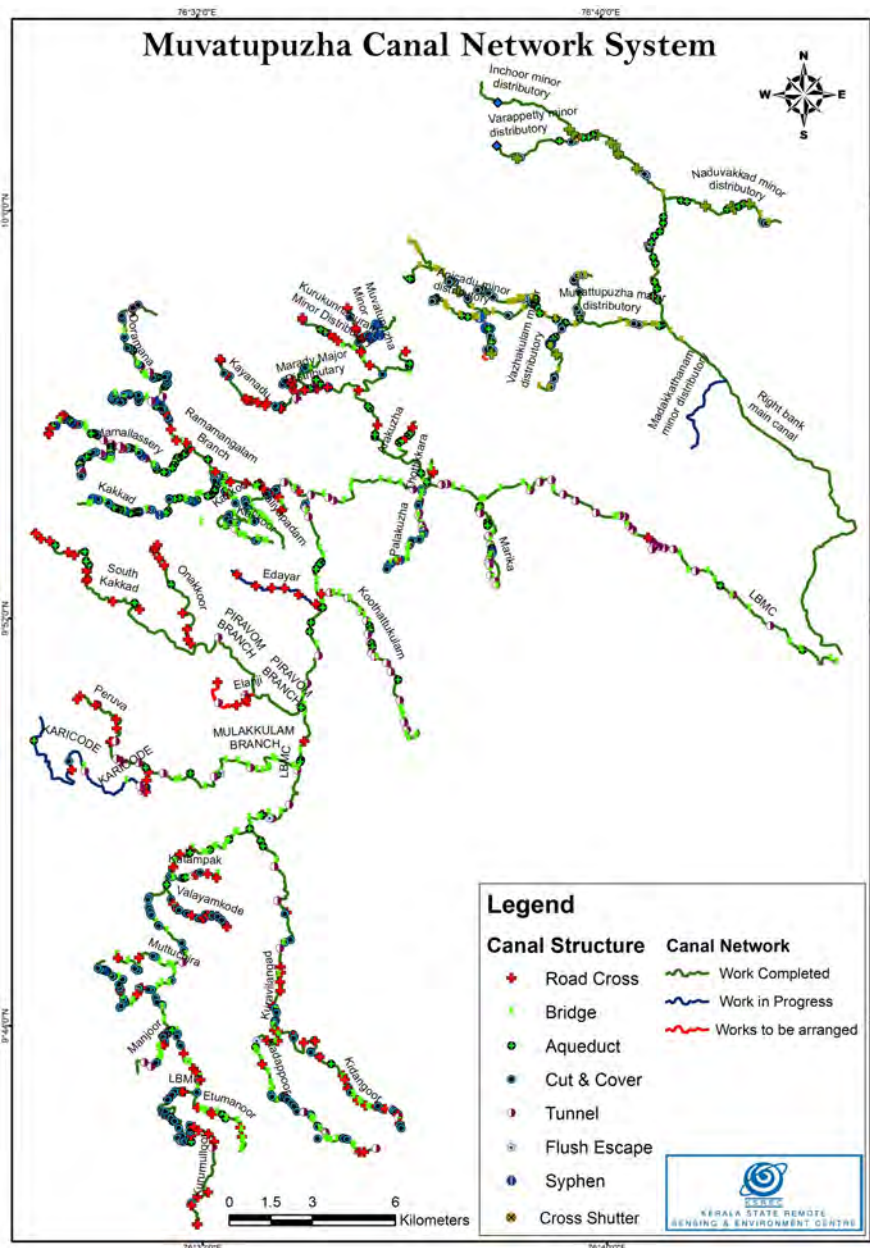


Figure 11 *The Canal Network of the Muvattupuzha Valley Irrigation Project (MVIP)*

complete commissioning requires completion of some remaining portions of work. These are important so that the project can be fully commissioned.

Ezhuthonippadom aqueduct

The Ezhuthonippadom aqueduct was to be constructed over a railway line at chainage 18275 m between the Kuruppanthara and Ettumanoor railways stations. This is a very short stretch over a single line in the LBMC (see Figure 13). The government had entrusted the work to the Kerala Irrigation Infrastructure Development Corporation Limited (KIIDC) in 2016. However, to begin work on the aqueduct, temporary staging work was to be completed by the Ministry of Railways. For this purpose, an amount of Rs 1,17,92,773 was remitted to the Ministry in 2008 itself. When the Technical Committee visited the MVIP site in January 2018, the work was still pending for want of the completion of various formalities and availability of materials. If the Ezhuthonippadom aqueduct is complete, an additional 786 ha of land can be brought under irrigation in the panchayats of Manjoor, Kanakkari, Njeezhoor and Athirampuzha.

As we are submitting the report, the authorities have informed us that the work has begun and is nearing completion. We note it with appreciation.

Bottlenecks in the Karikkode distributary

The Karikkode distributary is located in the Mulakkulam branch canal of the LBMC (see Figure 13). There are many minor issues that have accumulated in this distributary.

- Between chainage 0 m and 1210 m (first reach), and between 2560 m and 4110 m (second reach), land acquisition is incomplete. About 49.7 acre of land is to be acquired here, for which government sanction for direct purchase through the DLPC has been obtained. The Technical Committee understands that after our field visit, an allocation of Rs 1.23 crore has been made to the Irrigation Department for land acquisition. **We recommend that land distribution be completed at the earliest in this stretch.**
- Between chainage 1210 m and 2560 m (second reach), a revised estimate became necessary, as rock portions were found to be larger. The project office submitted such an estimate to the government in 2015; responses to queries raised were submitted in 2017. According to documents submitted to this Committee, the revised estimates are about 25.21 per cent higher than the original estimate. However, the contractor has done blasting work beyond the agreed quantity. The contractor has not been paid because the revised estimate has not yet been approved. Hence, the work has been stopped. **The**

Technical Committee recommends that this revised estimate be urgently considered and passed on merit by the government at an early date.

- Between chainage 5430 m and 7330 m (fifth reach), another revised estimate has been made necessary. In this case, the project office has passed on the revised estimate (14.11 per cent above the original estimate) to the office of the Chief Engineer, but it has not been passed over to the government for final approval after responding to all clarifications requested by the government. **The Technical Committee recommends that this revised estimate be urgently considered and passed on merit by the government at an early date.**
- Between chainage 7330 m to 10390 m, work has been stopped due to public protests against blasting of rocks. The protests have been against protected blasting and for chemical blasting. However, the Chief Engineer (P-2) has advised against chemical blasting, as it is considered hazardous to environment. The contractor has stopped work and work is pending from 2014. **The Technical Committee recommends that the Irrigation Department initiates urgent and transparent negotiations with the public and resolve the matter. If resolution is not possible, we recommend that the Karikkode distributary be terminated at 7330 m.** We understand that, after our field visit, permission has been accorded for controlled blasting in this stretch.

For all the above works, as work has been pending for a long period of time, another issue might arise during resolution. The original agreements with contractors were finalized in 2010-11, and they may demand higher rates for work if restarted in 2018. **The Irrigation Department may urgently reach a resolving decision on this, which should be binding over all the remaining works in the MVIP.**

Bottlenecks in the Edayar distributary

The Technical Committee is noting the bottleneck in the Edayar distributary in the LBMC with extreme worry. This bottleneck is an example of how our government systems perpetuate irrationalities in the name of rules, and refuse to address them when they come to light.

According to government rules (see G.O. No.981/2017/WRD, dated 05-12-2017), once surplus earth/rocks/rubble are dug out for the construction of canals or any public work, they have to be compulsorily auctioned out by the concerned department at the current DSR plus cost index. After the rocks and rubble were dug up during the construction of the Edayar distributary,

auction of these rocks had to be notified at a rate of Rs 1254.25 per m³, as per the DSR plus cost index and the decision of the CTE. However, the rate fixed by the Superintending Engineer of the Project Circle, Muvattupuzha was only Rs 874.72 per m³. Further, according to sources, the market rate for the rocks and rubble was only around Rs 450 per m³. As a result, there were no takers for the rocks and rubble dug up. As the Irrigation Department did not have any land to dump the rocks and rubble, and as they could not be discarded due to the G.O., the rocks and rubble have been dumped on the alignment of the Edayar distributary for a distance of about 800 m (see Figure 14). The situation is that any further work on the Edayar distributary can commence only after the material is auctioned off and removed.

The Technical Committee feels that this issue should have been brought to the notice of higher officials in the Irrigation Department and resolved early enough. **We recommend that the Irrigation Department urgently takes note of this issue and fixes a reasonable price for the rick and rubble over the Edayar distributary so that it can be auctioned off immediately.**



Figure 14 *Rocks and rubble dumped on the alignment of the Edayar Distributary in the MVIP*

Bottleneck in the Piravom branch canal

Between chainage 4150 m and 6604 m in the LBMC, there is another bottleneck. The revised estimate here has been submitted to the government, but it awaits approval. **This approval may be provided at the earliest.**

Electrical work at the Koothattukulam lift

There is a small electrical work pending at the Koothattukulam lift project on the RBMC. The civil and mechanical works have been completed. The electrical contractor has submitted the documents required for the electrical inspectorate sanction, but this has been pending. This needs to be completed at the earliest by the department.

If these remaining works are completed by March 2020, the MVIP can be fully commissioned.

CHAPTER 6

GENERAL RECOMMENDATIONS

In addition to the project-specific recommendations that we have provided below, we also would like to provide a few general recommendations that would help to streamline and accelerate the implementation of irrigation projects in the future. These recommendations are based on the learnings of the Committee from the various field visits as well as discussions with officials. We shall briefly list them below.

- 1) In all the projects that we examined, one general drawback noticed was the poor quality of technical investigations that preceded the preparation of project proposals. These drawbacks were visible to us in terms of, among other things, the fixation of canal alignments and the accurate conduct of hydraulic investigations. What we need is the creation of a team/teams within the Irrigation Department that is/are professional and technically accurate in preparing designs and conducting field investigations. The existing IDRIB has not been felt to us as such a professional and technically updated entity.
- 2) In most cases, land acquisition process under irrigation projects moves at snail's pace. In many regions, there are complaints that the revenue department's land acquisitions cells for land acquisition have been closed down. Further, the Irrigation Department has not been able to effectively undertake the Environmental Impact Assessment (EIA) under each project. As a result, a number of problems arise after the implementation begins.
- 3) There is an inordinate delay in the preparation of revised estimates on the part of the department. Even if the revised estimates are prepared and submitted, there are delays in their approval. Even if departmental approval is granted to these revised proposals, they further get stuck in processes like administrative sanction or technical sanction. Even if these sanctions are accorded, there are delays in notifying the tender. Even if tenders are called and opened, there are delays in awarding work to the contractor, which results in delays in beginning work. When works ultimately begin, problems related to contractors begin.
- 4) Contractors are often guilty of delaying work for no clear reason. They also stop work asking for the rates to be awarded under the most recent DSR. Department can blacklist

erring contractors, but they return to the bidding processes in new/benami names. They also approach the courts for every small reason and stall work as a bargaining chip with the department.

- 5) In such situations, the department is generally helpless. It is impossible for departments to impose penalties on contractors. Many times, they choose to remain silent. Officers at the level of SE or CE could intervene in disputes and settle them but they take a risk-averse stance and do not do so. As a result, what we need is a new system where the department can impose work stage-wise timelines on contractors and impose penalties at each stage. We also need a monitoring system at the State-level for major projects led by the Irrigation Minister and the Irrigation Secretary that could decisively intervene in disputes of a larger nature and resolve them. This monitoring system should also consider and ratify decisions taken by the SE or CE at lower levels while intervening in disputes.
- 6) In many cases, delays occur not due to problems at the Department-level, but at the level of the CTE (Chief Technical Examiner) and FD (Finance Department). The administrative department is able to do little when the decision-making process involves FD. We believe that some timelines have to be imposed at each link along the entire decision-making chain so as to avoid undue delays.
- 7) In backward districts like Wayanad, irrigation projects face an acute lack of sub-divisions to complete work. We need a system where engineers and staff attached to a particular irrigation project are not transferred out till the work on the project is completed at least till a specific stage. In many cases, engineers and staff go on long leave to avoid these postings. In our view, officers once posted in remote districts like Wayanad should be bound to join and work there for at least three years. If they do not, the Irrigation Department should have the power to initiate disciplinary action against them and overlook their opportunities for career advancement.
- 8) Even if we complete major irrigation projects on time, the maintenance of their canals is often ignored. We need a financing mechanism to ensure that canals are effectively maintained over time.

ANNEXURE 1

PROCEEDINGS OF THE MEMBER SECRETARY STATE PLANNING BOARD

(Present: Shri. V.S.Senthil IAS)

Sub: Assessment of long pending Major & Medium Irrigation Projects – Constitution of technical committee-reg

Ref :- Minutes of the review meeting on long pending Major & Medium Irrigation projects held at State Planning Board on 12.04.2017

Order No : 99/2017/Agri/SPB Dated : 16 .05.2017

To evaluate the four ongoing major and medium irrigation projects – Muvattupuzha, Idamalayar, Karapuzha and Banasurasagar- a meeting was conducted by Vice Chairperson of State Planning Board in the presence of Shri. Mathew. T. Thomas, Hon'ble Minister for Water Resources and Dr. Thomas Issac, Hon'ble Minister for Finance, vide reference cited. In the meeting, it was decided to constitute a five member technical committee to examine the current achievements and to assess the status of implementation of these projects, thereby suggesting an action plan for the completion/ closure of the projects.

In the above circumstances, a Technical Committee for assessing the four long pending irrigation projects is hereby constituted with the following members.

1. Dr. R. Ramakumar , Member, State Planning Board ----- Chairman
2. Secretary (Water Resources Department)/Officer nominated by Secretary
3. Dr. Indumathi M. Nambi, Associate Professor, Environmental and Water Resources Engineering Division, Indian Institute of Technology, Chennai
4. Dr. E. J. James, Former Director (CWRDM) & Distinguished Professor, Water Institute, Karunya University, Coimbatore
5. Chief (Agriculture Division), State Planning Board ---- Convenor and Member Secretary.

Terms of Reference

1. To assess the status of implementation of the four ongoing projects – Muvattupuzha, Idamalayar, Karapuzha, Banasurasagar – and to frame a schedule for their completion.
2. To assess the need and justification for ongoing works under each project and to suggest a priority based action plan (including dropping selected works that are in the preliminary stage or other works that are of relatively low benefit to agriculture and farmers).
3. Examine the possibility of categorizing the projects into three – (1) completion of the project by additional funding (2) closure of a project with minimum budgetary support so as to get full benefit of investment (3) complete closure of works/components
4. To suggest sources of finance for completion of projects (including assistance from NABARD/CSS)
5. To suggest a monitoring mechanism for the time-bound completion of identified works.
6. The committee can slightly modify the scope of assessment as per requirement with the approval of State Planning Board.

The committee can evolve its own methodology for the completion of the assessment as per the requirement. The committee may conduct field visits, organize desk reviews, process all available reports, studies and original DPRs and supporting materials, organize field level consultations etc for the timely completion of the work. Irrigation Department shall provide necessary assistance to the technical committee and State Planning Board shall co-ordinate the whole process.

The duration of the committee shall be three months and the committee will submit the draft report to State Planning Board by September 1st 2017. The members will be entitled to Travelling Allowance including airfare as applicable to Class I officers of Government of Kerala. The expenditure will be met from the scheme Preparation of Plans and conduct of surveys and studies under the H/A 3451-00-101-93-34 (plan).

Sd/-
Member Secretary

To

- 1) The Person concerned
- 2) The Senior Administrative Officer, State Planning Board, Thiruvananthapuram
- 3) The Sub Treasury Officer, Vellayambalam

Copy to

- 1) CE, Project I
- 2) CE, Project II

Forwarded/ by Order

Chief (i/c) (Agriculture Division)

BOX 1

**REPORT ON MVIP BY STATE PLANNING BOARD IN 2007 AND
SUBSEQUENT GOVERNMENT ORDER DATED 10.04.2008**

A comprehensive study was undertaken by Kerala State Planning Board in 2007 to evaluate the progress of work under the MVIP. It was found that due to improper and mismanaged implementation process, cost of the project was escalated by 3179 percent. On analysing the action plan of the project for the year 2007-08, State Planning Board opined that further land acquisition is not necessary for the smooth implementation of this project. Permission was recommended to continue with the works that were then progressing and also to undertake those works that were indispensable. But the works that had not yet started and those which required acquisition of land were not favoured in the report .

In order to examine the drawbacks in the implementation of the project, assess the necessity of undertaking new works and explore sources of funding, the government constituted a Technical Committee vide order No. 1338/07/WRD dated 15/10/2007. Based on the recommendations of the Technical Committee, the government vide order No. 20/2008/WRD dated 10.04.2008 issued sanction for the following works subject to the following conditions. Copy of the order appended (Appendix II).

1. Design of works that had not commenced would require the approval of IDRB.
2. Works of Madakkathanam Distributary can be undertaken subject to the condition that concrete lining should be limited to certain areas.
3. Works of Devamathakunnu Ambalakunnu: length of the distributary is to be reduced, suitable change required in the design for cost reduction.
4. Works of Edayar Distributary can be taken up by redesigning it in accordance with the available ayacut.
5. Balance works of Karikode Distributary shall be done in a low cost manner after reexamining the alignment and design.
6. Undertake the construction of Uppukandam, Anicad East M.D at low cost.
7. By including MVIP in the Eleventh Plan, all the works should be completed by 2010 and declare the project as completed by 2011.