

INTEGRATED RIVER BASIN MANAGEMENT IN WESTERN GHAT REGION THROUGH A CASE STUDY

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Need for an Integrated River Basin Management

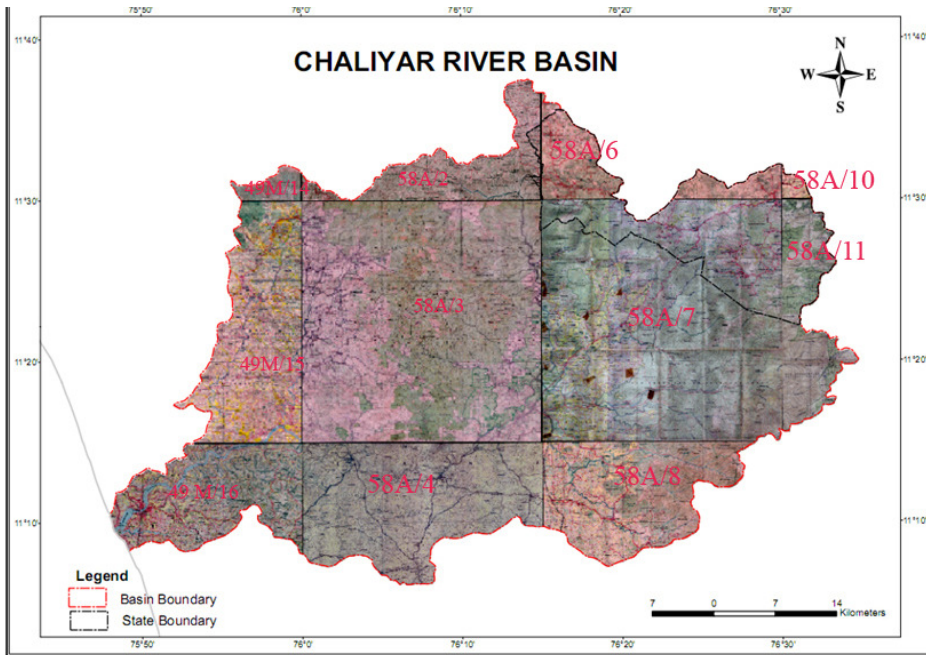
- **No interdepartmental cooperation among the user Departments**
- **Downstream users are not aware of the upstream interventions**
- **Integrated River Basin Management should consider multiple water uses in a river basin**
- **Coordination with other sectors and levels of government –(nation planning , regional planning)**
- **Will help the planners and decision makers in solving water management issues**

Database

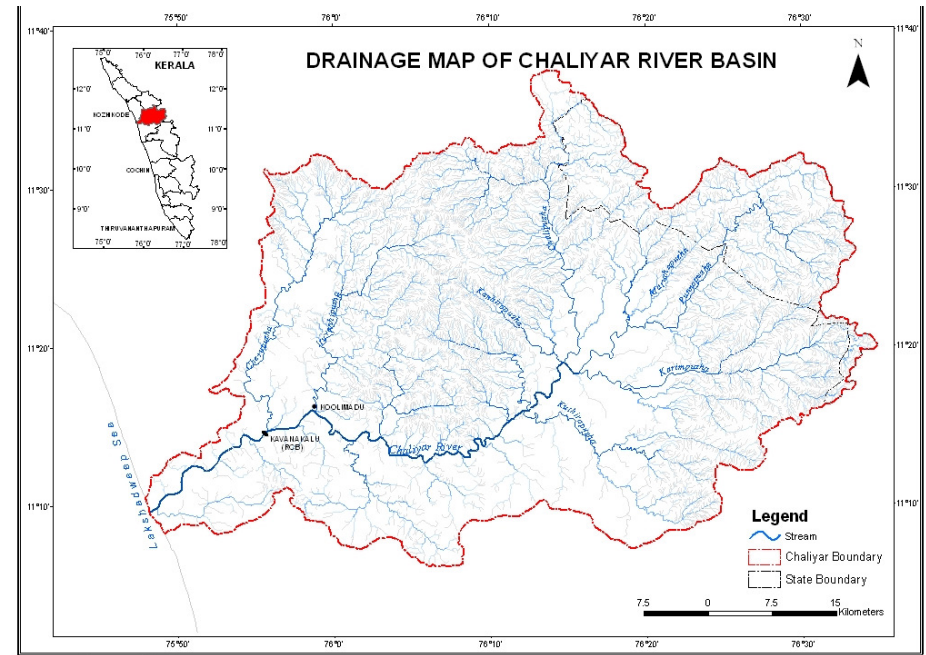
- **Survey of India Toposheets**
- **Rainfall and Runoff data from IMD, CWC WRD, KSEB**
- **IRS data for landuse classification**
- **Present utilization and future demand of water from KWA, WRD, KSEB, KSPCB and Dept. of Industries**
- **Block wise groundwater data from CGWB**
- **Modern tools like GIS, GPS and Remote Sensing Techniques were used**

Hydrological Analysis Done

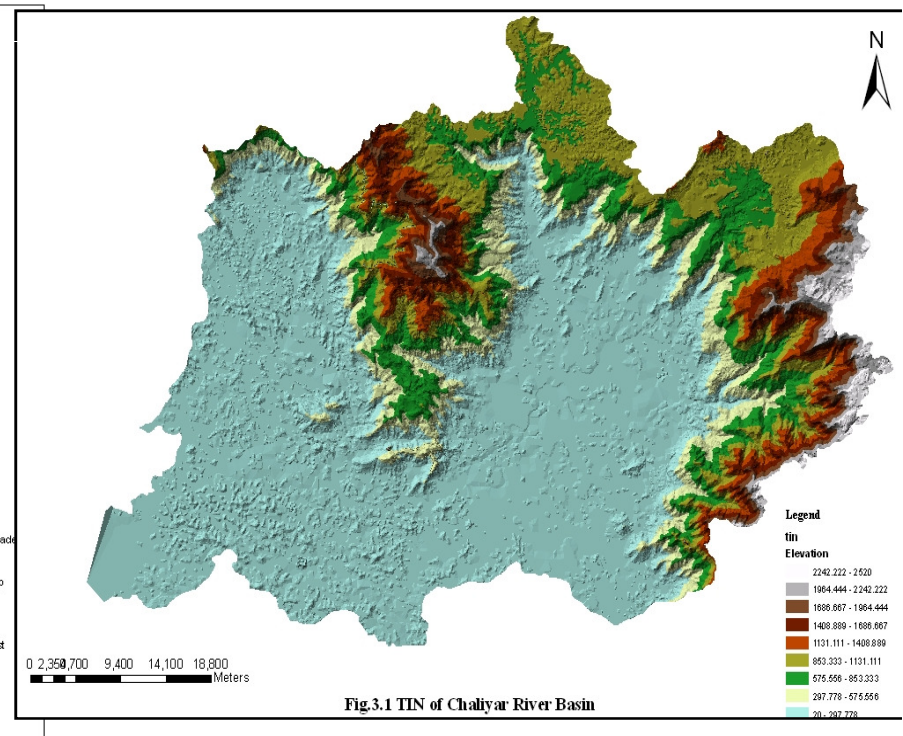
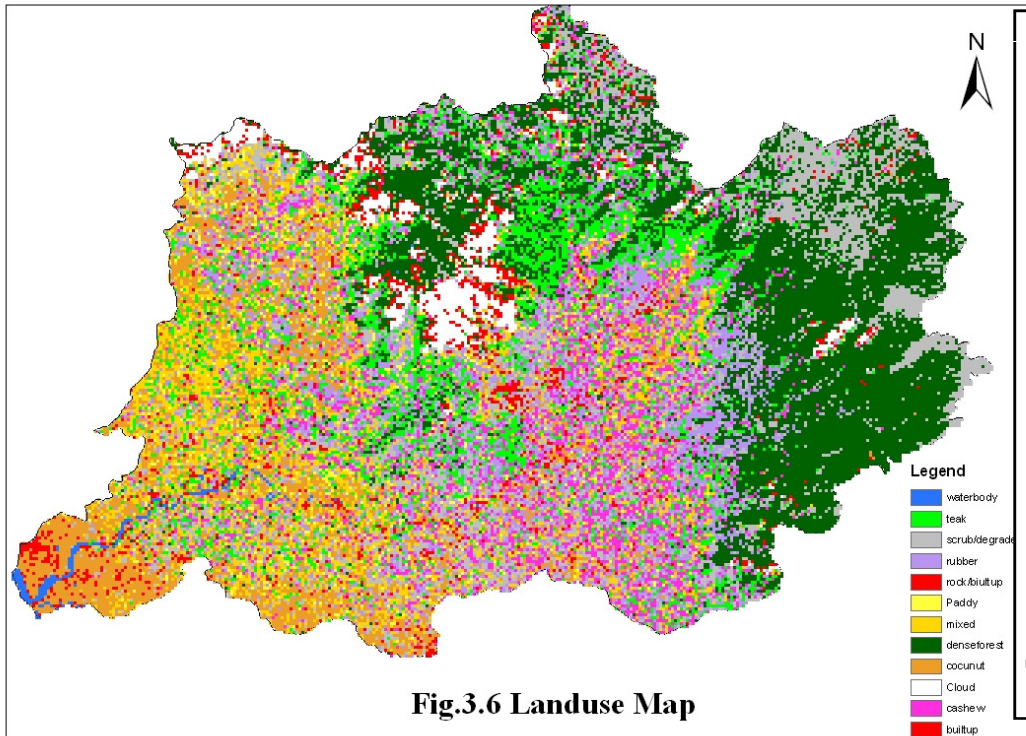
- **Spatial and temporal water availability and demand**
- **Water quality status**
- **Present water resources utilization**
- **Future water resources demand**
- **Spatial water balance**
- **Surplus/deficit**
- **Management strategies**



Source - Survey of India

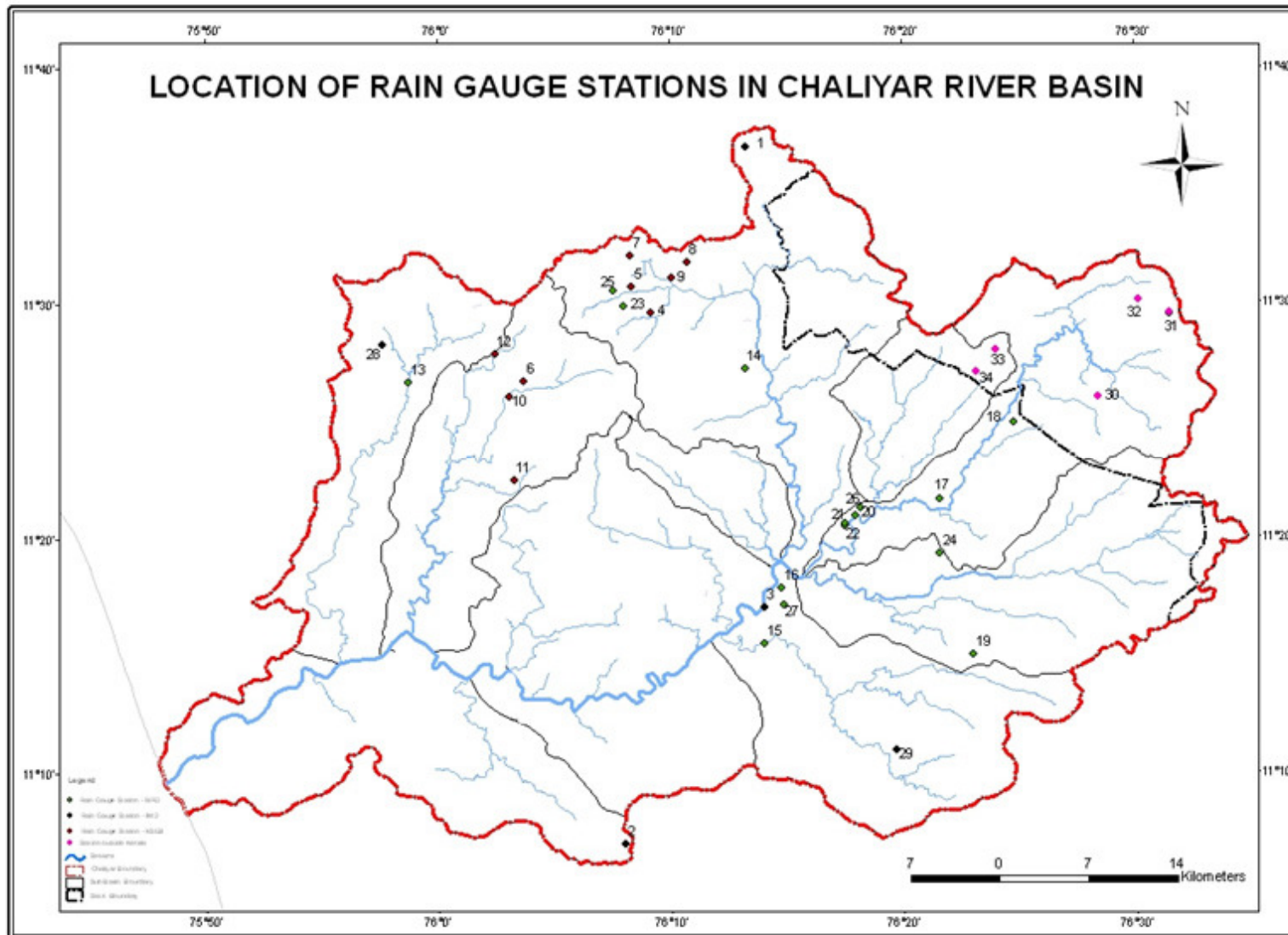


Source - Survey of India



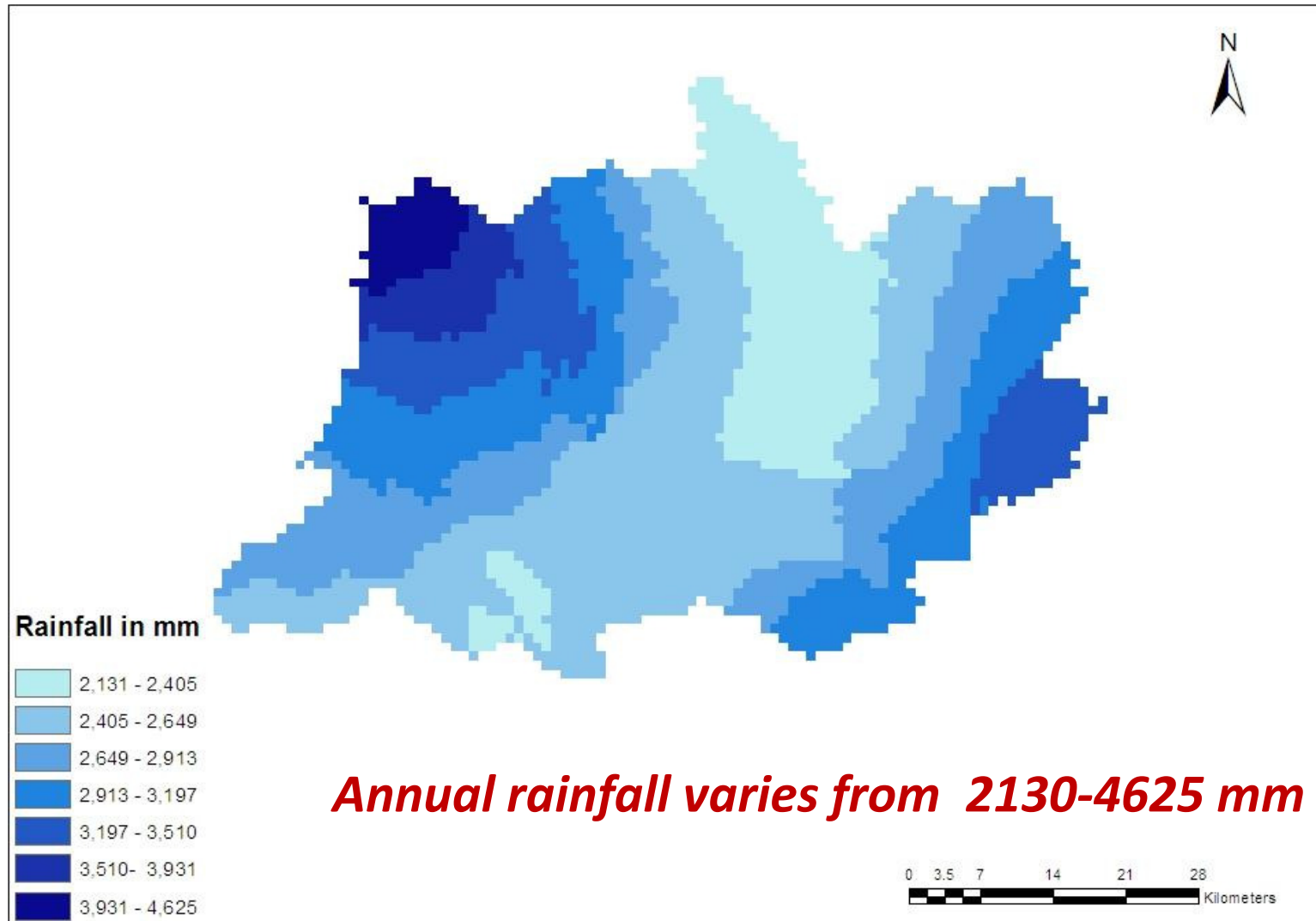
Spatial and Temporal Distribution of Rainfall

- [location details of raingauge stations.docx](#)
- [Mean monthly rainfall.docx](#)



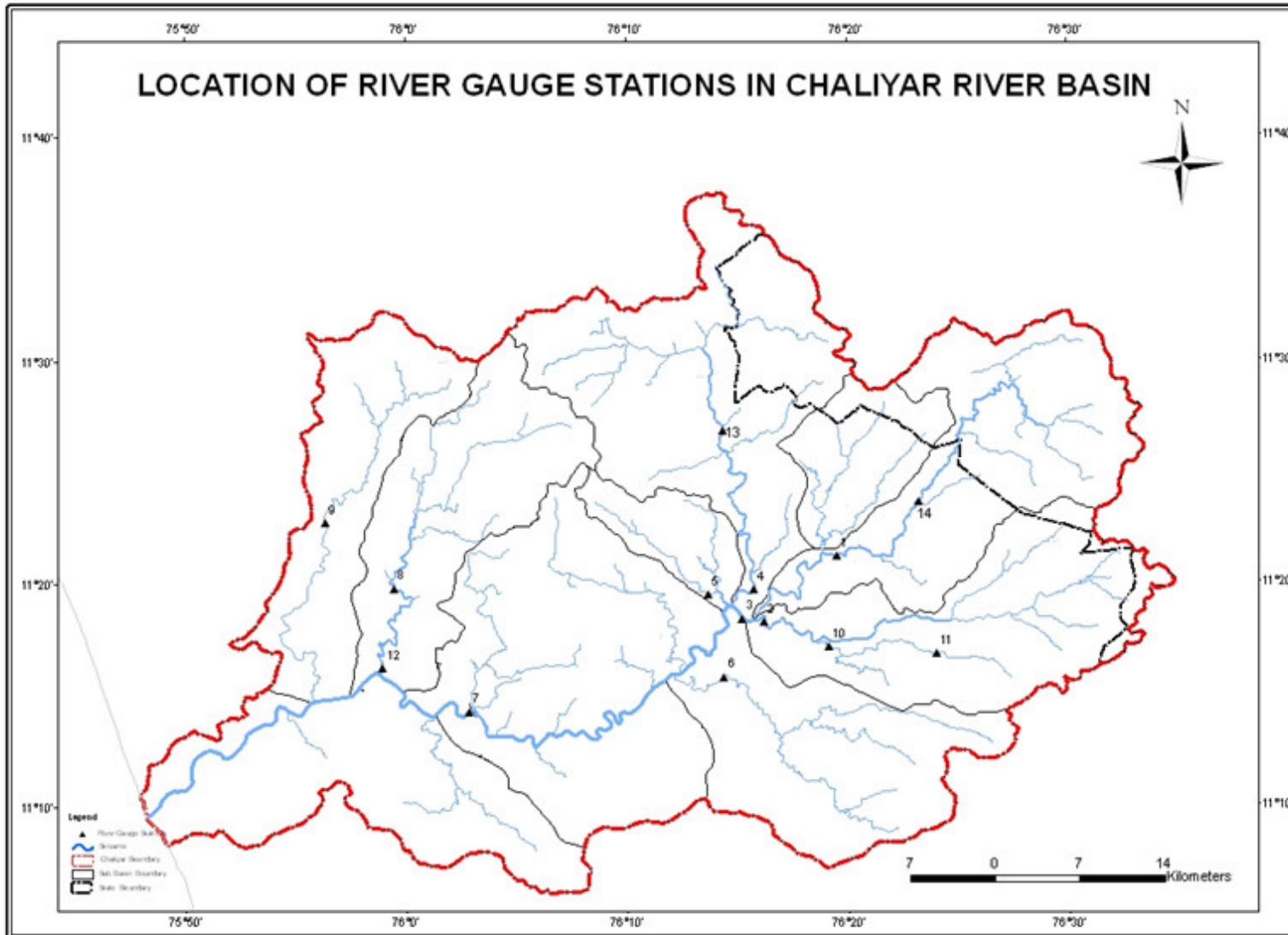
Source : India Meteorological Department , Water Resource Department and Kerala State Electricity Board

Isohyetal map of Chaliyar



Spatial and Temporal Analysis of Runoff

- [Location details of river gauging stations.docx](#)



Source - Water Resource Department, Kerala State Electricity Board and Centre for Water Commission

Mean monthly Surface Water Availability (MCM) in Chaliyar River Basin

Station	Area, Sq.km	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total
Kuniyil	1876	626	1262.9	952.6	503.1	420.6	240.8	73.9	38.4	12.7	9.3	7	43.6	4190.9
Koodathai	117	76.1	154.9	119	52.3	49.5	35.3	15.4	6.6	3.7	2.9	2.8	8.3	526.8
Mukkom	206.3	189.8	354.2	250.2	98.4	80	47.2	15.8	7.7	3.7	3.4	4.4	14.5	1069.3
Total	2199.3	891.9	1772	1321.8	653.8	550.1	323.3	105.1	52.7	20.1	15.6	14.2	66.4	5787
Ungauged area	723.7	241.5	162.6	82.5	22.1	5.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	514.4
Total Catchment area	2923	1133.4	1934.6	1404.3	675.9	555.1	323.9	105.1	52.7	20.1	15.6	14.2	66.4	6301.4
T N Area	388	9.4	13.2	22.7	35.1	98.8	124.9	43.3	6.5	2.4	14.9	8.1	22.7	402
Kerala	2535	1124.0	1921.4	1381.6	640.8	456.3	199.0	61.8	46.2	17.7	0.7	6.1	43.7	5899.4
Total Surface Water Availability in Kerala											5899 MCM			

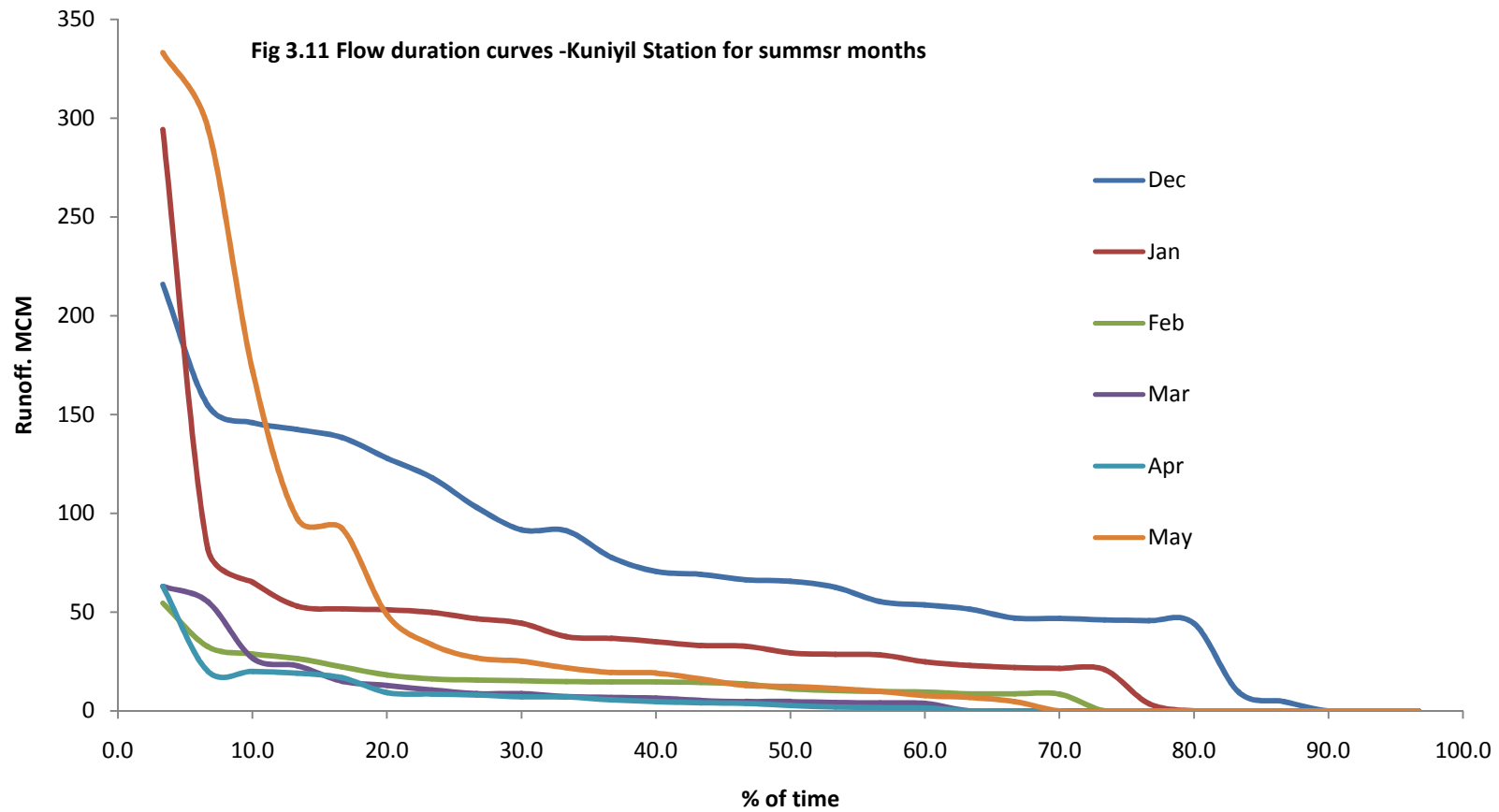
Utilizable Yield (MCM) of Chaliyar river Basin

Station	Area, Sq.km	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total
Kuniyil	1876.0	626.0	1262.9	952.6	503.1	420.6	240.8	73.9	38.4	12.7	9.3	7.0	43.6	4190.9
Highland	1313.2	372.5	751.4	566.8	299.3	250.3	143.3	44.0	22.8	7.6	5.5	4.2	25.9	2493.6
Midland	562.8	126.8	255.7	192.9	101.9	85.2	48.8	15.0	7.8	2.6	1.9	1.4	8.8	848.7
	Total	499.2	1007.2	759.7	401.2	335.4	192.0	58.9	30.6	10.1	7.4	5.6	34.8	3342.2
Koodathai	117.0	76.1	154.9	119.0	52.3	49.5	35.3	15.4	6.6	3.7	2.9	2.8	8.3	526.8
Highland	46.8	25.9	52.7	40.5	17.8	16.8	12.0	5.2	2.2	1.3	1.0	1.0	2.8	179.1
Midland	70.2	25.1	51.1	39.3	17.3	16.3	11.6	5.1	2.2	1.2	1.0	0.9	2.7	173.8
	Total	51.0	103.8	79.7	35.0	33.2	23.7	10.3	4.4	2.5	1.9	1.9	5.6	353.0
Mukkom	206.3	189.8	354.2	250.2	98.4	80.0	47.2	15.8	7.7	3.7	3.4	4.4	14.5	1069.3
Highland	140.4	109.8	204.9	144.8	56.9	46.3	27.3	9.1	4.5	2.1	2.0	2.5	8.4	618.7
Midland	66.1	40.0	74.6	52.7	20.7	16.9	9.9	3.3	1.6	0.8	0.7	0.9	3.1	225.3
	Total	149.8	279.6	197.5	77.7	63.1	37.3	12.5	6.1	2.9	2.7	3.5	11.4	844.0
Total Catchment	2199.3	700.0	1390.5	1036.9	513.9	431.7	252.9	81.7	41.1	15.5	12.0	10.9	51.8	4539.2
Runoff in T N Area	388.0	9.4	13.2	22.7	35.1	98.8	124.9	43.3	6.5	2.4	14.9	8.1	22.7	402.0
Utilizable yield in Kerala		690.6	1377.3	1014.2	478.8	332.9	128.0	38.4	34.6	13.1	-2.9	2.8	29.1	4137.2
Monsoon yield		4021.9												
Non monsoon yield		115.2												

50%, 75% and 90% dependable flows of sub basins of Chaliyar

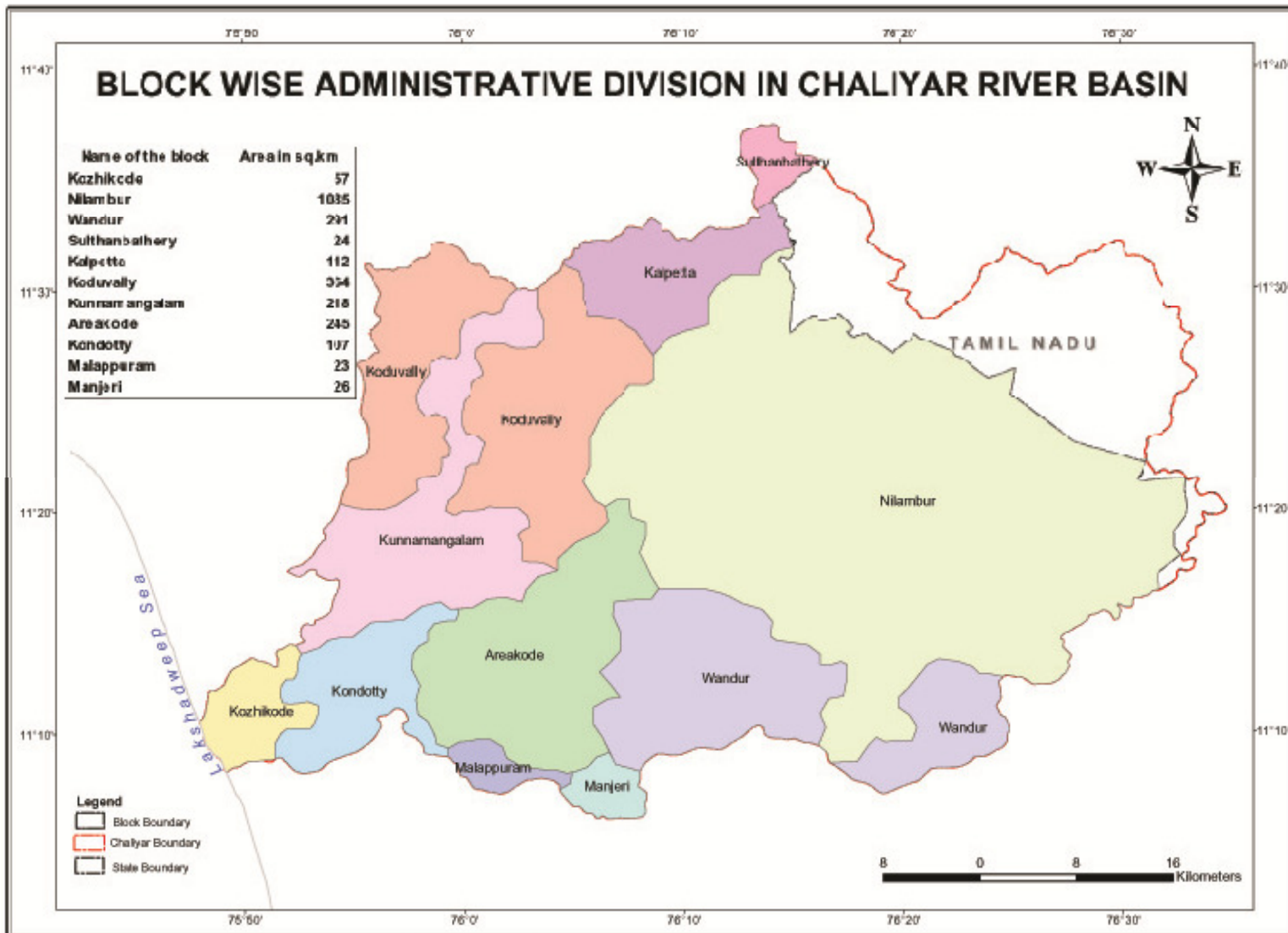
Month	Dependability	Maruthapuzha	Punnappuzha	Karimpuzha	Chaliyar	Kanchirapuzha	Kuthirapuzha	Areacode	Mukkom	Koodathai	Kuniyil
Dec	50%	7.1	18.7	26.2	17.1	3.7	8.4	64	15.8	14	65.5
	75%	5	14.3	16.6	8.7	2.5	6.3	31	8.8	7	45.6
	90%	4	9.2	9	4.7	0.7	3.9	8.7	3.9	4.3	0
Jan	50%	4	10	11	9.1	2	5.1	33	7	4	29.3
	75%	2.5	4.9	1	4.7	0.6	3	19.1	3.7	0	3.6
	90%	1	2.8	0	1.1	0	0.9	5.5	0.2	0	0
Feb	50%	2.2	4.2	4.2	5.5	1	2.1	18	2	2	11.1
	75%	1.7	1.4	0	3.1	0.2	1	7.3	0.9	0	0
	90%	0	0	0	0	0	0	1.9	0	0	0
Mar	50%	2.2	3.2	1.5	5.1	0.2	1.2	14	2	1.6	4.7
	75%	0.9	0	0	0	0	0	5.2	0	0	0
	90%	0	0	0		0	0	1.1	0	0	0
Apr	50%	2.2	3.9	1.1	4.3	0.2	1.8	12	2.1	2.1	2.6
	75%	1	0.5	0	0.7	0	0	2.5	0	0	0
	90%	0	0	0	0	0	0	0.5		0	0

Flow Duration Curves



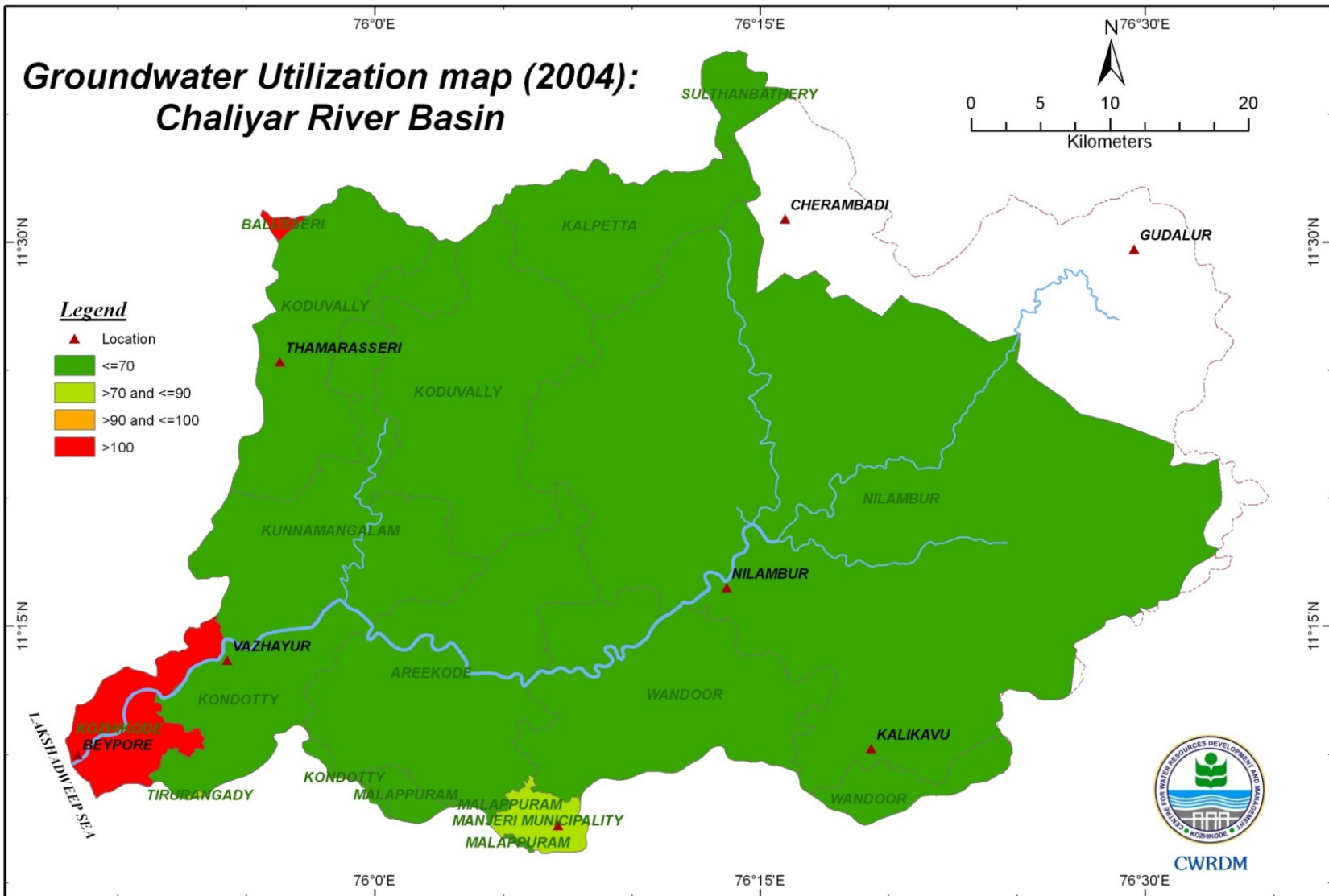
GROUNDWATER RESOURCES OF CHALIYAR

[Groundwater resources of Chaliyar.docx](#)



Source - Kerala State Land Use Board, Thiruvananthapuram.

Groundwater Utilization map (2004): Chaliyar River Basin



Water Availability

- **Surface Water**

Monsoon flow: 5723 MCM

Non monsoon: 176 MCM

- **Utilizable flow**

Monsoon flow: 4022 M MCM

Non monsoon: 115 MCM

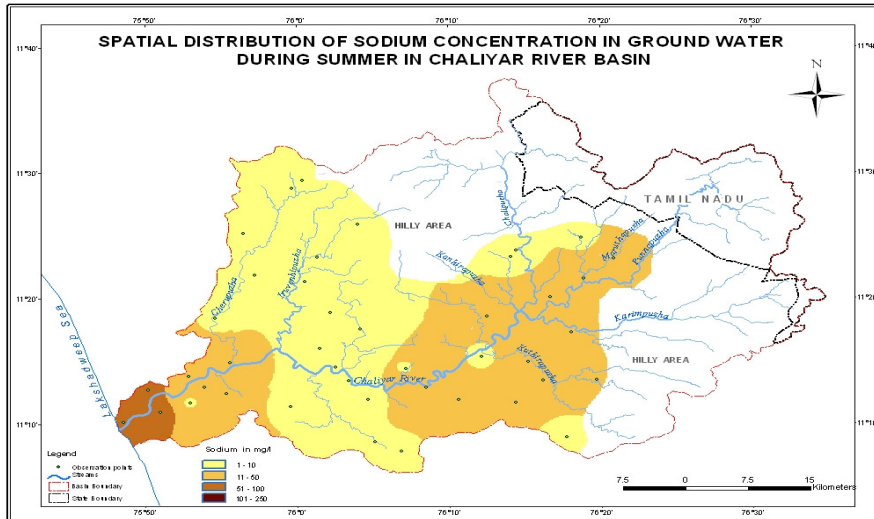
- **Groundwater Potential: 283.25 MCM**

GW Draft : 140 MCM 4 blocks semi critical ;

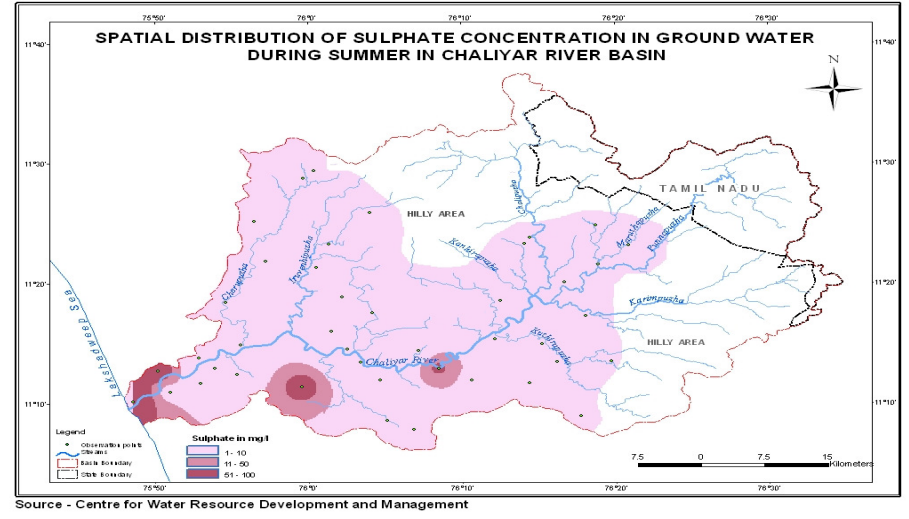
8 Blocks safe

Water Quality Status

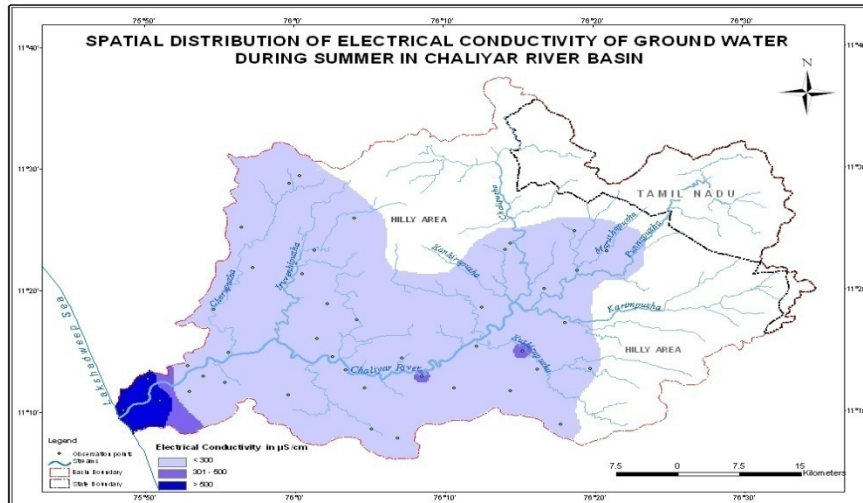
- **Higher level of dissolved solids in coastal region**
- **75% of wells show significant level of nitrate**
- **bore wells having high iron**
- **Except for pH, all the quality variables comply with the desirable limit**
- **The spatial trends of chloride, sulphate, sodium and calcium**
- **Low concentrations of these constituents confirming the good quality of water except few wells in the coastal area.**



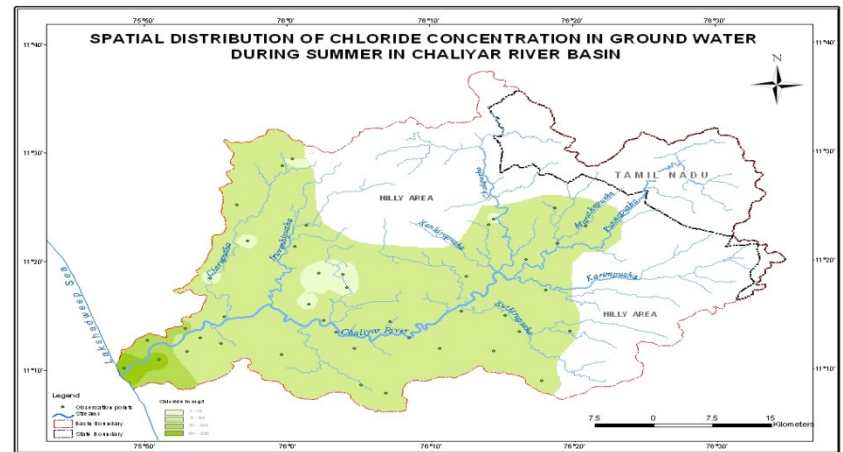
Source - Centre for Water Resource Development and Management



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**STATUS OF WATER RESOURCES UTILIZATION AND
FUTURE DEMAND FOR VARIOUS PURPOSES**

Water for Domestic Purpose

- **Present Utilization**
 - **No. of Schemes: 42 Schemes in Kozhikode & Malappuram Districts**
 - **Water utilization - 218 MLD**
80 MCM
- **Future Demand**
 - **No. of new Schemes – 45**
 - Water utilization - 409 MLD**
150 MCM

75°50'0"E

76°0'0"E

76°10'0"E

76°20'0"E

76°30'0"E

FIG 5.1 EXISTING AND PROPOSED WATER SUPPLY SCHEMES IN CHALIYAR RIVER BASIN

Legend

- ▲ Future Water Supply Schemes
- Existing Water Supply Schemes
- Drainage
- places
- Road network
- Railway network
- State boundary
- Chaliyar boundary



11°30'0"N

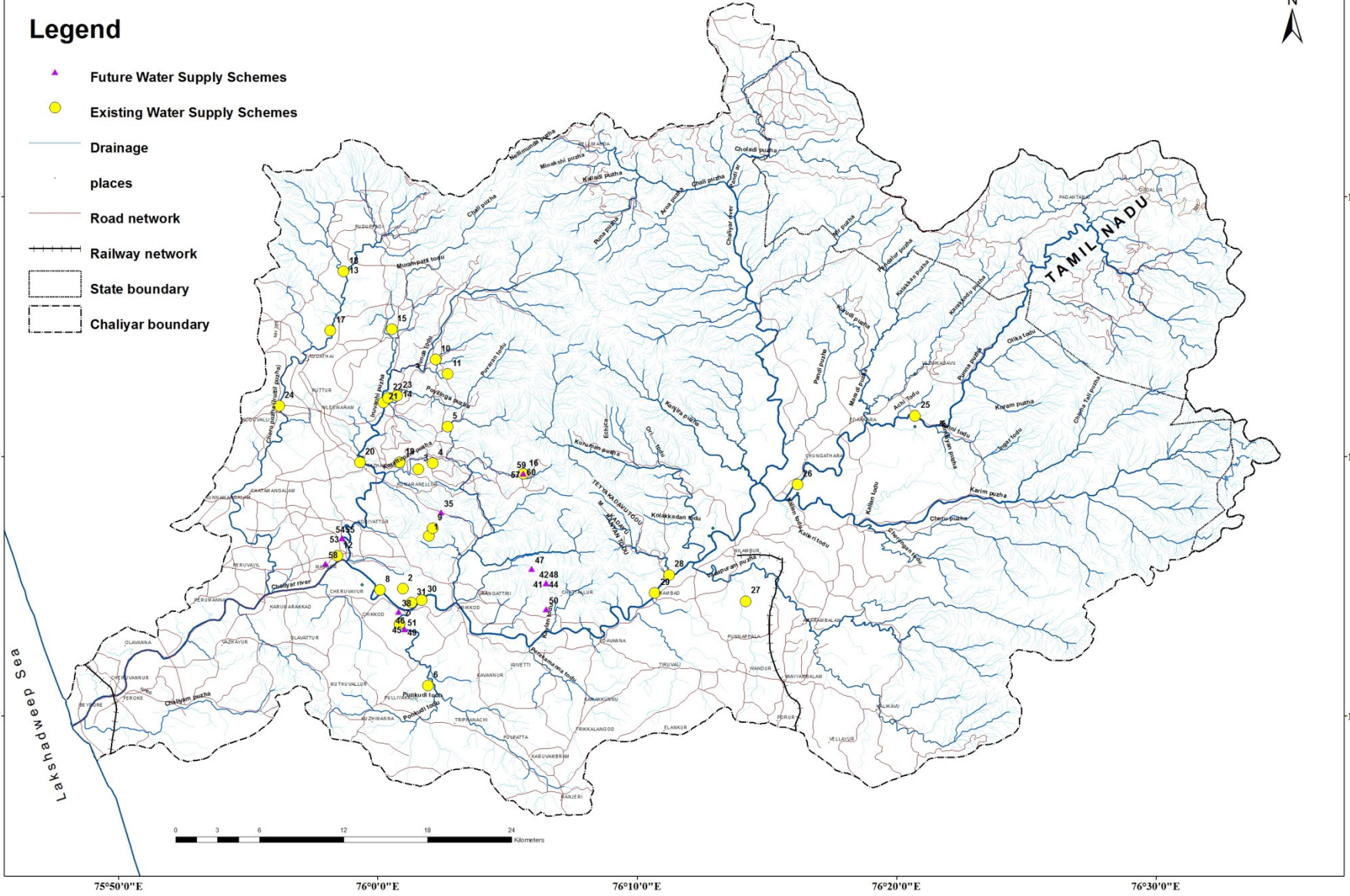
11°30'0"

11°20'0"N

11°20'0"

11°10'0"N

11°10'0"



75°50'0"E

76°0'0"E

76°10'0"E

76°20'0"E

76°30'0"E

Water for Irrigation

- No major schemes
- One medium scheme for salinity arresting
 - 4 Diversion Schemes
 - 24 Lift Irrigation Schemes
 - 30 Vented Cross Bars
 - 4 Ongoing medium schemes

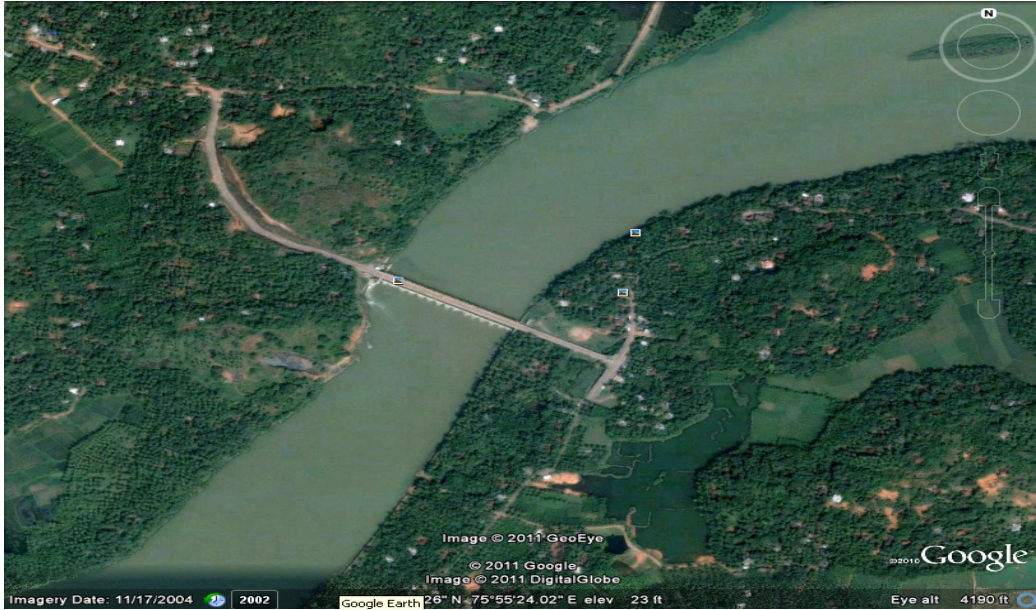
Net irrigated area - 15,423 ha

Proposed schemes

- 6 major, 5 medium and many check dams

Net area to be irrigated – 20,368 ha

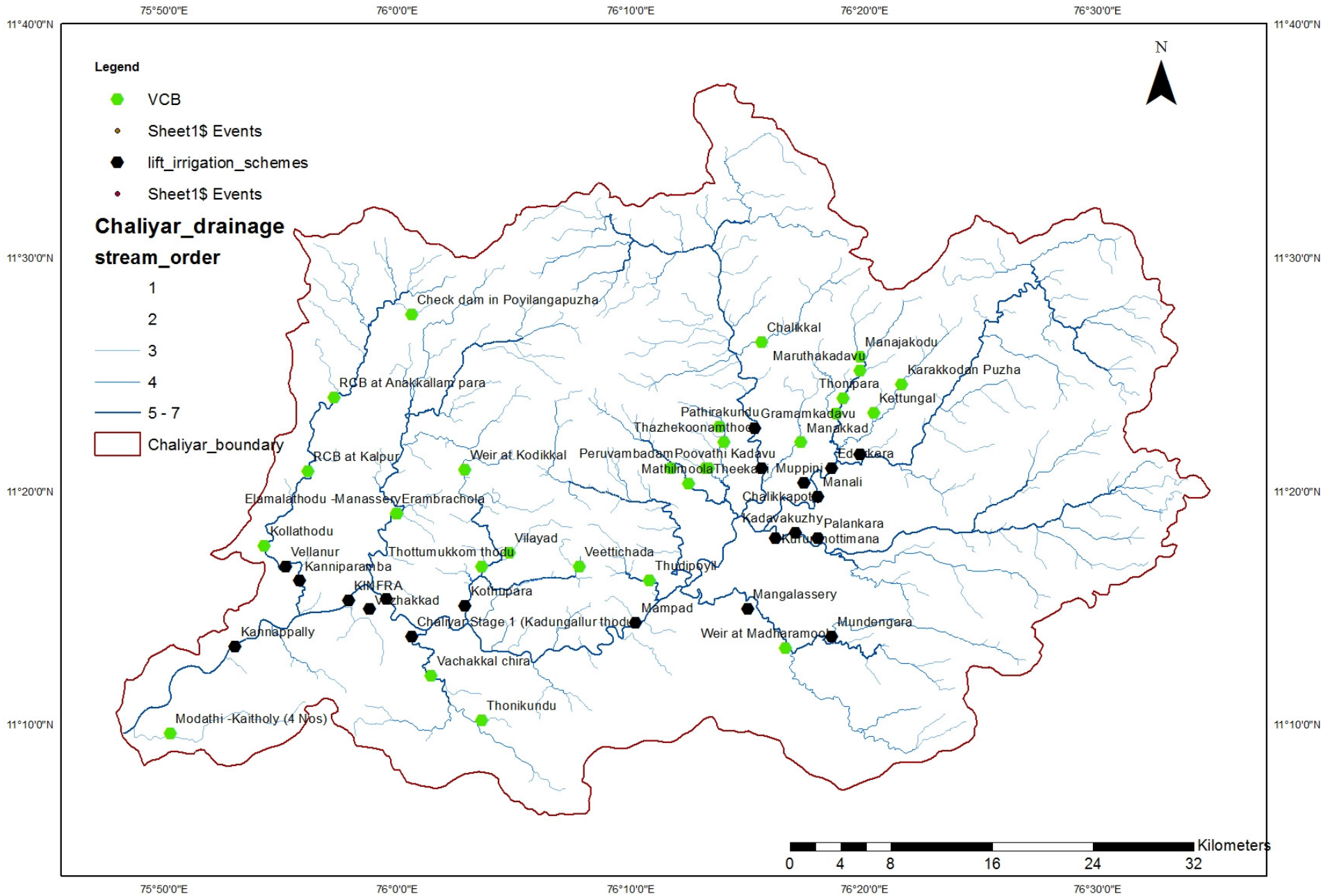
EXISTING WATER RESOURCES STRUCTURES



Topographical View of Regulator cum Bridge at Kavanakkallu

Upstream view of Kavanakkallu Regulator-cum Bridge





Hydel Power Generation

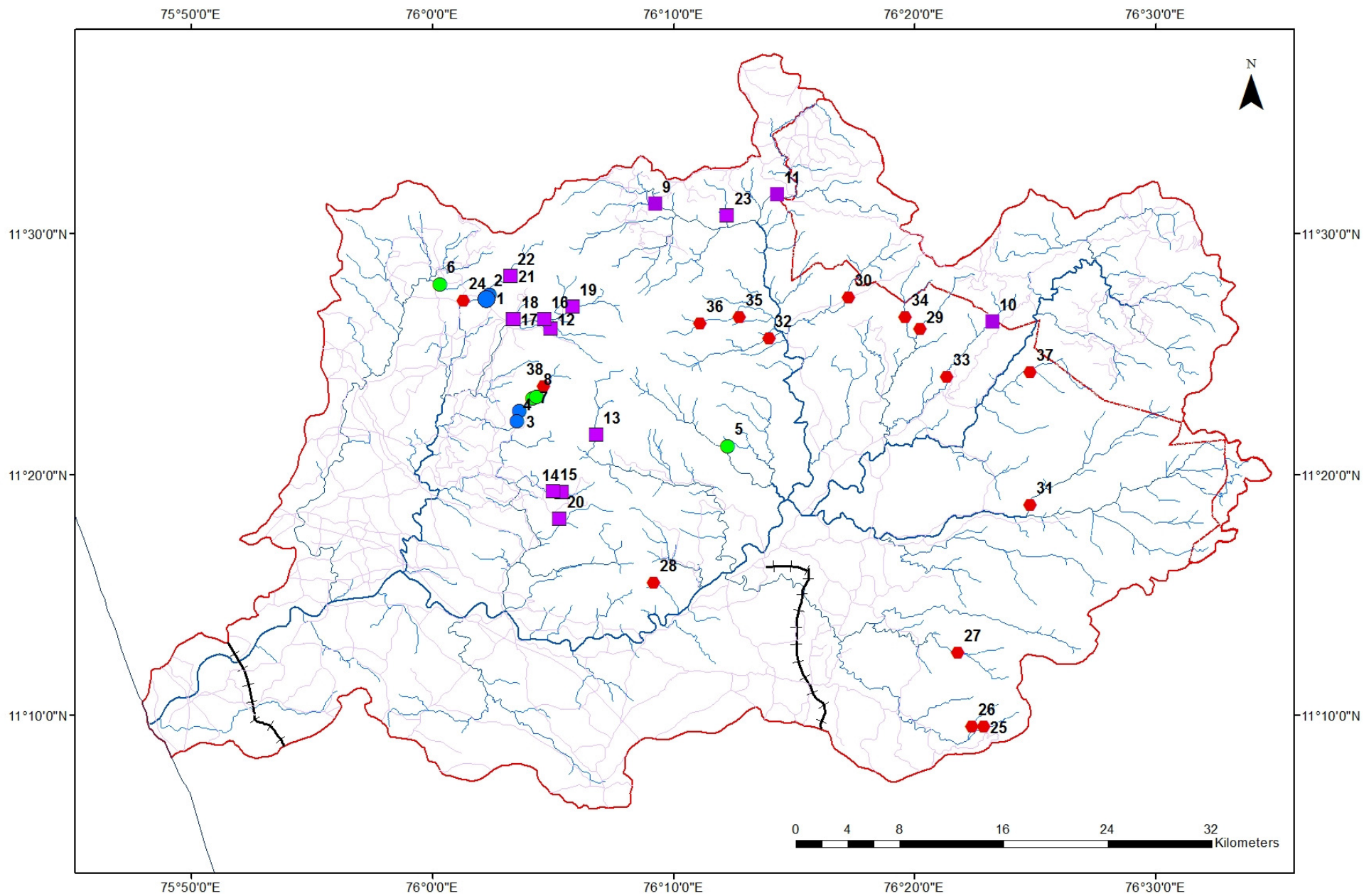
Present Utilisation

- **4 small hydro electric schemes in Chaliyar river basin which produces 16.6 MW power making use of 308 MCM of water.**
- **Four schemes are under construction which can produce 17.7 MW power making use of 183 MCM of water**

Future Schemes

- **3 major schemes**
- **12 small hydel schemes**
- **15 small schemes under feasibility stage**

Power generation – 342 MW, 932.13 MU, 1437 MCM



Water for other purposes

- **INDUSTRIAL WATER REQUIREMENT-12.35 MCM**
- **WATER FOR SALINITY EXCLUSION-184MCM**
- **INLAND NAVIGATION 39 Km length**
- **ECOLOGICAL BALANCE 10-15 % of Annual flow**
 - 17 MCM during non monsoon months**

Water Balance

Season	Utilizable potential, MCM			Present utilization, MCM	Surplus /Deficit MCM	Future Demand MCM	Surplus/Deficit MCM
	Surface	Ground	Total				
Monsoon	4022	56	4078	46.5	Surplus	87	Surplus
Non monsoon	115	84	199	332.5	Deficit (-133.5)	413	Deficit (-214)

CONCLUSIONS

- Chaliyar basin is at present deficit by 133.5 MCM of water during non monsoon period and will have a deficit of fresh water of 214 MCM by 2040 AD
- For successful planning, implementation and management of a river basin ,there should be an organization at the basin level for all developmental activities related to water resources irrespective of administrative boundaries
- Few more projects are needed for the sustainable development of the river basin.



Thank you