

## Gundar Basin

### Introduction

Gundar river basin is one of the major river basins of Tamil Nadu with a drainage area of 5690 sq.km. It is located between the geographic co-ordinates N Latitude 9°05' - 10° 03' and E Longitude 77° 35'E - 78° 35'. It is sandwiched between Vaigai river basin in the north and Vaippar river basin in the south. The length of the Gundar river is 150 kms. This is a fairly elongated basin and elongated in the northwest to southeast direction. The basin covers part of Madurai, Sivagangai, Virudhunagar, Ramanathapuram and Thoothukudi districts. The corresponding taluks and the blocks details are furnished below in table 1.

**Table 1 Districts and Taluks occupied by Gundar Basin.**

Sl. No.	Districts	Taluks	Blocks
1.	Madurai	1. Usilampatti 2. Peraiyur 3. Thirumangalam 4. Madurai South	1.Usilampatti, 2.Chellampatti 3.Sedapatti, 4.T.Kallupatti 5.Thirumangalam,6.Kallikudi 7.Thiruparankundram
2.	Sivagangai	5. Manamadurai	8.Manamadurai, 9.Thirupuvanam
3.	Virudhunagar	6. Aruppukottai 7. Kariyapatti 8. Tiruchuli	10.Aruppukottai 11.Kariyapatti 12.Tiruchuli, 13.Narikudi
4.	Ramanathapuram	9. Paramakudi 10. Ramanathapuram 11. Kadaladi 12. Kamudhi 13. Mudukulathur	14.Bogalur, 15.Paramakudi 16.Tirupullani 17.Kadaladi 18.Kamudhi 19.Mudukulathur
5.	Thoothukkudi	14. Vilathikulam	20. Vilathikulam, 21. Pudur

### **Physiography**

The Varshanadu Hills range occupy in the western part of the Gundar basin and several peaks rises above 1000m from MSL. Such peaks are having elevation ▲ 1293 m, ▲ 1273 m, ▲ 1047 m and ▲ 1008 m. Nagamalai Hills occupy in the northeastern part of the basin and runs several kilometers from NE – SW direction. The elevation of Nagamalai Hill range varies from 200m to 400m above MSL. The rest of the area occupy plain and is gently sloping towards sea. The elevation range in the plain area is 100m-10m. The important towns such as Thirumangalam, Mudugulathur, Thiruparankundram ,Melparthipanur, Usillampatti, Kamuthi, Narikudi, Kariyapatti, are

located in the plains. In the coastal area the elevation ranges from 1 to 19m. The coastal sand dune occupy several sq.km. area and it runs parallel to the coast. The length of the coast or seashore is about 71 km. There are two salt factories located in the coastal area one at Morekkulam village and the other at Muthuramanathapuram village.

### Geology and Structure

The Archaean rock types are confined to the western half of the basin area. The oldest members, namely, the pyroxenites, amphibolites, Calc.gneisses, granulites, crystalline limestone, quartzites, leptynites, garnetiferous sillimanite gneiss belong to Khondalate group of Dharwar age. Later charnockites, granites and younger intrusives of pegmatite occur interspersed within the older rock types. The general trend of foliations are NE-SW and NW-SE with dips SE and SW directions. The oldest members display anticlinal, synclinal and basin structures dissected by faults and fractures. The oldest members were also subjected to intensive metamorphism. The Geological formation of Guntar basin is shown in figure 1.

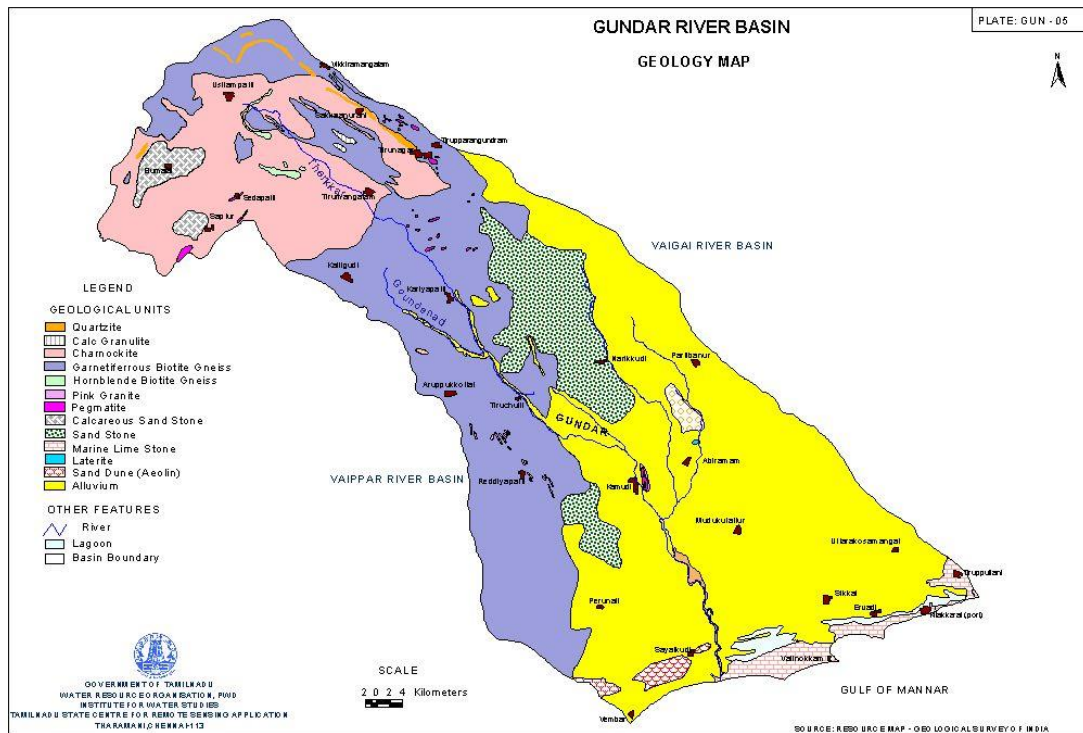


Figure 1 Geology Map of Guntar River Basin

## Landuse Study

The Landuse classification of Gundar Basin is shown in figure 2. The visual interpretation technique was mainly applied to derive the relevant landuse informations of the Gundar basin and the different land uses were categorized.

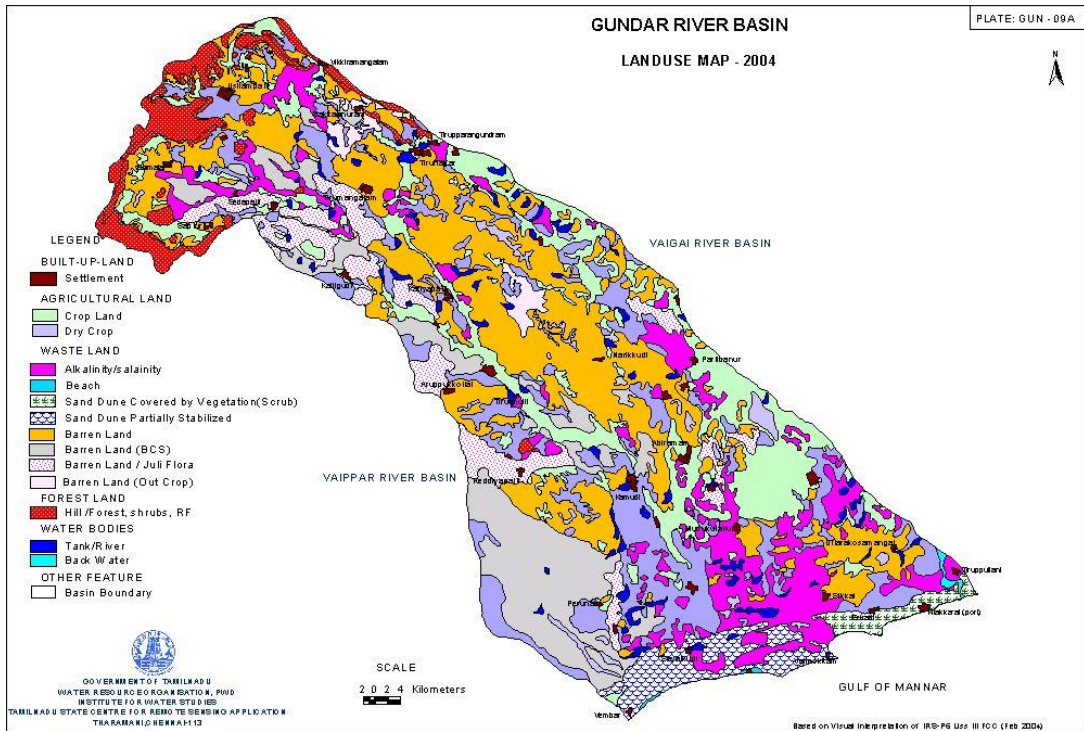


Figure 2 Landuse Map of Gundar River Basin.

Level 1 and level II classifications were done from the remotely sensed data. The present land use pattern has been assessed in relation to the ground water development of the basin and given in Table 2.

Table 2 Landuse Classification

Sl. No.	Landuse Category		Area In Sq.Km.	% To The Basin Area
	Level I	Level II		
a.	Built up Land	Settlement	21.16	0.37
b.	Crop Land Dry Land	Paddy, Sugarcane, Groundnut, Cholam, floriculture Groves, Casuarina plantation	816.39 1346.21	14.35 23.66
c.	Forest Land	Dense Forest Dense Forest and Plantation Medium Dense Forest Shrubs	199.18	3.50

d.	Waste Land	Alkalinity/salinity Barren land/Rocky out crop Block cotton soil Mining area Stony waste Beach, salt pan, Sand dunes	3135.63	55.10
e.	Water Bodies	Back swamps Tanks	173.31	3.02
<b>Total Geographical Area</b>			<b>5690.80</b>	<b>100</b>

### Geomorphology

In Gundar basin study, more attention is focused on the evaluation of ground water potential qualitatively taking in to account the geomorphological landforms. The geomorphology of the Gundar river Basin is shown in figure 3.

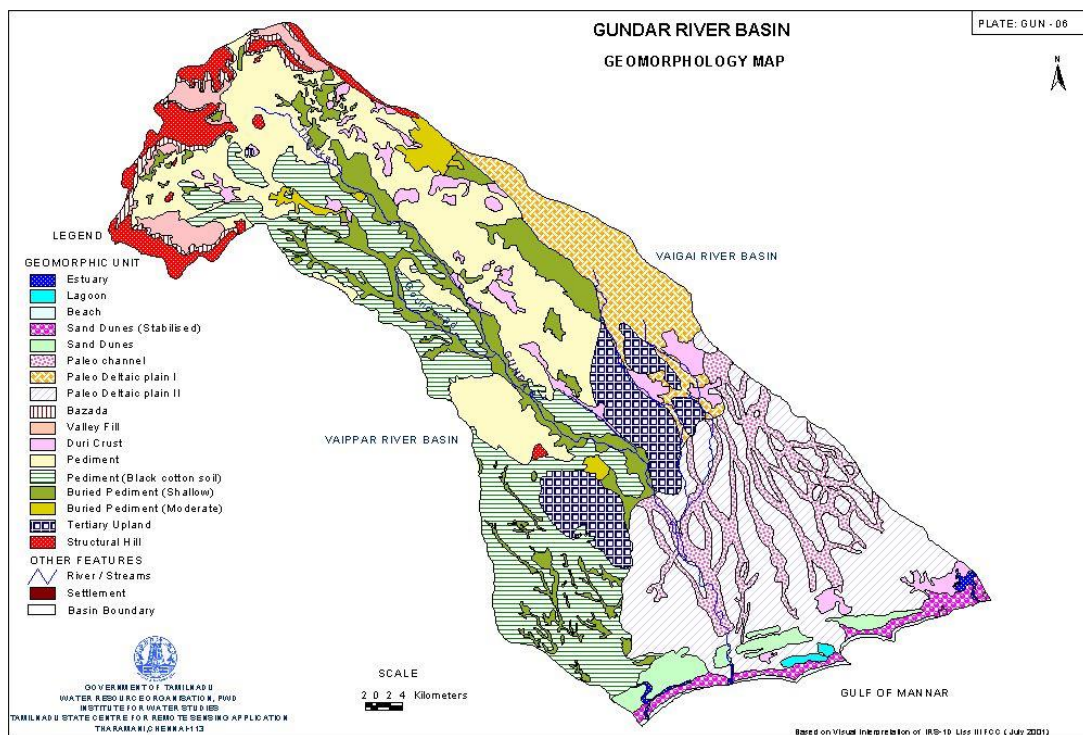


Figure 3 Geomorphology Map of Gundar River Basin

The Gundar basin area is mostly covered by structural hills in the west and pediplain areas in south and west and rest of the area by the palaeo deltaic plain in the east. Ground water occurrence and potential zones have been identified by delineating the geomorphic units. The study of geomorphology exercises a significant control over the

ground water region, relief, slope, depth of weathering, thickness of deposition, nature of the deposited materials and the assemblage of different landforms given in Table 3

**Table 3 Geomorphology (Area Coverage Detail)**

<b>Geomorphic Unit</b>	<b>AreaIn Sq.Km.</b>	<b>Percentage %</b>
Bazada	66.136	1.162
Beach	23.256	0.409
Buried pediment shallow	543.395	9.549
Sand dune stabilized	91.151	1.602
Buried pediment deep	2.139	0.038
Paleo deltaic plain I	371.909	6.535
Paleo deltaic plain II	1041.61	18.303
Duricrust	207.309	3.643
Estuary	15.389	0.270
Lagoon	8.658	0.152
Buried pediment moderate	72.383	1.272
Paleo channel	411.976	7.239
Pediment	1132.014	19.892
Pediment (Black cotton soil)	929.092	16.326
Residual hill	11.787	0.207
Salt Industry	4.064	0.071
Salt dunes	115.966	2.038
Shallow pediment	5.927	0.104
Structural hill	178.206	3.131
Tertiary upland	353.912	6.219
Valley fill	104.521	1.837
<b>Total Geographic Area</b>	<b>5690.80</b>	<b>100</b>

### **Soils**

The soils of the Gundar River Basin have been shown in figure 4. The predominant soil types found in this river basin is Inceptisols, Alfisol, Entisol and Vertisol. Due to different stages of weathering of parent material, the above soil types are met with in combination.

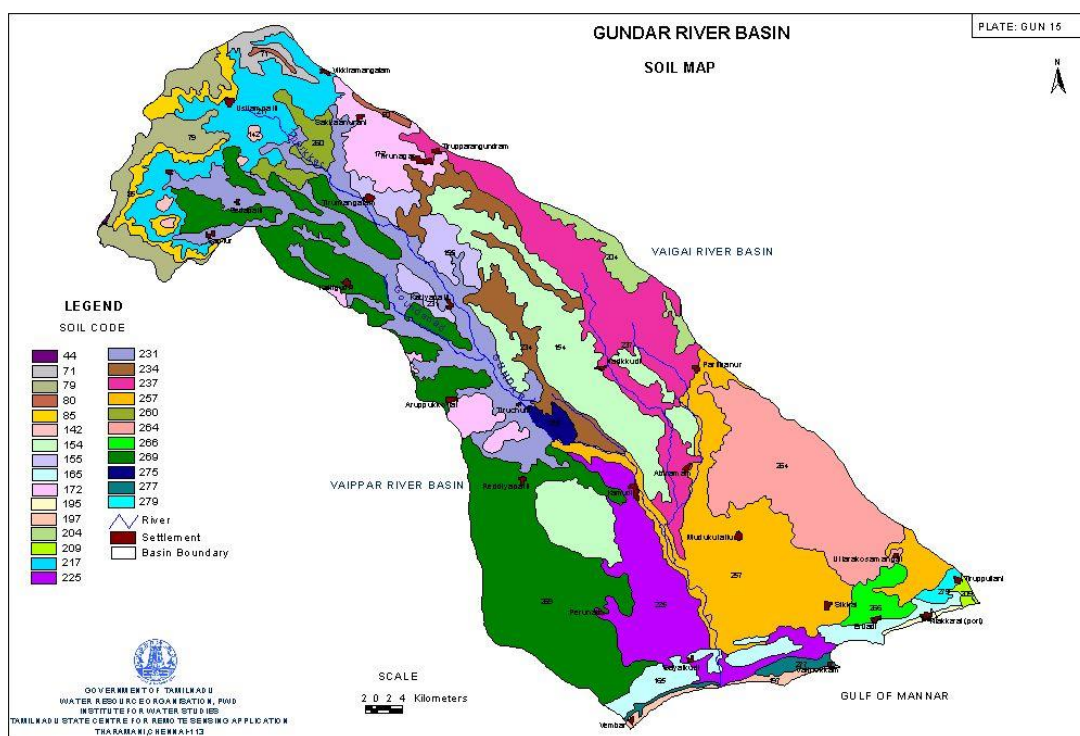


Figure 4 Soil Map of Gundar Basin

## Demographic and Social Characteristics

Land utilisation pattern, size of land holdings, nature of agricultural employment and industrial employment also would reflect on the water requirement of the population with reference to Gundar river basin is described hereunder.

### Population Size: Urban and Rural

The Gundar basin covers five districts in parts namely Madurai, Virudhunagar, Sivagangai, Ramnad and Thoothukudi. The urban and rural population are 0.669 Million and 0.501 Million for Madurai District, 0.045 Million and 0.396 Million for Ramnad districts, nil and 0.046 Million for Sivagangai district, nil and 0.029 Million for Thoothukudi district and 0.014 Million and 0.239 Million for Virudhunagar district. The total Urban and Rural population for the basin are 0.727 Million and 1.210 Million respectively. The basin is divided into nine sub basins. The sub basin wise population is given in Table 4 below.

**Table 4 The Urban and Rural Population as per census 2001 in Million**

Sl. No.	Name of the Sub basin	Urban Population	Rural Population	Total Population
1	Gridhammal Nadhi	0.537	0.188	0.725
2	Kanal Odoi	0.000	0.031	0.031

3	Lower Gundar	0.038	0.178	0.216
4	Palar	0.000	0.065	0.065
5	Paralaiaru	0.007	0.072	0.079
6	Therkar	0.131	0.252	0.383
7	Upper Gundar	0.014	0.216	0.230
8	Uthirakosamangaiaru	0.000	0.137	0.137
9	Vembar	0.000	0.071	0.071
<b>TOTAL</b>		<b>0.727</b>	<b>1.210</b>	<b>1.937</b>

### Population Density

The basin population density is the highest in Gridhammal (1729 Persons per sq.km) and the lowest is in Kanal Odai (75 Persons per sq.km) as shown in the following table. The average population density for the entire basin is 340 persons / sq.km given in Table 5 which is well below the State average of 480 persons / sq.km.

**Table 5 Population density of each Subbasin**

Sl.No	Name of the sub basin	Area (Sq.km)	Total Population in Million	Density Person/ sq.km
1	Gridhammal Nadhi	566.851	0.725	1729
2	Kanal Odai	412.57	0.031	75
3	Lower Gundar	842.239	0.216	256
4	Palar	279.722	0.065	232
5	Paralaiaru	398.283	0.079	198
6	Therkar	948.031	0.383	404
7	Upper Gundar	1009.993	0.230	228
8	Uthirakosamangaiaru	636.228	0.137	215
9	Vembar	596.457	0.071	119
<b>Average population density for the basin</b>				<b>340</b>

## Hydrometeorology

### **Rainfall**

#### **Raingauge Stations**

The Gundar basin has an area of about 5690 sqkm. spread over in Madurai, Virudunagar, Sivagangai, Ramanathapuram and Thoothukudi Districts. There are 18 non-recording raingauge stations in the basin. The various agencies maintaining these raingauge stations and the number of raingauge stations maintained by each agency are listed below in Table 5.

**Table 5 Number of Raingauges for each agencies**

<b>S. No.</b>	<b>Name of the Agency</b>	<b>Numbers</b>
1	Public Works Department - WRO	8
2	Revenue Department	8
3	Agricultural University	1
4	Southern Railway	1
<b>Total</b>		<b>18</b>

In addition, there are 4 self-recording raingauge stations in the basin, all maintained by PWD. Considering the distribution of raingauge stations and the availability of data, only 18 raingauge stations having long term records in and around the basin are considered for the detailed analysis. The details of the raingauge stations such as, their location, geographical coordinates and the study period are shown in Table 6. For the purpose of rainfall analysis, month is taken as a time step.

**Table 6 Raingauge stations coordinates and the study period**

<b>Sl. No.</b>	<b>Raingauge stations</b>	<b>Taluk</b>	<b>District</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Study Period</b>
1.	Aruppukottai	Aruppukottai	Virudunagar	09 30' 50"	78 06' 30"	1973 – 2017
2.	Cholavandhan	Nilakottai	Madurai	10 01' 00"	77 57' 00"	1973 – 2017
3.	Kamudhi	Mudhukulathur	Ramanathapuram	09 25' 30"	78 22' 00"	1973 – 2017
4.	Madurai Airport	Madurai South	Madurai	09 50' 00"	78 05' 00"	1973 – 2017
5.	Manamadurai	Manamadurai	Sivagangai	09 41' 40"	78 28' 00"	1973 – 2017
6.	Morekulam	Ramanathapuram	Ramanathapuram	09 14' 40"	78 45' 00"	1973 – 2017



7.	Mudhukulathur	Mudhukulathur	Ramanathapuram	09 21' 30"	78 31' 50"	1973 – 2017
8.	Paramakudi	Paramakudi	Ramanathapuram	09 33' 00"	78 35' 00"	1973 – 2017
9.	Ramanathapuram	Ramanathapuram	Ramanathapuram	09 21' 30	78 50' 30"	1973 – 2017
10.	Thirubhuvanam	Sivagangai	Sivagangai	09 49' 20"	78 15' 40"	1973 – 2017
11.	Thiruchuli	Aruppukottai	Virudunagar	09 32' 00"	78 12' 00"	1973 – 2017
12.	Thirumangalam	Thirumangalam	Madurai	09 49' 34"	77 58' 31"	1973 – 2017
13.	Usilampatti	Usilampatti	Madurai	09 58' 00"	77 47' 00"	1973 – 2017
14.	Vilathikulam	Kovilpatti	Tirunelveli	09 09' 00"	77 52' 00"	1973 – 2017
15.	Watrap	Srivilliputhur	Virudhunagar	09 38' 50"	77 39' 25"	1973 – 2017

### Monsoon and non-monsoon periods

Gundar river basin lies within the tropical monsoon zone. Based on the hydrometeorological features of the basin, year is divided into 2 periods (i.e) 1) Monsoon period spanning from June to December and 2) Non-monsoon period spanning from January to May. The monsoon period is further sub-divided into Southwest monsoon period spanning from June to September (4 months) and Northeast monsoon period spanning from October to December (3 months). Similarly, the non-monsoon period is further sub-divided into Winter period spanning January and February (2 months) and Summer period spanning from March to May (3 months). As the monsoon period brings heavy rainfall, it improves the recharging of groundwater as well as storage of surface water. Hence, the monsoon period is hydrologically significant for water resources analysis. But in the case of non-monsoon, it is insignificant. The Annual dependable rainfall for 25%, 50%, 75% and 90% for the Gundar basin are given below in table 7 & table 8.

**Table 7 Annual Dependable Rainfall – Gundar Basin (mm)**

Sl. No.	Sub basin	25%	50%	75%	90%
1	Upper Gundar	267.98	194.51	145.10	120.65
2	Therkkar	257.06	198.81	174.46	135.31

3	Gridhamal Nadhi	152.10	114.56	89.24	70.16
4	Kanal Odai	89.60	72.36	48.64	27.33
5	Paralaiaru	131.41	96.25	76.55	51.03
6	Uthirakosamangaiaru	165.17	127.46	99.10	76.91
7	Lower Gundar	180.83	142.72	103.36	66.17
8	Vembar	108.10	81.98	61.33	42.21
9	Palar	65.80	54.99	38.71	29.82

### **Maximum, minimum and average rainfall**

Ramanathapuram received the highest annual rainfall of 2201.06mm (2004-05) and Morekulam received the lowest annual rainfall of 149.25mm (2016-17).

### **Seasonal Rainfall**

The northeast monsoon seasonal rainfall is higher than the other seasons for all the raingauge stations. The southwest monsoon maximum rainfall varies from 195.2 mm to 724.2 mm and the minimum rainfall varies from 0 to 125.6 mm. For southwest, the average varies from 69.9 mm to 318.21 mm. The northeast maximum rainfall varies from 695.7 mm to 1302.6 mm and the minimum varies from 0 to 167.2 mm. The northeast average rainfall varies from 355.16 mm to 680.61 mm for the basin. In winter, the maximum rainfall varies from 131.8 mm to 402.8 mm and the minimum is 0. The winter average varies from 19.36 mm to 66.2 mm. In summer, the maximum rainfall varies from 280 mm to 603.96 mm and the minimum varies from 0 to 68 mm. The summer average varies from 80.06 mm to 198.17 mm for the basin. The annual maximum rainfall varies from 1042 mm to 2201.06 mm and the minimum varies from 149.25 mm to 551.4 mm. The annual average rainfall varies from 560.05 mm to 1021.47 mm for the basin.

### **Climate**

The weather station at Kavalur Maintained by PWD (SG & SWRDC) WRO considered is furnished below. The climatological values of this river basin are given in the following Table 8

**Table 8 Climatological Parameters**

<b>S. No</b>	<b>Climatological Parameter</b>	<b>Kavalur</b>
1	Average monthly temperature max. / min. in. ° Celsius	34.47 / 25.49
2	Average mean temperature in ° Celsius	29.98
3	Average relative humidity in %	64.42
4	Average wind velocity in km/hour	4.41
5	Average pan evaporation in mm / month	187.20
6	Average Sunshine hours / day	7.23

Evapotranspiration, E<sub>o</sub>

<b>Eto values (mm/month) of FCS for Gundar basin</b>													
<b>Name of the basin &amp; FCS</b>	<b>JAN</b>	<b>FEB</b>	<b>MAR</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JUL</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>	<b>NOV</b>	<b>DEC</b>	<b>Average</b>
Gundar basin - Kavalur FCS	123.1	128.5	163.1	162.3	164.0	160.8	161.5	166.5	148.2	128.7	109.2	114.1	144.2

**Temperature**

The meteorological features of the basin have been studied from the data collected from Kavalur weather station for the period from 1972 to 2017. Temperature is one of the basic factors under climatological features and it is one of the main parameters to calculate the crop water requirement (i.e. evapotranspiration).

The maximum and minimum monthly mean temperature observed in the above climatological station are given below in Table 9:

**Table 9 Maximum and Minimum Mean temperature**

<b>Name of the Climatological Station</b>	<b>Minimum in Mean Temp. in Celsius</b>	<b>Maximum in Mean Temp. in Celsius</b>
Kavalur	20.29 ° C in December 1977	35.24 ° C in June 2003

The monthly average for maximum temperature varies from 30.14° C (December) to 37.56° C (May) and the monthly average Minimum temperature varies from 22.23° C (January) to 27.71° C (May).

#### **Aridity Index for Climatic Clarification**

The region is dry humid if the value of aridity index is from 0 to 33.3%, Semi arid if the value is between 33.3% to 66.67% and arid if the value is above 66.67%. The region is humid if the value is less than 0. The aridity index ( $I_a$ ) for all the 18 raingauge stations have been worked out and the classification is shown in Table 10. The entire Gundar basin comes under semiarid region, as seen from this statement.

**Table 10 Aridity Index ( $I_a$ ) For Climatic Classification**

S.No.	Name of Stations	Annual Ave. Precipitation P mm	PET mm	Total deficit P-PET mm	Ia Aridity Index	Classification
1	Aruppukottai	790.16	1730	-939.84	-54.33	Semi Arid
2	Cholavandhan	894.64	1730	-835.36	-48.29	Semi Arid
3	Kamudhi	690.84	1730	-1039.16	-60.07	Semi Arid
4	Madurai Airport	816.9	1730	-913.1	-52.78	Semi Arid
5	Manamadurai	1021.47	1730	-708.53	-40.96	Semi Arid
6	Morekulam	824.45	1730	-905.55	-52.34	Semi Arid
7	Mudhukulathur	719.59	1730	-1010.41	-58.41	Semi Arid
8	Paramakudi	721.71	1730	-1008.29	-58.28	Semi Arid
9	Ramanathapuram	1010.05	1730	-719.95	-41.62	Semi Arid
10	Thirubhuvanam	870.5	1730	-859.5	-49.68	Semi Arid
11	Thiruchuli	689.73	1730	-1040.27	-60.13	Semi Arid
12	Thirumangalam	881.06	1730	-848.94	-49.07	Semi Arid
13	Usilampatti	956.69	1730	-773.31	-44.70	Semi Arid
14	Vilathikulam	560.05	1730	-1169.95	-67.63	Arid
15	Watrap	959.6	1730	-770.4	-44.53	Semi Arid

## Surface Water Flow

The figure shows the Gundar River flow Diagram

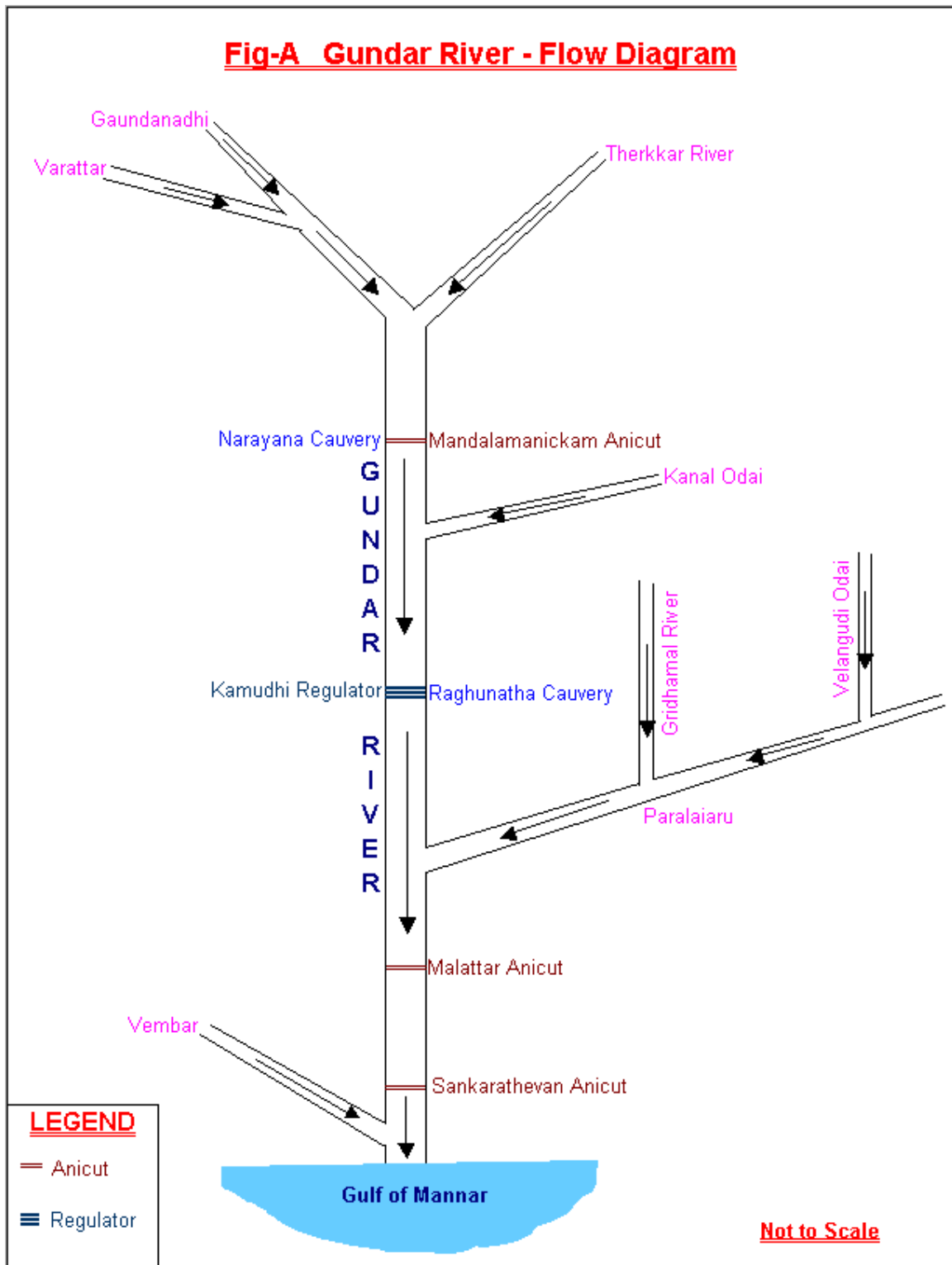


Figure Flow Diagram of Gundar River

## River Systems

Gundar, the non-perennial river originates at an altitude of 1273m near Kottaimalai of Saptur reserve forest in the Varushanadu hills. After traversing about 150km, it falls into the Gulf of Mannar at about 6 km. south east of Sayalkudi. The Gridhamal river draining the plateau south east of Madurai joins Raghunatha Cauvery near Kamudhi. Goundanadhi and Therkkar start in Madurai district and flow in the southeast direction to enter Aruppukkotai taluk of Virudhunagar district and join near Puduppatti village. After confluence of Goundanadhi with Therkkar, the river derives the name Gundar. Uthirakosamangaiaru is bounded by Gundar subbasin on the north and Vembar in the south. Palar and Vembar rivers are ephemeral rivers, which originate in the lower end of the basin and drain into the sea.

The river Gundar is having 5 tributaries namely, Therkkar river, Goundanadhi, Gridhamal river, Kanal odai and Paralaiaru.

- Therkkar and Goundanadhi are in the upper reach.
- Gridhamal and Kanal Odai are in the middle reach.
- Paralaiaru is in the tail reach.

Raghunatha Cauvery and New Narayana Cauvery are the canals taking off from Gundar river in the lower reaches of the basin. This river is called by its name as “Gundar” prominently in the middle reach of the basin (between Pudhupatti near Aruppukottai and Kamudhi). Beyond Kamudhi town, the river does not feed any tank and hence is called Malattar (means sterile river). The width of the river varies from 10 m in the upper reaches and 100 m in lower reaches.

**Therkkar:** The tributary originates from Pothampatti and Karukattanpatti villages located in the Western ghats near Usilampatti. A stream named Vellimalai odai originating in the same area joins this river as tributary. In total there are 11 anicuts constructed across Therkkar and they feed around 1284 ha of ayacut.

**Goundanadhi:** There are 14 anicuts constructed across Goundanadhi, which feed 1026 ha of ayacut before it joins the Varattar river. After its confluence the tributary is named as Goundanadhi and there are 2 more anicuts constructed across Goundanadhi that feeds 1625 ha of ayacut. In addition there are 5 anicuts constructed across Varattar

stream that feeds around 209 ha. Varattar meets Goundapatti river at Sivarakottai near Kallikkudi.

**Gridhamal:** The tributary Gridhamal feeds 75 tanks in the middle reaches. Kattanoor, Ambalathadi, Nallukkurichi, Irunchirai are some of the big tanks fed by this river. It runs through Narikudi, Veeracholan and crosses the Raghunatha Cauvery at Pakkuvetti village in Kamudhi taluk and joins the river Malattar at Kilavalasai village in the same taluk. There are three anicuts constructed across this river, which feed more than 60 tanks through several tank chains.

**Paralaiaru:** An anicut has been constructed across Paralaiaru at Idayathur village in Mudhukulathur taluk. The tributary feeds about 50 tanks through four channels and then crosses the Raghunatha Cauvery at Pakkuvetti village. Thereafter it reaches Malattar at Kilavalasai in Kamudhi taluk. A small stream called 'Vellangudi odai' also, joins Paralaiaru in this stretch. An anicut in Paralaiaru diverts water through Keelathuval and Keeranur channels to feed 34 tanks. Also the river feeds 20 tanks through other direct feeder channels. A total ayacut of 2034 ha is served by the Paralaiaru river.

**Malattar:** After draining an estimated flow of around 2000 cusecs to Raghunatha Cauvery, the surplus of Gundar flows southwards and reaches the Bay of Bengal. This part of the river is called as Malattar. Malattar Anicut with two main canals is under construction. An extent of 1913 ha will be served on completion through 54 tanks. There is also an anicut named as Sakkarathevan anicut constructed across the river which serves 322 ha through 4 tanks in Kadaladi block.

### **Surface Water Data**

Flow measurements are being taken in one location only on the east of Kamudhi at Kamudhi regulator across Gundar from where, water is diverted into Raghunatha-Cauvery channel. There is no major reservoir in this basin.

### **Flow Details**

#### **A. Diversion to Gundar Basin from Other Basins**

Apart from the resources from its own watershed, the Gundar basin gets water from Periyar system and Vaigai system through various supply channels and flood

flows from Vaigai basin through two flood carriers. The flood diversions are intended to supplement one filling to the tanks.

## **B. Diversion of Vaigai Flood Waters**

### **(i) Vaigai – Gridhamal Link:**

This flood carrier takes off from Virahanur regulator linking Vaigai to Gridhamal river with a carrying capacity of 28.23 cumec (1000 cusec) and feeds 37 tanks with an ayacut of 5436.19 ha in Gridhamal subbasin.

### **(ii) Vaigai – Paralaiaru Link:**

The other flood carrier takes off from Parthibanur regulator linking Vaigai to Paralaiaru with a carrying capacity of 14.15 cumec (500 cusecs) and feeds Kattuemaneswaram tank, Periya anaikulam tank, Virathakulam tank and Reghunatha Cauvery supply channel.

## **C. Diversion of Vaigai Water through Supply Channels**

The supply channel namely, Avaniapuram supply channel, Chinthamani Periya Kanmoi supply channel, Anuppanadi supply channel, Panaiyur supply channel, Sottathatti supply channel, Thiruppuvanam supply channel, Piramanur supply channel, Palayanur supply channel, Nilayur supply channel are diverting Vaigai water.

## **D. Diversion of Periyar Water**

About 81 tanks lying in Gundar basin having a total ayacut of 7839.64 ha (Direct ayacut of 3690.21 ha and indirect ayacut of 4149.43 ha) are fed by Periyar water through Thirumangalam Main Canal and its extension. Yearly average supply is around 39.74 Mcum.

## **Out Flow to Sea**

The only control structure across Gundar is Kamudhi Regulator which practically diverts the water into Raghunatha Cauvery channel feeding about 70 tanks ending with Kalari tank near Mudukulathur. The surplus flow details of Gundar are available at this regulator for 39 years from 1966 to 2004.

The basin as a whole is not a surplus basin. Kamudhi Regulator is the last measuring structure across Gundar river.



The analysis of flow particulars for 39 years (1966-2004) reveals that there was no surplus flow in 24 years. In four years, the quantity exceeded 1000 Mcum due to breach of large number of tanks. In four years, the quantity is in between 100 to 400 Mcum is also due to breach of few tanks. During seven years, the surplus quantity is less than 100 Mcum and the analysis further reveals that the average surplus flow for seven years is 34 Mcum and flow to sea at 50%, 75% & 90% dependability.

### Surface Water Potential

Seasonal wise 75 % dependable Surface water potential for Gundar River Basin is given in the table 12.

**Table 12 75% Dependable Surface Water Potential for the Gundar River Basin**

Sl. No.	Name of Sub basin	75% Dependable Surface Water Potential in Mcum			
		SW	NE	NM	Annual
1.	Upper Gundar	11.84	94.40	38.86	145.10
2.	Therkkar	27.40	99.56	47.50	174.46
3.	Gridhamal Nadhi	28.25	48.63	12.36	89.24
4.	Kanal Odai	13.56	24.07	11.00	48.64
5.	Paralaiaru	30.86	28.45	17.24	76.55
6.	Uthirakosamangaiaru	11.47	54.23	33.40	99.10
7.	Lower Gundar	16.11	61.47	25.78	103.36
8.	Vembar	4.32	52.50	4.51	61.33
9.	Palar	2.34	29.35	7.02	38.71
<b>Total</b>		<b>146.15</b>	<b>492.66</b>	<b>197.67</b>	<b>836.49</b>
<b>South West Monsoon Potential</b> <b>North East Monsoon Potential</b> <b>Non Monsoon Potential</b> <b>Annual Potential</b>		<b>146.15 (or) 146 Mcum</b> <b>492.66 (or) 493 Mcum</b> <b>197.67 (or) 198 Mcum</b> <b>836.49 (or) 837 Mcum</b>			

**Surface Water Potential of Gundar Basin is 837 Mcum.**

### The Existing Surface Water Supply Systems

In the Gundar Basin, the surface water is drawn for usage from tanks. The tanks are classified as System tanks and Non system tanks.

The non-system tanks use surface water of the direct runoff from their own catchment, whereas the system tanks are filled from the canal flow diverted through the anicuts across the river apart from the direct runoff from their own catchment.

### Anicuts

Totally there are 42 anicuts constructed across various tributaries of Gundar river, which divert the water to irrigate an area of 14,388 ha through the tanks in the basin. Five anicuts of Goundanadhi tributary are having direct ayacut only. About 32 anicuts out of 42 are located in the two upper tributaries – Therkkar and Goundanadhi. The Anicuts details of the Guntar basin is given in the Table 13.

**Table 13 - Anicut Details**

S. No.	Name of River	Name of Anicut	Location in (km)	No. of tanks benefited	Ayacut benefited in acres
1	Vellimalai odai	1. Vellimalai	4.5	1	61.00
2	Therkkar (Aswamanathi)	2. Matharai	8.5	1	50.78
		3. Karukkatanpatti	10	1	96.52
		4. Nallakulam	14	1	112.66
		5. Sathangudi	29	1	288.00
		6. Venkatasamutharam	33	1	318.00
		7. Vadakarai	35	1	478.04
		8. Melakottai	43	1	146.65
		9. Maikkudi	42	1	603.40
		10. Kallanai	45	1	120.00
		11. Kambikudi	48	1	1334.04
		12. Chatram Puliyankulam	53	1	311.99
3	Goundanadhi	13. Kanakkankulam Sub Survey	3	(D.A)	60.11
		14. Angayarkanni	5	(D.A)	22.90
		15. Chokkanathan	7	1	105.98
		16. Thalai Anikal	8	(D.A)	70.45
		17. Thirumanickam	9	1	299.96
		18. Mochikulam	16.5	1	71.63
		19. Sembarani	18	1	148.61
		20. Madaiyur	19.5	(D.A)	148.61
		21. Soundarpatti	21.5	1	228.00
		22. Kilavaneri	25	1	22.88
		23. Thirali	30	1	374.00

		24. Melanesaneri	35	1	221.00
		25. Arasapatti	37	1	739.63
		26. Sivarakottai	39	1	349.00
		27. Kurayur	45	10	1582.53
		28. Chennampatti	54	21	2432.72
4	Varattar	29. Karuvattu	4.5	(D.A)	21.00
		30. Kuppammal Samutharam	6	1	146.33
		31. Vandapuli	7	1	82.98
		32. Sennelperi	15	1	110.12
		33. Allappalacheri	17	1	155.01
5	Malattar	34. Mandalamanickam	22	34	4795.40
		35. Kamudhi regulator	36	71	17928.00
		36. Malattar*	43	54	4727.12
		37. Sankarathevan	57	4	195.16
6	Gridhamal	38. Ambalathadi	23	22	3922.23
		39. Kattanoor	35	16	4055.20
		40. Athikulam	45	9	3098.74
		41. Nallukurichi	57	9	1166.16
		42. Abiramam	68	6	1790.53
7	Paralaiaru	43. Paralai Anicut	23	34	2021.44
		Paralai Directly Fed Tanks	-	20	3003.56
<b>Total</b>				<b>336</b>	<b>58018.07</b>

## Tanks

There are around 2,276 tanks with a registered ayacut of 72,000 ha. serving mostly a single crop of paddy. Of these tanks, 1765 are under Panchayat (with less than 40 ha. command) and 511 are under PWD serving 27,617 ha, 43,903 ha. respectively. A large number of tanks are concentrated in the middle and the lower reaches of basin. On an average there exists a tank for every 2.5 sqkm. The topography of the basin is almost flat having a gentle slope towards the east. Around 92 percent of the tanks are in chains with hydrologic linkages. The details of the tanks in the basin based on the administration is given in table 14.

**Table 14 Tanks in the Basin based on the administration**

S. No.	Maintained by	Numbers	Ayacut (ha)
1	PWD – WRO	511	43903.16

2	Panchayat Union	1765	27616.50
<b>Total</b>		<b>2276</b>	<b>71519.66</b>

### **Inter Basin Transfer of Water**

There is no inter basin transfer of water from this basin.

But, inter basin transfer of water from Vaigai to Gundar basin takes place through five different locations – Thirumangalam Main Canal of Peranai regulator, Right Main Canals of Viraganur and Parthibanur regulators, Kalari off take channel and several open off take channels from Vaigai at its right side. Of these, inter basin transfer through the Thirumangalam Main Canal (TMC) and the Viraganur and Parthibanur regulators contribute the major share during the normal years. The inter basin transfer quantity is 132 Mcum.

### **Groundwater Potential in the Study Area**

The balance groundwater potential available for further development has been arrived by deducting the total groundwater extraction from the net groundwater recharge available. Table 15 shows the district wise groundwater potential of the Gundar basin area. The total available groundwater potential as on Mar 2013 is worked out as 578.89 Mcum.

**Table 15 Ground Water Potential as on Mar 2013**

<b>Name of District covered</b>	<b>Area covered in %</b>	<b>Net water available</b>	<b>Ground water potential District wise</b>
Madurai	29.12	63797.96	18577.97
Dindugal	0.42	58016.67	243.67
Ramanathapuram	37.48	51962.52	19475.55
Thoothukudi	4.78	50683.95	2422.69
Sivagangai	5.69	90618.63	5156.20
Virudhunagar	22.52	53344.37	12013.15

**Total**                      57889.23 Ha.m  
578.89 M.cum



## **PRESENT AND FUTURE WATER DEMANDS**

### **Domestic Water Demand Projection**

These norms were multiplied by the corresponding accepted population projection in all the nine sub basins of Gundar river basin, the result gives the projected annual domestic water demand for each sub basin, for each target year and for each population sector Table-16.

### **Irrigation Water Demand Projections**

The present gross irrigated area in the basin under different crop is 1,05,841 Ha. Under irrigated conditions, Paddy (69,796 ha) is the main crop irrigated in this basin, followed by Chillies (7,086 ha), Sugarcane (7,074 ha), Coconut (6,618 ha) and Vegetables (7,409 ha). Banana, Cotton, Flowers, Pulses, Cholan, Cumbu, Ragi, and Groundnut are also grown. The rainfed crops area in this basin is about 1,30000 Ha. Under rainfed conditions Cholan, Cumbu, Ragi, Greengram, Blackgram, Redgram, Gingili, Groundnut, Cotton and Paddy are grown. As the rainfed crops are purely dependent on rainfall only, rainfed area is not considered for calculating the crop water requirements. Only, the irrigated crops raised with surface water and groundwater or both are considered for calculating the crop water requirement. The irrigation details of the Gundar Basin is given in the table 18

**TABLE 16 – DOMESTIC WATER DEMAND**

<b>Year</b>		<b>Population</b>	<b>Demand</b>	
<b>2001</b>	Urban	727000	<b>MLD</b>	<b>M.cum</b>
	Rural	1210000		
<b>2011</b>	Urban	482476.00	40.26	40.69
	Rural	1780561.00	71.22	
<b>2017</b>	Urban	543344.00	45.86	44.83
	Rural	1924037.00	76.96	
<b>2020</b>	Urban	576603.00	48.66	46.96
	Rural	2000055.00	80.00	
<b>2030</b>	Urban	702876.00	59.32	54.88
	Rural	2275812.00	91.03	
<b>2040</b>	Urban	856802.00	72.31	64.20
	Rural	2589589.00	103.58	
<b>2050</b>	Urban	1044437.00	88.15	75.20
	Rural	2946627.00	117.87	



## Industrial Water Demand

The annual water demand for the Industries during the planning periods for each sub basin is given below in Table 17

**Table 17 Industrial Demand**

### WATER DEMAND CALCULATION FOR SMALL, MEDIUM AND LARGE INDUSTRIES BASED ON INDUSTRY CENSUS AS TAKEN FROM IWS

Sl. No.	Type of industry	Average Rate of Water consumption as given in IWS m <sup>3</sup> /day	2005		2017		2020		2030		2040		2050	
			No. of industry as per IWS	Water Demand	No. of industry	Water Demand	No. of industry	Water Demand	No. of industry	Water Demand	No. of industry	Water Demand	No. of industry	Water Demand
1	Small scale industry	2.5	6966	6.36	<b>17542</b>	16.01	<b>22097</b>	20.16	<b>47706</b>	43.53	<b>102995</b>	93.98	<b>222358</b>	202.9
2	Medium & large scale industry	2500	60	54.75	<b>151</b>	137.79	<b>190</b>	173.38	<b>411</b>	375.04	<b>887</b>	809.39	<b>1915</b>	1747.44
	Total Demand in M.Cum			<b>61.11</b>		<b>153.8</b>		<b>193.54</b>		<b>418.57</b>		<b>903.37</b>		<b>1950.3</b>

## **Water Balance**

Water balance for Gundar basin at 75% dependability is shown in Table 25.

**Table 25 Water balance for Gundar basin at 75% dependability in Mcm**

Sl. No	Name of the basin	Area of the basin (in Sq.Km)	No. of Sub basins	Year	Demand of water in various sectors MCM)						Water availability (MCM)					Surplus / Deficit in Mcum
					Irrigation	Domestics	Industries	Live stock	Others	Total	Surface water potential	Ground water potential	Quantity of recycled water from Sewage	Quantity of water from desilting	Total	
1	Gundar	5684.32	9	2017	731.38	40.69	153.80	55.49	0.00	981.36	549.00	578.89	-	-	1127.89	146.54
				2020	731.38	44.83	193.54	55.56	0.00	1025.31	549.00	578.89	-	-	1127.89	102.58
				2030	731.38	46.96	418.57	56.14	0.00	1253.05	549.00	578.89	-	-	1127.89	-125.16
				2040	731.38	54.88	903.37	57.16	0.00	1746.79	549.00	578.89	-	-	1127.89	-618.90
				2050	731.38	64.20	1950.34	58.69	1.00	2805.61	549.00	578.89	-	-	1127.89	-