15 -ാം കേരള നിയമസഭ

12 -ാം സമ്മേളനം

നക്ഷത്ര ചിഹ്നം ഇല്ലാത്ത ചോദ്യം നം. 1094 **09-10-2024 - ൽ മറുപടിയ്ക്ക്**

എറണാകുളത്തെ വ്യവസായിക ജലവിതരണ പദ്ധതി

ചോദ്യം		ഉത്തരം	
ശ്രീമതി ഉമ തോമസ്		**ശ്രീ. റോഷി അഗസ്റ്റിൻ (ജലവിഭവ വകുപ്പ് മന്ത്രി)**	
(എ)	കിൻഫ്രയുടെ എറണാകുളത്തെ 45 എം.എൽ.ഡി. വ്യവസായിക ജലവിതരണ പദ്ധതിയുമായി ബന്ധപ്പെട്ട പ്രവൃത്തികളുടെ നിലവിലെ സ്ഥിതി വിശദമാക്കുമോ;	(എ)	കിൻഫ്രയുടെ എറണാകുളത്തെ 45 എം.എൽ.ഡി. വ്യവസായിക ജലവിതരണ പദ്ധതിയുടെ ആവശ്യത്തിനുതകുന്ന വെള്ളം ലഭിക്കണമെങ്കിൽ അമ്മാനത്ത് പള്ളത്ത് ക്രോസ് റഗുലേറ്റർ നിർമ്മിക്കേണ്ടതുണ്ട്. പ്രസ്തുത ക്രോസ് റഗുലേറ്റർ സ്ഥാപിക്കുന്നതുമായി ബന്ധപ്പെട്ട ഇൻവെസ്റ്റിഗേഷൻ പ്രവൃത്തികൾ പൂർത്തീകരിക്കുകയും ഇൻവെസ്റ്റിഗേഷൻ റിപ്പോർട്ട് ഡിസൈൻ ചീഫ് എഞ്ചിനീയർ, ഐ. ഡി. ആർ. ബി, പരിശോധിച്ചു വരികയും ചെയ്യുന്നു. ഡിസൈൻ & ഡ്രോയിംഗ് പൂർത്തിയാകുന്ന മുറയ്ക്ക് തുടർനടപടികൾ സ്വീകരിക്കുന്നതാണ്.
(ബി)	ഇതുമായി ബന്ധപ്പെട്ട് പെരിയാറിലെ ജലലഭ്യത സംബന്ധിച്ച് വകുപ്പ് നടത്തിയ പഠന റിപ്പോർട്ടിന്റെ പകർപ്പ് ലഭ്യമാക്കുമോ?	(ബി)	പഠന റിപ്പോർട്ടിന്റെ പകർപ്പ് അനുബന്ധമായി ചേർക്കുന്നു

സെക്ഷൻ ഓഫീസർ

Final Report

WATER AVAILABILITY STUDY AT ALUVA

FOR

KINFRA WATER SUPPLY PROJECT

Irrigation Design and Research Board (IDRB)

Thiruvananthapuram

25.10.2023

EXECUTIVE SUMMARY

Kerala Industrial Infrastructural Development Corporation (KINFRA) got approval from the Industrial Department Kerala for a Water Supply Project for supplying 45 MLD of water to the beneficiaries like Infopark, Kinfra Export Promotion Industrial Park, upcoming KINFRA Electronic Manufacturing Cluster, KINFRA International Exhibition Centre and KINFRA Petrochemical Park. But the work was stopped by the people in protest, saying that the domestic water supply from the Water treatment Plant at Aluva, will be affected if KINFRA draws 45 MLD of water.

Hence the minister for Water Resources directed the Chief Engineer I&A and the Chief Engineer KWA to conduct a joint inspection to assess whether sufficient quantity of water is available for withdrawal of 45MLD of water for KINFRA project.

The study area is located in the lower reaches of river Periyar and its surroundings. Water availability at Kalady is computed based on the historical discharge data available from Kalady river gauge station. The present and projected domestic, industrial and irrigation water demands in the downstream of Kalady gauge station are estimated by the Executive Engineers of Kerala Water Authority, PH Division Aluva, Major Irrigation Ernakulam and Minor Irrigation Ernakulam respectively, in anticipation of a hike in the water requirement by 2050.

The dependable yield at Kalady gauging station is estimated as per standard method, Flow Duration Curve. The conclusion on the availability of water is arrived based on the availability of water in the river at 75% dependability.

Considering the present abstractions, the least Net Water Availability at Aluva, at 75% dependability, is 2.55 MCM/10days, observed during 1^{st} -10^{th} of February. Since excess water is available at Aluva, the current water requirement of KINFRA, i.e. 45MLD (0.45 MCM/10days) may be drawn from river Periyar, **subject to the condition that a minimum water level of 0.3m (on the KWA scale) is maintained at the intake point of Water Treatment Plant, Aluva, as specified by the KWA.**

Based on the anticipated abstractions of 2050, the increased demand for water for prioritized purposes will result in a maximum shortage of 21.73 MCM/10days which is observed during 1^{st} -10^{th} of February. Kadambrayar may be considered as a possible alternate source of water after conducting water availability study.

BACKGROUND

The Industrial Department Kerala has sanctioned a water supply project to draw 45 MLD of water from Periyar river, a proposal of Kerala Industrial Infrastructural Development Corporation (KINFRA), which would benefit Infopark, Kinfra Export Promotion Industrial Park, upcoming KINFRA Electronic Manufacturing Cluster, KINFRA International Exhibition Centre and KINFRA Petrochemical Park. The Water Resources Department (WRD) Kerala has issued permission to KINFRA vide GO (RT) 317/2016/WRD dtd 30/03/2016 for the same, based on the study conducted by Centre for Water Resources Development and Management (CWRDM) Kozhikode.

Thus, KINFRA has tendered the work and Package I – Construction of Intake well - was in progress. But, a protest was staged and stopped the work saying that the domestic water supply will be affected if KINFRA draws 45 MLD of water.

A meeting was convened in the chamber of the honorable minister for Water Resources on 19.04.2023 to discuss the availability of water for KINFRA project. The Chief Engineer, I&A has reported that water availability is computed scientifically using Flow Duration Curve method based on the discharge observations made at Kalady rivergauge station for 31 years and then by deducting the water demand for Kerala Water Authority (KWA), Industries and LI schemes. The KWA officials stated that the water level at the intake point of Water Treatment Plant (WTP) Aluva is not sufficient for pumping and they are not able to satisfy the domestic water requirement of the beneficiary community. The MLAs present in the meeting were also of the opinion that the priority should be given to drinking water project. Hence the minister directed the Chief Engineer I&A and the Chief Engineer KWA to conduct a joint inspection to arrive at a conclusion.

Hence, a joint inspection of the Periyar river at the intake well of KWA and the intake well of KINFRA was conducted on 28.04.2023, to assess whether sufficient quantity of water is available for withdrawal of 45MLD of water. On discussion, it was decided to compute the water demands for the year 2050, by projecting the present demand. Figure 1 shows the photographs of the site visit. This study aims to comprehend the availability of water at the abstraction point for KINFRA, based on the discharge data at Kalady rivergauge station and the existing withdrawal. This report details the work carried out to estimate the water availability at the intake well of KINFRA.

Further to the above, a google meet was conducted on 04-10-2023 by Hon'ble Chief Minister. Water Resources Minister, PWD Minister and Industrial Minister were also present in the online meeting with Senior department officers of all the allied department such as Irrigation, PWD, KWA and Industries Department. In this meeting it was decided to conduct an another meeting with members of local bodies and connected officials to convey the facts regarding availability of water to KINFRA. According to this, meeting was conducted with the Local Body Members on 25-10-2023 at the chamber of Industrial Minister. In this meeting Chief Engineer, Irrigation and Administration presented detailed report regarding the water availability is as follows.

The average water availability calculations are as below:

<table>
<tr><th colspan="4">Average Water Availability Calculations at Aluva</th></tr>
<tr><td>Gross Water Availability (Fixed) (in MLD)</td><td>As per committed discharge from Bhoothatthankettu Barrage</td><td colspan="2">2419.2 MLD (28 m3/s)</td></tr>
<tr><td rowspan="5">Water Demand excluding e-flow (in MLD)</td><td>Type</td><td>Present</td><td>2050</td></tr>
<tr><td>Domestic Water Demand</td><td>750.00</td><td>1120.00</td></tr>
<tr><td>Industrial Water Demand</td><td>86.38</td><td>86.38</td></tr>
<tr><td>Irrigation Water Demand</td><td>539.14</td><td>1590.69</td></tr>
<tr><td>Total</td><td>1375.52</td><td>2797.07</td></tr>
<tr><td rowspan="2">Net Water Availability (in MLD)</td><td rowspan="2">Surplus/Deficit i.e.
(Gross Water Availability - Water Demand)</td><td>1043.68</td><td>-377.87</td></tr>
<tr><td>Surplus</td><td>Deficit</td></tr>
</table>

- The reported demand of KWA is as below, which has been accounted:

Sl. No.	WTP	Water requirement
1	Existing WTP at Aluva	325 MLD
2	Proposed WTP at Aluva	225 MLD
3	WTPs under the jurisdiction of SE, PH Circle Kochi **(190 MLD plant proposed under ADB)**	200 MLD
TOTAL		**750 MLD**

- The present net water availability excluding e-flow, at Aluva, is 1043.68 MLD. Hence, the 45 MLD requirement of KINFRA can be met at present.
- To meet the head requirement of +0.3m at KWA pumphouse in Aluva, additional regulator-cum-bridge has to be built at Ammanatthupallam thodu.
- In 2050, the domestic water demand (KWA) increases to 1120 MLD and Irrigation Water Demand increases to 1590.69 MLD. Industrial demand is considered as static. Hence, there is a deficit of 377.87 MLD at Aluva, excluding e-flow. Alternative sources should be identified, including possibility of drawing from Kadambrayar.

Fig. 1 Joint inspection at the intake wells of KWA & KINFRA

OBJECTIVES

- To compute the availability of water at the intake well of KINFRA
- To assess the scope of withdrawal of 45MLD (0.45MCM/10days) of water from the river Periyar, for the KINFRA project.

STUDY AREA

The river Periyar which originates from the Western Ghats, flows through Idukki district and Ernakulam district. Mullai ar, Perinjakkutty ar, Muthirampuzha and Idamayar are the major tributaries of river Periyar. A series of dams are constructed across the river Periyar and the lower reach is fed by the release from the Bhoothathankettu Barrage.

At Aluva, the river bifurcates into the Marthandavarma and the Mangalapuzha branches. The Mangalapuzha branch joins with Chalakudy River and empties into the Lakshadweep Sea at Munambam, and the Marthandavarma branch, again dividing into two near Kunjunnikkara island, drains into the Cochin backwater system (part of Vembanad Lake) at Varappuzha. Figure 2(a) shows the Periyar river basin with drainage network and dams in it.

Kochi city and the nearby places, in the vicinity of the river mouth draw its water supply from Aluva, an upstream site sufficiently free of seawater intrusion. Twenty five percent of Kerala's industries are along the banks of river Periyar.

The study area includes the river stretch from Kalady gauging station to the regulators in the lower reaches of Periyar and the benefited areas of Ernakulam district, in and around Aluva.

KWA has its treatment plant in Aluva. The intake well is approximately 0.5km upstream of the Aluva railway bridge. KINFRA project also has its inception in the banks of river Periyar. The intake well of KINFRA is being constructed at Thottumugham, approximately 0.90km upstream of the intake well of KWA. Hence, the study area falls in Periyar river basin, near Aluva Railway Bridge. The location is shown in figure 2(b).

The nearest gauging station is located at Kalady, which is approximately 20km upstream of the intake point.

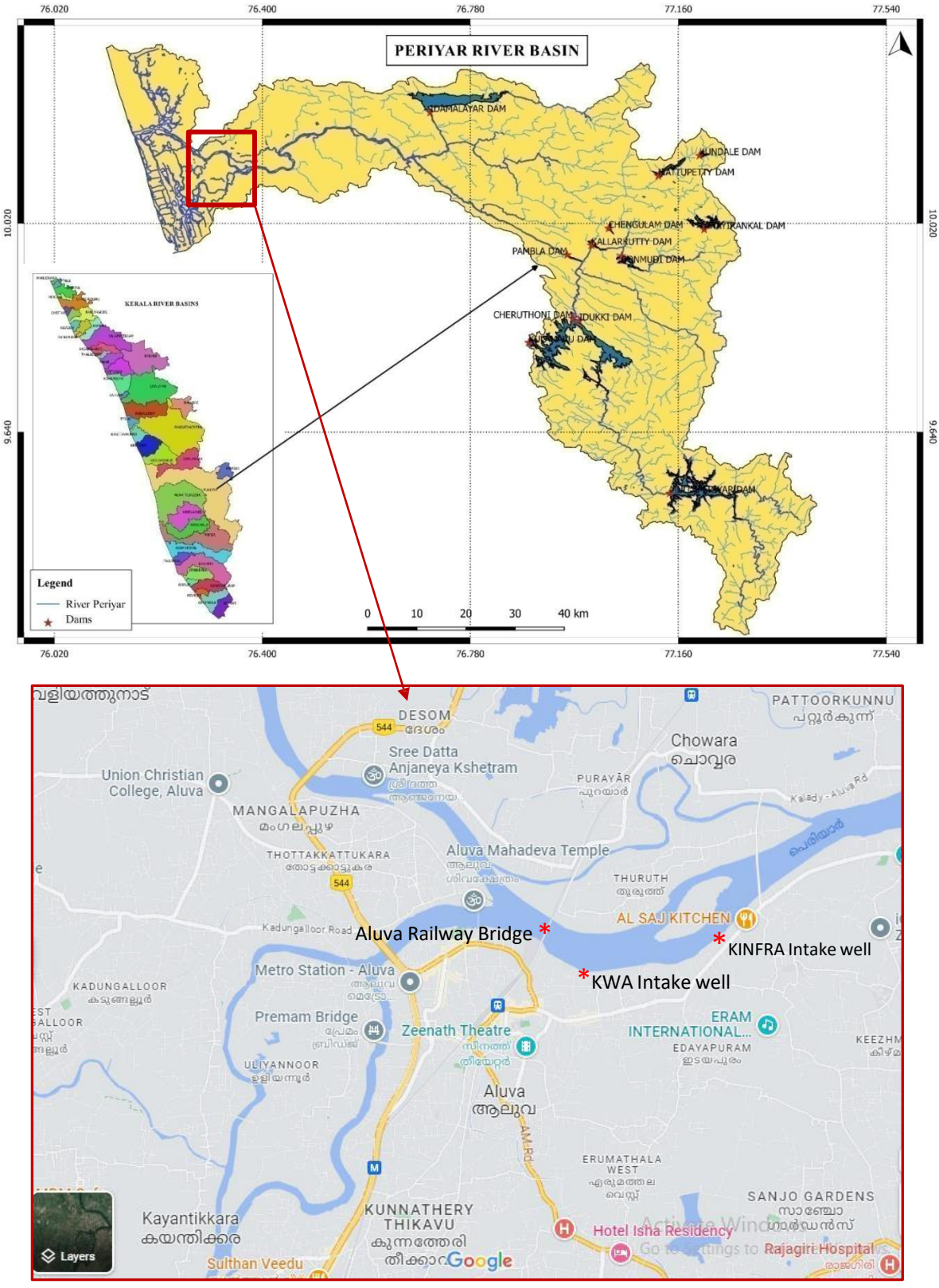

Fig. 2(a) Periyar River Basin 2(b) Location map of the study area (intake wells)

DATA USED

For evaluating the net water availability at the study location, quantity of water available at Kalady and water abstractions in the downstream of Kalady are considered in this study. The water level at Purappillykkavu regulator is also studied.

I. WATER AVAILABILITY

River periyar originates from the Sivagiri hills of Western Ghats. The water is impounded in major reservoirs of Mullaperiyar dam, Idukki dam, Idamalayar dam, Mattuppetty dam, etc. and finally in the Bhoothathankettu barrage. The assured release from the barrage is 28m^3/s during the lean season. Beside the release from the barrage, the river is fed by other small tributaries and rainfall. Discharge in the river is measured at Kalady river gauge station, maintained by the Irrigation Department, Kerala. Daily discharge data from Kalady river gauge station for the period 1990-91 to 2021-22 (31 years) have been used for the study.

II. WATER ABSTRACTION

River Periyar is the lifeline of Kochi city and the surrounding areas. Water is consumed for domestic purpose, Industrial purpose, Irrigation etc. Water Demand for different uses is calculated as follows:

(a) Domestic Water Demand

Existing Demand:

Superintending Engineer, PH Circle Kochi vide email dated 27th March, 2023 has reported the water requirement for the existing and proposed WTPs as in table 1 and given in Appendix A(i).

Table 1 Domestic Water Demand – Existing Water Requirement

Sl No.	WTP	Water requirement
1	Existing WTP at Aluva	325 MLD
2	Proposed WTP at Aluva	225 MLD
3	WTPs under the jurisdiction of SE, PH Circle Kochi	200 MLD
TOTAL		**750 MLD**

Demand of 2050:

The per capita water demand for a day is taken as 200lpcd. Floating population and leakage are also taken into account while calculating the water demand. By 2050, the KWA aims at supplying water in a 24*7 basis in Kochi city, seven municipalities and fifty two panchayaths in Ernakulam district. Water demand under the jurisdiction of different offices of KWA is given in table 2. The anticipated domestic water demand is given in Appendix A(ii). Vide letter dated 04/05/2023 of the Executive Engineer PH Division Aluva, EE has reported that the water demand by the year 2050, based on the then population, is calculated to be 1117.394MLD.

Table 2 Domestic Water Demand – Water Requirement by 2050

Sl No.	Jurisdiction	Water Demand
1	PH Division Muvattupuzha	41.908 MLD
2	PH Subdivision Perumbavoor	145.627 MLD
3	PH Subdivision Angamaly	100.390 MLD
4	PH Subdivision Vadakkekkara	93.192 MLD
5	PH Headworks Subdivision Aluva	449.574 MLD
6	PH Subdivision Aluva	90.466 MLD
7	WS Subdivision N. Paravur	196.236 MLD
Total		**1117.394 MLD**

Say 1120MLD i.e., 11.2 MCM/10days)

(b) Irrigation Water Demand

Present Demand

Irrigation is required in and around Aluva as some of the crops requires more water than what it is provided by the rainfall. There are 29nos. of Lift Irrigation (LI) Schemes functional under the jurisdiction of MI Division Ernakulam. The irrigation water demand is calculated on a 10-daily basis. Irrigation requirement varies from **0.52MCM/10 days** during the months of June and July **to 4.93MCM/10 days** during the months of January and February. The present irrigation water demand is given in Appendix B(i).

Demand of 2050

Beside the existing schemes and proposals, a few new proposals are also expected by year 2050. Irrigation requirement varies from **2.784MCM/10days** in July to **26.131MCM/10days** in February and March. During monsoon, irrigation is required in the region of Perumbavoor and North Paravoor only. The anticipated irrigation water demand is given in Appendix B(ii).

(c) Industrial Water Demand

Twenty five percent of Kerala's industries are along the banks of river Periyar. The quantity of water sanctioned by the Executive Engineer Irrigation Division Ernakulam is given in Appendix C. The major Industries that draw water from Periyar are shown in Table 3.

Table 3 Industrial Water Demand

Sl No.	Industry	Water Demand
1	BPCL	74 MLD
2	KINFRA	9 MLD
3	Amritha Institute	2 MLD
4	Appollo Tyres	0.9 MLD
5	V. T. Raphel	0.48 MLD
Total		**86.38 MLD**

Say 90 MLD i.e., 0.90 MCM/10days

III. ENVIRONMENTAL FLOW

Vide MA No. 628/2016, the National Green Tribunal (NGT) has directed the states to maintain a minimum of 15% to 20% of the average lean season flow in all the rivers.

IV. WATER LEVEL DATA AT PURAPPILLYKKAVU REGULATOR

River Periyar bifurcates at Mangalappuzha as Mangalappuzha branch and Marthandavarma branch. There are three regulators namely, Pathalam RCB, Purappillykkavu RCB and Manjummel RCB, in different distributaries of river Periyar. The regulators are constructed with the intention to prevent salt water intrusion and to ensure a sufficient quantity of water for KWA at Aluva.

The Ammanathupallom thodu which bifurcates from river Periyar at the upstream of PurappIllykkavu regulator, joins with Manjaly thodu and then joins back in Periyar at the downstream of the regulator. There is a temperory bund at Cheriya Thekkanam, after the confluence of Ammanathupallom thodu and Manjaly thodu to prevent salinity intrusion. These details are given in the line sketch in figure 3.

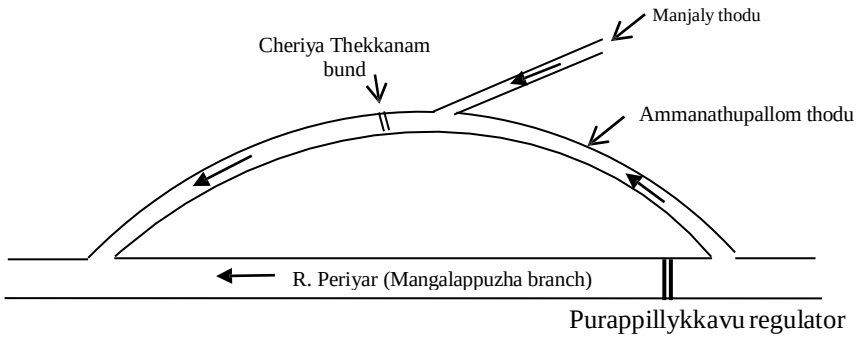

Fig. 3 Line sketch of the river Periyar near Purappillykkavu regulator

Vide letter no. DBGL-1388/2023 dtd. 24/05/2023, the Executive Engineer, Irrigation Division Ernakulam (Appendix D), has reported that:

- The maximum water level for the designed capacity of the Purappillykkavu regulator is 1.4m above MSL. But presently, the maximum water level to which the water can be stored is only 0.9m.
- Any rise in water level beyond 0.9m is a threat to the banks of Ammanathupallam thodu and the temperory bund at Cheriya Thekkanam. This will also leads to reverse flow to Manjaly thodu and cause flooding in the nearby paddy fields.

Because of the above reasons, the water level in Purappallykkavu regulator cannot be raised beyond 0.9m, though the designed maximum water level is 1.4m. Hence, the water level at the intake point of KWA is limited to be around 0.3 to 0.4 m.

V. WATER WITHDRAWAL FROM KADAMBRAYAR

The meeting, convened by the honorable minister for Water Resources on 19.04.2023, put forward an idea of using river Kadambrayar as an alternate source of water for KINFRA. The Superintending Engineer, Field Studies Circle Thrissur along with the Executive Engineer and Assistant Executive Engineer of Hydrology wing, visited the 7km long Kadambrayar on 01.06.2023 (figure 4). The Executive Engineer Irrigation Division Ernakulam has reported that seven industries are already drawing water from Kadambrayar, including KINFRA, and the details are given in table 4.

Table 4 Water Abstraction from Kadambrayar

Sl No.	Company	Sanctioned Quantity
1	KINFRA	10000 m3/day
2	Cochin Cadalas	30 m3/day
3	Philip's Carbon	2500 m3/day
4	Nitta Gelatine	4000 m3/day
5	CSEZ	1500 m3/day
6	Wonderla	500 m3/day
7	Smart City	3000 m3/day
TOTAL		**21530 m3/day**

i.e., 0.2153 MCM/10days

Every year a temperory bund is being erected at Kozhichira, to prevent salt water intrusion. Now it is proposed to construct a permanent structure across Kadambrayar, as Lock cum Regulator, for the easy transport of water metro. The location is yet to be finalized. The report of the Executive Engineer is given in Appendix E.

Even after the present abstractions, the quantity of water in Kadambrayar seems to be sufficient for KINFRA. However it is essential to establish a gauging station in Kadambrayar for assessing the quantity and quality of water.

Fig 4 Site visit to Kadambrayar – intake points of four companies in the d/s of the bridge

METHOD

Daily discharge data from Kalady river gauge station for the period 1990-91 to 2021-22 (31 years) are converted to 10-daily data. Water year is considered while arranging the data. Dependable flow is estimated by plotting Flow Duration Curve (FDC) using 10-daily data. For each 10-daily interval value (June 10-daily I to May 10-daily III), 50% and 75% dependable flow are obtained from the FDC, i.e., the discharge which equaled or exceeded 50% and 75% of time respectively, in a given period. Officers concerned have submitted the present domestic and irrigation water demand and anticipated demand for 2050 also. Hence, the total abstractions for the two cases are worked out, such as:

Case I – Net Water Availability considering the present abstractions

Case II – Net Water Availability considering the anticipated abstractions of 2050

Abstractions during each 10-daily period are deducted from the Gross Available Discharge. As per National Green Tribunal norms, 15% of the average lean season flow, after deducting the

committed abstractions, is taken as the Environmental Flow and the same is also deducted to obtain the Net Water Availability at Aluva.

RESULT

The 10-daily Gross Available Water at Kalady, at 75% dependability, varies from 22.51MCM during first 10-daily of February to 334.07MCM during second 10-daily of July. The Net Water Availability in case I and case II are as follows:

Case I – Net Water Availability considering Present Abstractions

Calculation is given in table 4.

The total abstractions (i.e., water demand for domestic, irrigation and industrial purposes) vary from 8.92MCM/10days during the months of June and July to 13.33MCM/10days during the months of January and February.

An approximate value of the Environmental Flow, i.e., 15% of the average lean season flow, is calculated as 6.79MCM/10days.

The Net Water Availability at Aluva varies from 2.55MCM (first 10-daily of February) to 62.80MCM (first 10-daily of November) during lean season and27.77 MCM (first 10-daily of June) to 318.26 MCM (second 10-daily of July) during monsoon season.

Case II – Net Water Availability considering Anticipated Abstractions of 2050

Calculation is given in table 5.

The total abstractions (i.e., water demand for domestic, irrigation and industrial purposes) vary from 14.88MCM/10days during the month of July to 38.23MCM/10days during the months of February and March. The estimated abstraction for the year 2050 exceeds the water availability, during the lean season.

An approximate value of the Environmental Flow, i.e., 15% of the average lean season flow, is calculated as 6.79MCM/10days.

Table 5 shows the 10-daily Gross and Net Water Availability for a Water Year, i.e., from June to May. During the period from first 10-daily of December to the second 10-daily of May, the calculation shows negative values for water availability, which indicates a shortage of water in the river Periyar by the year 2050.

Table 4 Case I - Net Water Availability at Aluva considering present abstractions

WATER AVAILABILITY AT ALUVA (based on 1990-91 to 2021-22 discharge data)										
Month	10-daily interval	Gross water availability at Kalady (MCM)		Abstractions (MCM)					Net Water availability at Aluva (MCM)	
				Domestic Water Demand	Irrigation Water Demand	Industrial Water Demand	TOTAL	E-Flow (15% of average lean flow)		
		50% Dep	75% Dep						50% Dep	75% Dep
June	Ten Daily I	163.28	43.65	7.50	0.69	0.90	9.09	6.79	147.40	27.77
	Ten Daily II	259.14	109.62	7.50	0.52	0.90	8.92	6.79	243.43	93.91
	Ten Daily III	251.28	162.31	7.50	0.52	0.90	8.92	6.79	235.57	146.60
July	Ten Daily I	418.67	120.70	7.50	0.62	0.90	9.02	6.79	402.86	104.89
	Ten Daily II	531.98	334.07	7.50	0.62	0.90	9.02	6.79	516.17	318.26
	Ten Daily III	527.64	312.68	7.50	0.52	0.90	8.92	6.79	511.93	296.97
August	Ten Daily I	405.84	229.71	7.50	0.52	0.90	8.92	6.79	390.13	214.00
	Ten Daily II	422.74	309.05	7.50	0.72	0.90	9.12	6.79	406.83	293.14
	Ten Daily III	318.04	248.48	7.50	0.72	0.90	9.12	6.79	302.13	232.57
September	Ten Daily I	201.49	141.80	7.50	1.07	0.90	9.47	6.79	185.23	125.54
	Ten Daily II	242.95	127.81	7.50	1.07	0.90	9.47	6.79	226.69	111.55
	Ten Daily III	188.71	100.96	7.50	1.82	0.90	10.22	6.79	171.70	83.95
October	Ten Daily I	164.12	84.50	7.50	1.86	0.90	10.26	6.79	147.07	67.45
	Ten Daily II	189.25	121.01	7.50	2.24	0.90	10.64	6.79	171.82	103.58
	Ten Daily III	206.23	125.53	7.50	2.54	0.90	10.94	6.79	188.50	107.80
November	Ten Daily I	135.59	81.68	7.50	3.69	0.90	12.09	6.79	116.71	62.80
	Ten Daily II	125.47	63.44	7.50	3.84	0.90	12.24	6.79	106.44	44.41
	Ten Daily III	86.22	51.91	7.50	3.69	0.90	12.09	6.79	67.34	33.03

December	Ten Daily I	71.14	40.36	7.50	4.19	0.90	12.59	6.79	51.76	20.98
	Ten Daily II	64.93	35.30	7.50	4.32	0.90	12.72	6.79	45.42	15.79
	Ten Daily III	62.07	30.00	7.50	4.09	0.90	12.49	6.79	42.79	10.72
January	Ten Daily I	39.88	25.08	7.50	4.93	0.90	13.33	6.79	19.76	4.96
	Ten Daily II	37.44	29.43	7.50	4.62	0.90	13.02	6.79	17.63	9.62
	Ten Daily III	42.31	31.33	7.50	4.36	0.90	12.76	6.79	22.76	11.78
February	Ten Daily I	37.92	22.51	7.50	4.77	0.90	13.17	6.79	17.96	2.55
	Ten Daily II	39.22	28.68	7.50	4.17	0.90	12.57	6.79	19.86	9.32
	Ten Daily III	42.36	24.45	7.50	4.93	0.90	13.33	6.79	22.24	4.33
March	Ten Daily I	44.02	31.39	7.50	4.30	0.90	12.70	6.79	24.53	11.90
	Ten Daily II	55.97	30.47	7.50	4.77	0.90	13.17	6.79	36.01	10.51
	Ten Daily III	65.31	35.18	7.50	4.30	0.90	12.70	6.79	45.82	15.69
April	Ten Daily I	62.49	36.08	7.50	3.75	0.90	12.15	6.79	43.55	17.14
	Ten Daily II	61.15	32.43	7.50	2.41	0.90	10.81	6.79	43.55	14.83
	Ten Daily III	63.07	34.19	7.50	2.41	0.90	10.81	6.79	45.47	16.59
May	Ten Daily I	65.16	36.50	7.50	2.31	0.90	10.71	6.79	47.66	19.00
	Ten Daily II	68.62	36.64	7.50	2.01	0.90	10.41	6.79	51.42	19.44
	Ten Daily III	86.66	46.57	7.50	1.45	0.90	9.85	6.79	70.02	29.93

Table 5 Case II – Net Water Availability at Aluva considering anticipated abstractions of 2050

WATER AVAILABILITY AT ALUVA (based on 1990-91 to 2021-22 discharge data)										
Month	10-daily interval	Gross water availability at Kalady (MCM)		Abstractions (committed demands) (in MCM)				E-Flow- 15% of average lean flow (MCM)	Net Water availability at Aluva (MCM)	
		50% Dep	75% Dep	Domestic water Demand	Irrigation Water Demand	Industrial Water Demand	TOTAL		50% Dep	75% Dep
June	Ten Daily I	163.28	43.65	11.20	3.862	0.90	15.96	6.79	140.53	20.90
	Ten Daily II	259.14	109.62	11.20	3.862	0.90	15.96	6.79	236.39	86.86
	Ten Daily III	251.28	162.31	11.20	3.323	0.90	15.42	6.79	229.06	140.10
July	Ten Daily I	418.67	120.70	11.20	2.784	0.90	14.88	6.79	396.99	99.03
	Ten Daily II	531.98	334.07	11.20	3.053	0.90	15.15	6.79	510.04	312.12
	Ten Daily III	527.64	312.68	11.20	3.323	0.90	15.42	6.79	505.43	290.46
August	Ten Daily I	405.84	229.71	11.20	3.323	0.90	15.42	6.79	383.63	207.50
	Ten Daily II	422.74	309.05	11.20	3.862	0.90	15.96	6.79	399.99	286.29
	Ten Daily III	318.04	248.48	11.20	5.542	0.90	17.64	6.79	293.61	224.04
September	Ten Daily I	201.49	141.80	11.20	5.542	0.90	17.64	6.79	177.06	117.36
	Ten Daily II	242.95	127.81	11.20	6.988	0.90	19.09	6.79	217.07	101.93
	Ten Daily III	188.71	100.96	11.20	8.954	0.90	21.05	6.79	160.86	73.11
October	Ten Daily I	164.12	84.50	11.20	11.538	0.90	23.64	6.79	133.69	54.07
	Ten Daily II	189.25	121.01	11.20	12.666	0.90	24.77	6.79	157.69	89.45
	Ten Daily III	206.23	125.53	11.20	13.952	0.90	26.05	6.79	173.39	92.69

November	Ten Daily I	135.59	81.68	11.20	15.707	0.90	27.81	6.79	100.99	47.08
	Ten Daily II	125.47	63.44	11.20	16.429	0.90	28.53	6.79	90.15	28.12
	Ten Daily III	86.22	51.91	11.20	16.561	0.90	28.66	6.79	50.77	16.46
December	Ten Daily I	71.14	40.36	11.20	22.921	0.90	35.02	6.79	29.33	-1.45
	Ten Daily II	64.93	35.30	11.20	22.76	0.90	34.86	6.79	23.28	-6.35
	Ten Daily III	62.07	30.00	11.20	22.691	0.90	34.79	6.79	20.49	-11.58
January	Ten Daily I	39.88	25.08	11.20	24.862	0.90	36.96	6.79	-3.88	-18.67
	Ten Daily II	37.44	29.43	11.20	24.427	0.90	36.53	6.79	-5.87	-13.88
	Ten Daily III	42.31	31.33	11.20	24.85	0.90	36.95	6.79	-1.43	-12.41
February	Ten Daily I	37.92	22.51	11.20	25.347	0.90	37.45	6.79	-6.32	-21.73
	Ten Daily II	39.22	28.68	11.20	23.701	0.90	35.80	6.79	-3.37	-13.91
	Ten Daily III	42.36	24.45	11.20	26.131	0.90	38.23	6.79	-2.66	-20.57
March	Ten Daily I	44.02	31.39	11.20	24.485	0.90	36.59	6.79	0.64	-11.98
	Ten Daily II	55.97	30.47	11.20	26.131	0.90	38.23	6.79	10.95	-14.55
	Ten Daily III	65.31	35.18	11.20	23.624	0.90	35.72	6.79	22.79	-7.34
April	Ten Daily I	62.49	36.08	11.20	23.624	0.90	35.72	6.79	19.98	-6.43
	Ten Daily II	61.15	32.43	11.20	23.946	0.90	36.05	6.79	18.32	-10.40
	Ten Daily III	63.07	34.19	11.20	23.946	0.90	36.05	6.79	20.23	-8.65
May	Ten Daily I	65.16	36.50	11.20	25.025	0.90	37.13	6.79	21.25	-7.42
	Ten Daily II	68.62	36.64	11.20	25.811	0.90	37.91	6.79	23.91	-8.06
	Ten Daily III	86.66	46.57	11.20	25.049	0.90	37.15	6.79	42.72	2.64

CONCLUSION and RECOMMENDATION

The water availability is estimated using Flow Duration Curve method, based on the daily discharge values observed at Kalady river gauge station for the period 1990-91 to 2021-22.

Case-I Based on the present abstractions, the least Net Water Availability at Aluva, at 75% dependability, is 2.55 MCM/10days (observed during 1st -10th February). Since excess water is available at Aluva, even after the abstractions, the current water requirement of KINFRA, i.e. 45MLD (0.45 MCM/10days) may be drawn from river Periyar, **subject to the condition that a minimum water level of 0.3m (on the KWA scale) is maintained at the intake point of Water Treatment Plant, Aluva, as specified by the KWA.**

The water level at the intake point of the WTP Aluva can be improved atleast by 0.50m by raising the storage level of Purappillykkavu regulator to the maximum capacity of 1.4m. In order to achieve this, the Executive Engineer Irrigation Division Ernakulam, has recommended:

- Construction of a 35m long regulator at the mouth of Ammanathupallam thodu and
- Construction of a permanent structure at Cheriya Thekkanam

Case II –Based on the anticipated abstractions of 2050, submitted by the officers concerned, the increased demand for water for prioritized purposes will result in a maximum shortage of 21.73 MCM/10days which is observed during 1st -10th of February.

Kadambrayar could be a possible alternate source of water for 2050, after conducting a regular quantitative and qualitative analysis.

Thrissur
25-10-2023

Superintending Engineer,
Field Studies Circle, Thrissur.

Section Officer