

Government of Maharashtra

WATER RESOURCES DEPARTMENT



WATER YEAR BOOK 2012-2013-2014



DATA ANALYSIS CIRCLE NASHIK

HYDROMETEOROLOGICAL DATA PROCESSING DIVISION, NASHIK

CHIEF ENGINEER, PLANNING & HYDROLOGY PROJECT (SW), NASHIK

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INTRODUCTION

Water plays crucial role in the socio-economic development of the country. Safe drinking water is required for very large and growing population. Water has also become a major constraining factor for the growth of the agricultural and industrial sectors. In contrast, flooding frequently threaten populations and civil structures.

The Hydrological Information System provides information about Hydrological and Hydro meteorological parameters that vary with respect to time and space. The information is useful to the decision/policy makers, designers and researchers.

Earlier, Water Resources Department (GOM) was collecting the Hydrological Information System (HIS) Data and was recording manually in the form of registers for the use of Water Resources Department only. In 1995 National Hydrology Project was established in collaboration with Ministry of Water Resources, Government of India, CWC, CGWB, National Institute of Hydrology (Roorkee), CWPRS (Pune), CPCB, India Meteorological Department, with nine states i.e. Maharashtra, Orissa, Tamilnadu, Madhya Pradesh, Chhattisgarh, Andhra Pradesh, Gujrat, Karnataka & Kerala to develop sustainable HIS with following characteristics.

- Demand driven i.e. output is as per the users needs.
- Use of standardized equipments and adequate procedures for data Collection and processing.
- Computerized, comprehensive and easily accessible database.
- Proper infrastructure to ensure sustainability.

Under this Project since 1995, Hydrology Project (SW) Water Resources Department, Maharashtra State has started to collect the data on these lines and entering it in electronic mode. Stage discharge data is measured on GD stations. Hourly & Daily rainfall is measured on ARG & SRG stations respectively. On FCS station climatic parameters namely minimum & Maximum temperature, dry & wet bulb temperature, humidity, pan evaporation, wind direction & wind velocity, pan water temperature are measured. On water quality sampling stations water samples are collected and tested in the laboratory for turbidly, BOD, COD, PH etc. All these data is observed either daily, twice daily or hourly.

Three softwares are used for data entry, validation and data dissemination.

1. SWDES (Surface Water Data Entry System) for data entry and primary validation

2. HYMOS (Hydrological Modeling System) for secondary validation

3. WISDOM (Water Information System Data Online Management) for data storage and dissemination

The finally validated data is then given to Hydrological Data Users Group (HDUG) members online/ offline with nominal cost.

1.

The idea of preparing and publishing water year book is to communicate the intended data users, the kind of meteorological and hydrological scenario in the basins of the state during the hydrological year under consideration. A list of stations is attached herewith (Annexure A). The intended users can have this data from data bank as per the procedure laid down. Analysis of data is illustrated basin wise and basin is the unit for presentation of this data for Maharashtra State.

This water year book contains following information of the Maharashtra State.

- 1. Extreme rainfall events
- 2. District wise average rainfall.
- 3. Basin wise annual Isohyets.
- 4. Discharges at Gauge Discharge sites

HYDROLOGICAL REVIEW

2.1 Basins of Maharashtra and network :

2.

There are five river basins in Maharashtra namely Godavari, Krishna, Tapi, Narmada and West Flowing Rivers.



Fig 2.1 Map showing Major River Basins in Maharashtra

S. N.	Name of Basin	ARG	SRG	FCS	GD
1	Godavari	160	270	69	99
2	Тарі	35	48	13	41
3	Narmada	-	3	-	-
4	Krishna	31	128	45	54
5	West Flowing Rivers	114	192	26	70
	Total	162	276	67	210

Table 2.1 Network of Hydrology Project (SW) Maharashtra

2.2 Maximum Rainfall in Basins:

After analysing the daily rainfall data, it is observed that the maximum daily rainfall is not same as that of the previous years. Also it is observed that the maximum daily rainfall is not occurring on same station. It varies with respect to the location and period. It is also observed that yearly maximum rainfall and maximum daily rainfall is not occurring on the same station. The comparison is shown in the table given below.

Sr. No.	Basin	Maximum Dail mm	y rainfall in 1	Annual Ma Rainfall i	aximum in mm
		Station	Rainfall	Station	Rainfall
1	Lower Godavari	Kurkheda	383	Bhimkund	2833
2	Upper Godavari	Ravankola	263	Dongarpada	2519
3	Krishna	Kitwade	293.4	Kitwade	6412
4	Narmada	Toranmal	135.4	Mandvi Udai	1064
5	Тарі	Chunkhadi	240	Semadoh	2090
6	West Flowing Rivers South of Tapi	Khutal	330.3	Amboli	6268

Table 2.2 Comparison of Annual Maximum Rainfall and Maximum DailyRainfall for year 2012

Table 2.3 Comparison of annual Maximum Rainfall and Maximum DailyRainfall for year 2013

Sr.	Basin	Maximum Daily rainfall in mm		Annual Maximum Rainfall in mm	
NO.		Station	Rainfall	Station	Rainfall
1	Lower Godavari	Bhimkund	318	Bhimkund	3550
2	Upper Godavari	Bhavali	250	Dongapada	2663
3	Krishna	Het	383.1	Kitwade	7039
4	Narmada	Sisa	220	Toranmal	1443
5	Тарі	Churakund	302	Tarubanda	3148
6	West Flowing Rivers South of Tapi	Karak	463	Amboli	7075

Sr. No.	Basin	Maximum Daily rainfall in Basin mm		Annual Maximum Rainfall in mm	
		Station	Rainfall	Station	Rainfall
1	Lower Godavari	Bori	482	Kurkheda	2433
2	Upper Godavari	Bhanwad	390.8	Bhavali	2223
3	Krishna	Mahabaleshwar	372	Kitwade	6064
4	Narmada	Toranmal	174	Toranmal	1050
5	Тарі	Churakund	380	Rahu	1515
6	West Flowing Rivers South of Tapi	Amboli	340	Amboli	6967

Table 2.4 Comparison of Annual Maximum Rainfall and Maximum DailyRainfall for year 2014

2.5 Following table shows comparison of average annual rainfall for various basins

61		Average Rainfall in mm Year		
No	Name of Basin			
		2012	2013	2014
1	Lower Godavari	1217	1748	912
2	Upper Godavari	611	851	543
3	Krishna	1093	1481	1346
4	Narmada	930	1278	716
5	Тарі	754	964	691
6	West Flowing Rivers South of Tapi	2886	3530	2965

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2.4 District wise yearly average rainfall:

District wise yearly average rainfall for year 2012, 2013 and 2014 over Maharashtra is shown in following table. Maximum average rainfall occurred at Sindhudurga district for year 2012, 2013 and 2014. Minimum average rainfall occurred at Aurangbad district for year 2012 and at Ahamadnagar district for year 2013 and 2014.

Sr. No.	Name of District	Average Rainfall in mm (Year 2012)	Average Rainfall in mm (Year 2013)	Average Rainfall in mm (Year 2014)
1	Akola	713.5	935.2	640.0
2	Amarawati	1210.6	1401.6	957.9
3	Aurangabad	313.5	579.5	403.3
4	Beed	448.2	795.0	447.6
5	Bhandara	1359.3	1780.9	950.0
6	Buldhana	584.4	1025.7	620.6
7	Chandrapur	1295.2	1848.7	895.8
8	Dhule	514.9	728.6	519.3
9	Gadchiroli	1867.6	2362.5	1325.9
10	Gondiya	1386.2	1938.2	1074.3
11	Hingoli	712.1	1106.5	465.8
12	Jalgaon	445.0	707.5	608.4
13	Jalna	408.7	906.8	419.3
14	Kohapur	2358.2	2782.7	2559.4
15	Latur	833.6	831.6	425.2
16	Nagar	377.6	549.7	363.9
17	Nagpur	1066.1	1739.7	963.7
18	Nanded	841.4	1306.2	556.0
19	Nandurbar	710.4	1081.9	546.7
20	Nashik	881.9	1062.1	972.3
21	Osmanabad	475.8	747.3	506.0
22	Parabhani	680.2	1059.8	405.2
23	Pune	866.4	1418.7	1183.4
24	Raigad	2629.8	3534.9	2869.1
25	Ratnagiri	3215.6	3594.3	3102.8
26	Sangli	595.1	798.0	832.6
27	Satara	1057.1	1381.3	1474.4
28	Sindhudurga	3558.6	4047.5	3291.7

Table 2.6: District wise average Rainfall for year 2012,2013,2014:

29	Solapur	396.5	602.7	449.3
30	Thane	2045.6	2906.3	2605.3
31	Wardha	1001.6	1475.6	931.2
32	Washim	800.9	1648.5	741.9
33	Yeotmal	1007.0	1532.4	642.5

Table 2.7: Rainfall in scarcity zone for year 2012 :

Sr. No.	Name of District	Rainfall in mm Year 2012
1	Akola	713.5
2	Aurangabad	313.5
3	Beed	448.2
4	Buldhana	584.4
5	Dhule	514.9
6	Hingoli	712.1
7	Jalgaon	445.0
8	Jalna	408.7
9	Nagar	377.6
10	Nandurbar	710.4
11	Osmanabad	475.8
12	Parabhani	680.2
13	Sangli	595.1
14	Solapur	396.5

Table 2.8:Rainfall in scarcity zone for year 2013:

Sr. No.	Name of District	Rainfall in mm Year 2010
1	Aurangabad	579.5
2	Dhule	728.6
3	Jalgaon	707.5
4	Nagar	549.7
5	Osmanabad	747.3
6	Solapur	602.7

Sr. No.	Name of District	Rainfall in mm Year 2014
1	Akola	640.0
2	Aurangabad	403.3
3	Beed	447.6
4	Buldhana	620.6
5	Dhule	519.3
6	Hingoli	465.8
7	Jalgaon	608.4
8	Jalna	419.3
9	Latur	425.2
10	Nagar	363.9
11	Nanded	556.0
12	Nandurbar	546.7
13	Osmanabad	506.0
14	Parabhani	405.2
15	Solapur	449.3
16	Washim	741.9
17	Yeotmal	642.5

Table 2.9:Rainfall in scarcity zone for year 2014:

Comparison of Rainfall in scarcity zone i.e. rainfall < 750mm shows that in year 2012, 14 districts were in scarcity zone; in year 2013, 6 districts were in scarcity zone and in year 2014, 17 districts were in scarcity zone. Districts, Ahamadnagar, Aurangabad , Dhule and Solapur are consistently in scarcity zone.

2.5 Number of rainy days in month: - Following table shows average number of rainy days in month for year 2012,2013 & 2014. It is observed that at station Hardoli rainy days are maximum for all three years.

Sr.no.	Year	Average No. Of Rainy Days in Month	Max Rainy Days in Month
1	2012	13	27
2	2013	15	29
3	2014	9	27

Table 2.10: Comparison of number of average rainy days

2.6 Basin wise annual rainfall:

Following figures shows isohyets maps of Maharashtra and the 5 major basins in it for year 2012, 2013 and 2014.







































Fig 2.21: Isohytal Map of Narmada River Basin 2012



Fig 2.22: Isohytal Map of Narmada River Basin 2013



Fig 2.23: Isohytal Map of Narmada River Basin 2014

Review of Maximum Minimum Temperature

Following tables show daily maximum & minimum temperature for various basins for period 2005 to 2014.

Table 3.1: Daily maximum & minimum temperature for Lower GodavariBasin

Sr.no.	Year	Max Temp	Name of station	Min Temp	Name of station
1	2005	47.0	Gosekhurda	4.7	Sirpur
2	2006	46.0	Gosekhurda	2.0	Gosekhurda
3	2007	47.1	Bhamaragad	4.0	Warudbagaji
4	2008	47.3	Lakhampur	1.0	Kamtikhairi
5	2009	48.8	Lakhampur	0.9	Bori
6	2010	50.0	Lakhampur	3.5	Mathani
7	2011	48.0	Bhamragad	2.0	Warudbagaji
8	2012	48.6	Bhamragad	2.4	Warudbagaji
9	2013	48.0	Bori	4.4	Warudbagaji
10	2014	47.5	Gosekhurda	5.1	Kamtikhairi

Fig 3.1: Graph of maximum temperature for Lower Godavari Basin



3.



Fig 3.2: Graph of minimum temperature for Lower Godavari Basin

Table 3.2: Daily maximum & minimum temperature for Tapi Basin

Sr.no.	Year	Max	Name of station	Min	Name of
		Temp		Temp	station
1	2005	47	Manasgaon	2.0	Belval
2	2006	46.5	Bhusaval	2.45	Fardapur
3	2007	48.6	Bhusaval	5.0	Furdapur & Belval
4	2008	46.5	Bhusaval	3.2	Jamner
5	2009	47	Bhusaval,Aurangpur, Belval, Padalse	3.5	Manasgaon
6	2010	48	Bhusaval	2.5	Aurangpur
7	2011	47	Bhusaval	2.0	Furdapur, Padalse, Shirla, Aurangpur
8	2012	46	Bhusaval	2.0	Furdapur
9	2013	47	Khariya	2.0	Padalse
10	2014	46.5	Khariya& Aurangpur	2.0	Belval



Fig 3.3: Graph of Daily maximum temperature for Tapi Basin

Fig 3.4: Graph of Daily minimum temperature for Tapi Basin


Sr.no.	Year	Max Temp	Name of station	Min Temp	Name of station
1	2005	46	Tuksai	5.5	Wegre
2	2006			6.0	Awalegaon, Jambreumgaon, Patrachiwadi
3	2007	46	Khapri	5.0	Khapri
4	2008	48.5	Parali	4.5	Alman
5	2009	45.2	Suksale	2.0	Suksale
6	2010	45.3	Suksale	8.3	Suksale
7	2011	43.5	Suksale	6.2	Suksale
8	2012	43	Awlegaon, Bhatsanagar, Karak,Suksale	1.5	Suksale
9	2013	44	Karak	6.2	Suksale
10	2014	45	Karak	10.0	Bhatsanagar

Table 3.3: Daily maximum & minimum temperature for West Flowing RiverBasin







Fig 3.6: Graph of Daily minimum temperature for West Flowing River Basin

Table 3.4: Daily maximum	& minimum	temperature 1	for Upper	Godavari	Basin
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Sr.no.	Year	Max Temp	Name of station	Min Temp	Name of station
1	2005	45.5	Potanandgaon	3.0	Newasa
2	2006	44.4	Potanandgaon	3.5	Newasa
3	2007	44.5	Kopargaon	3.5	Jaffrabad, Kopargaon, Newasa, Padali
4	2008	44.6	Manoor	3.0	Newasa
5	2009	45.0	Potnandgaon	1.5	Newasa
6	2010	46.0	Potanandgaon, Manoor	4.5	Newasa
7	2011	44.4	Sundgi	1.0	Potanandgaon
8	2012	45.5	Sundgi	2.0	Kopargaon
9	2013	45.0	Potanandgaon, shahgad, sundgi, Nandednagapur	4.0	Padali
10	2014	45.0	Sundgi	5.0	Mannor, Jaffrabad



Fig 3.7: Graph of Daily maximum temperature for Upper Godavari Basin

Fig 3.8: Graph of Daily minimum temperature for Upper Godavari Basin



Sr.no.	Year	Max Temp	Name of station	Min Temp	Name of station
1	2005	46	Rosa	4.0	Paud,Umbre
2	2006	45	Bandalgi	3.5	Kashti
3	2007	44	Rosa, Khamgaon	4.5	Askheda
4	2008	43.5	Barur	4.0	Barhanpur,Paud,Velhe
5	2009	43.5	Barur, Kashti, Sidhewadi(solapur)	1.5	Ambwade
6	2010	45.0	Barur	2.5	Parali
7	2011	42.5	Pargaon	4.0	Pargaon
8	2012	43.0	Barur	4.0	Kashti
9	2013	43.5	Barur	4.0	Kashti
10	2014	43.0	Barur	5.0	Kashti

Table 3.5: Daily maximum & minimum temperature for Krishna Basin

Fig 3.9: Graph of Daily maximum temperature for Krishna Basin





Fig 3.10: Graph of Daily minimum temperature for Krishna Basin

Inference from comparison of maximum and minimum temperature:

It is observed that there is not much variation in maximum temperature in all basins. But there is much variation in minimum temperature in all basins. Maximum temperature reached up to 50° C at station Lakhandur in 2010 and 0.9° C at station Lakhandur in 2009.

4. Discharges at GD sites in various basins in Maharashtra

Maharashtra is divided into five major river basins namely Godavari, Krishna, Tapi, WFR south of Tapi and Narmada. Hydrometeorological network is spread all over the Maharashtra. There are 263 Gauge Discharge stations under the control of Hydrology Project (SW) Maharashtra.

4.1 Discharges at GD sites in Lower Godavari basin:

The catchment area of Lower Godavari Basin in Maharashtra is 81097 sqkm. There are 55 Gauge discharge stations in this catchment. Following table shows 3 years discharges for GD stations on which discharge data is available in this catchment.

Anantwadi, Tal. Mahagaon, Dist. Yevatmal, Area 269.34sqkm							
Year	June	July	August	September	October	Monsoon Total in Mm3	
2012	15.18	76.43	53.45	206.80	59.19	411.04	
2013	133.02	240.23	204.90	36.61	43.94	658.71	
2014	0.00	0.00	8.12	62.27	0.65	71.04	

Armori, Tal. Armori, Dist. Gadchiroli, Area 198.57sqkm							
Year June July August September October Mons Mm							
2012	0.00	28.66	59.65	36.89	20.05	145.24	
2013	78.50	233.43	415.68	42.84	50.46	820.90	
2014	0.00	66.43	19.67	30.94	7.06	124.09	

	Bamni, Tal. Dhanora, Dist. Gadchiroli, Area 208.05 sqkm							
Year June July August September October Total Mm								
2012	0.00	253.64	857.75	481.65	194.53	1787.57		
2013	229.93	383.26	288.66	121.50	116.65	1140.00		
2014	0.00	233.13	103.10	251.35	74.08	661.66		

Damrench, Tal. Aheri, Dist. Gadchiroli, Area 175.925 sqkm							
Year	June	July	August	September	October	Monsoon Total in Mm3	
2012	0.00	3285.61	9550.19	7915.28	2408.96	23160.04	
2013	1340.14	2806.08	3350.27	1895.36	2157.66	11549.50	
2014	0.00	1542.29	2152.58	3374.58	1064.06	8133.50	

Gadbori, Tal. Sindewahi, Dist. Chadrapur, Area 199.30 sqkm							
Year	June	July	August	September	October	Monsoon Total in Mm3	
2012	0.00	11.95	155.56	438.37	45.85	651.73	
2013	74.08	207.96	136.96	4.40	10.40	433.79	
2014	0.00	87.39	9.13	43.73		140.24	

GhotangaonBori, Tal. Arjuni –Morgaon, Dist. Gondia, Area 229.30 sqkm							
Year	June	July	August	September	October	Monsoon Total in Mm3	
2012	0.00	35.63	114.33	93.09	0.47	243.52	
2013	13.50	25.04	87.83	12.51	13.62	152.49	
2014	0.00	37.83	11.74	13.58	5.58	68.73	

Har	Hamdapur, Tal. Samudrapur, Dist. Vardha, Area 223.425sqkm							
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	0.00	44.81	139.37	8.84	193.02		
2013	28.77	93.28	38.97	21.70	33.17	215.88		
2014	0.00	41.65	27.57	24.80	0.00	94.02		

Hir	Hingangaht, Tal. Hingangaht, Dist. Vardha, Area 214. 20sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	0.00	1.72	163.14	291.72	13.76	470.35			
2013	82.61	335.82	190.87	39.82	75.67	724.79			
2014	0.00	161.41	23.51	63.24	16.76	264.92			

Kardha, Tal. Bhandara, Dist. Bhandara, Area 22538.00sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	543.80	2130.79	2044.55	148.76	4867.91		
2013	172.10	1799.62	2369.27	268.70	328.17	4937.85		
2014	0.00	3392.91	576.88	659.77	975.91	5605.47		

Khadka, Tal. Arni, Dist. Yeotmal, Area 236.735sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	57.83	393.81	212.28	339.57	97.76	1101.25		
2013	264.94	541.08	437.26	89.85	86.09	1419.22		
2014	0.00	17.76	52.41	80.05	19.30	169.52		

	KolgaonGod, Tal. Vani, Dist. Yevatmal, Area 181.26sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	124.73	1382.76	632.14	1764.80	125.41	4029.85			
2013	891.48	2385.34	2086.26	307.56	296.79	5967.42			
2014	0.00	0.00	660.36	491.79	56.43	1208.58			

I	KoliBk, Tal. Ghatanji, Dist. Yevatmal, Area 263.555sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	38.92	203.90	169.99	403.56	34.51	850.89			
2013	91.22	239.17	213.17	45.23	41.74	630.53			
2014	0.00	12.80	36.57	48.31	6.73	104.40			

I	Mahagaon, Tal. Aheri, Dist. Gadchirolo, Area 128.25sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	2055.45	9114.58	16445.81	16287.85	7405.56	51309.26			
2013	1877.37	6114.67	6754.27	3757.61	3396.41	21900.32			
2014	98.51	3120.99	2883.74	6048.44	1061.01	13212.69			

Mandvi Vain, Tal. Tirora, Dist. Yevatmal, Area 20440.00sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	672.07	2167.52	1855.29	132.93	4827.81		
2013	167.30	1696.73	1951.49	267.67	322.06	4405.25		
2014	0.00	1668.92	435.95	318.27	65.76	2488.91		

Murli, Tal. Umerkhed, Dist. Yevatmal, Area 365.915sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	19.05	202.21	219.07	459.44	109.11	1008.89		
2013	0.00	421.50	419.91	197.17	176.82	1215.41		
2014	0.00		13.11	90.35	2.59	106.04		

Par	Parsewada, Tal. Shironcha, Dist. Gadchiroli, Area 106.15sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	0.00	182.85	243.71	128.91	19.63	575.10			
2013	16.09	54.11	48.72	12.09	10.99	142.01			
2014	1.23	29.63	20.02	36.26	9.08	96.23			

	Petta, Tal. Ettapali, Dist. Gadchiroli, Area 217.535sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	0.00	860.66	1475.34	765.09	68.84	3169.93			
2013	118.20	466.17	283.63	172.43	233.91	1274.33			
2014	0.00	374.69	240.00	681.56	99.29	1395.54			

	Pipriya, Tal. Satekasa, Dist. Gondiya, Area 317.90sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	0.00	10.99	73.47	55.04	27.40	166.91			
2013	6.31	22.19	35.24	19.29	12.45	89.17			
2014	7.22	13.07	18.64	19.85	10.09	61.65			

Saiphal, Tal. Ghatanji, Dist. Yavatmal, Area 267.80sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	135.45	715.95	636.59	1009.45	381.34	2878.79		
2013	624.54	1029.93	878.92	327.77	347.92	3209.07		
2014	0.00	101.61	122.88	384.11	51.73	660.34		

Shivni, Tal. Armori, Dist. Gadchiroli, Area 202.62sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	283.88	695.96	478.63	0.00	1458.47		
2013	149.25	374.67	426.86	104.42	178.62	1233.82		
2014	0.00	202.48	87.16	173.65	0.00	463.29		

Temburdoh, Tal. Saoner, Dist. Nagpur,Area 315.50sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	18.62	58.01	490.18	379.76	5.68	952.25		
2013	37.13	238.43	621.58	13.51	44.03	954.69		
2014	0.00	117.98	27.11	34.56	0.00	179.65		

Bham	Bhamaragad, Tal. Bhamaragad, Dist. Gadchiroli, Area 207.53sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	0.00	856.32	2275.46	1658.88	449.89	5240.56			
2013	414.51	897.64	939.73	276.13	308.99	2837.00			
2014	37.65	390.41	237.55	638.73	185.64	1489.98			

Bhir	Bhimkunda, Tal. Chamroshi, Dist. Gadchiroli, Area 189.06sqkm									
Year	June	July	August	September	October	Monsoon Total in Mm3				
2012	0.00	252.63	377.42	577.69	124.91	1332.65				
2013	35.84	295.80	171.08	27.53	50.19	580.43				
2014	0.00	125.86	66.60	221.92	18.65	580.43				

Bori, Tal. Aheri, Dist. Gadchiroli, Area 127.47sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	332.65	502.49	560.37	82.50	1478.01		
2013	73.62	186.65	211.62	69.70	128.13	669.71		
2014	11.22	66.35	57.95	113.11	16.21	264.84		

Dechali, Tal. Aheri, Dist. Gadchiroli, Area 197.72sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	114.26	183.52	120.59	37.40	455.77		
2013	24.11	39.85	19.71	16.88	8.42	108.97		
2014	0.00	4.43	6.69	37.48	1.74	50.34		

Deori, Tal. Gondia, Dist. Gondia, Area 16068.00sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	29.76	1134.82	2945.32	2481.12	345.20	6936.21		
2013	293.61	1694.30	1938.32	745.63	688.40	5360.25		
2014	0.00	1294.97	802.35	860.08	152.92	3110.32		

К	Kamthikhairi, Tal Parseoni, Dist. Nagpur, Area 295.00sqkm						
Year	June	July	August	September	October	Monsoon Total in Mm3	
2012	82.69	0.00	39.34	696.77	0.00	818.80	
2013	76.47	289.53	607.10	61.58	215.71	1250.39	
2014	WL is	below ZGRI	_ during the	month, Charry	method ado	pted.	

Lakhandur, Tal. Lakhandur, Dist. Nagpur, Area 222.50sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	125.11	525.36	359.69	26.19	1036.35		
2013	117.58	312.90	576.62	32.91	38.19	1078.20		
2014	0.00	651.28	115.18	50.13	9.74	826.32		

Mathani, Tal. Mouda, Dist. Nagpur, Area 264.00sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	46.53	141.16	1245.73	1971.94	172.83	3578.19		
2013	200.61	793.52	1658.08	222.16	482.55	3356.91		
2014	0.00	475.82	119.08	186.71	73.55	855.16		

Sirpur, Tal. Deoli, Dist. Bhandara, Area 239.46sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	154.70	269.33	228.43	1815.14	215.24	2682.85		
2013	133.22	362.89	602.93	187.11	345.53	1631.68		
2014	26.47	301.22	149.24	334.22	39.81	850.96		

[Dhaba, Tal. Gondpipri, Dist. Chadrapur, Area 162.00sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	637.00	1844.23	1750.58	3032.52	884.98	8149.30			
2013	531.22	2322.06	2016.43	1134.29	1279.00	7283.00			
2014	108.75	465.48	1139.50	1860.29	1151.03	4725.04			

М	Mangdatola, Tal. Armori, Dist. Gadchiroli, Area 226.60sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	0.00	162.00	251.42	161.70	8.00	583.12			
2013	37.07	20.10	90.84	33.94	39.26	221.21			
2014	0.00	62.30	17.70	47.13	0.00	127.13			

м	Mahalgaon, Tal. Tumsar, Dist. Bhandara, Area 263.10 sqkm									
Year	June	July	August	September	October	Monsoon Total in Mm3				
2012	0.00	17.56	38.67	135.63	4.18	196.05				
2013	17.84	123.52	206.88	37.94	45.28	431.46				
2014	0.00	258.41	9.57	4.71	0.00	272.69				

Soitdindora, Tal. Warora, Dist. Chadrapur, Area 203.15sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	54.88	146.15	606.44	2683.29	166.95	3657.71		
2013	418.90	1116.47	904.03	272.74	545.59	3257.73		
2014	120.24	383.88	107.84	470.63	0.00	1082.60		

Takali, Tal. Zari Jamni, Dist. Yavatmal, Area 206.825sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	55.53	202.33	166.19	300.67	44.59	769.30		
2013	53.31	225.15	116.44	7.21	18.37	420.48		
2014	0.00	14.13	56.71	66.40	11.46	148.69		

Wadsachicholi, Tal. Brahmapuri, Dist. Chadrapur, Area 38172sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	56.69	1225.87	6012.78	5157.63	640.37	13093.34		
2013	459.26	2892.75	4518.75	662.62	1073.94	9607.31		
2014	19.87	1180.09	736.60	682.24	165.66	2784.47		

Wagholibuti, Tal. Saoli, Dist. Chadrapur, Area 43798sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	44.01	987.27	7776.72	5786.55	425.70	15020.25		
2013	529.43	4683.74	6794.11	661.68	1137.80	13806.76		
2014	11.26	1644.54	696.33	892.84	77.64	3322.60		

4.2 Discharges at GD sites in Krishna basin:

The catchment area of Krishna Basin in Maharashtra is 68397 sq km. There are 50 Gauge discharge stations in this catchment. Following table shows 3 years discharges for 25 GD stations in Krishna basin..

Ambeghar (K), Tal. Bhor, Dist. Pune, Area 249.44 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	22.67	105.14	0.00	0.00	127.81		
2013	16.71	602.35	228.48	33.20	10.28	891.01		
2014	103.87	130.63	89.86	0.82	325.17	650.34		

Budhwad (V) , Tal. Maval, Dist. Pune, Area 151.919 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	11.91	14.64	11.46	0.00	38.01		
2013	17.50	137.58	44.33	1.14	0.00	200.55		
2014	0.00	0.00	0.00	0.00	0.00	0.00		

Nighoje , Tal Khed, Dist. Pune, Area 832.30 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	56.34	173.44	1.96	0.00	231.74		
2013	143.12	370.64	144.30	51.85	0.00	709.91		
2014	0.00	0.00	78.53	247.36	325.89	651.77		

Pargaon , Tal. Daund, Dist. Pune, Area 6251.00 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	0.00	0.00	0.00	0.00	0.00		
2013	0.00	0.00	0.00	0.00	0.00	0.00		
2014	386.87	1096.14	667.00	19.29	2169.30	4338.60		

	Paud , Tal. Bhor, Dist. Pune, Area 473.64 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	0.00	32.90	65.52	0.00	0.00	98.42			
2013	18.36	207.14	89.65	15.37	0.00	330.52			
2014	0.00	0.00	0.00	0.00	0.00	0.00			

Sakhar, Tal. Velhe, Dist. Pune, Area 182.57 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	23.94	38.38	0.56	0.00	62.89		
2013	12.49	47.71	19.20	11.79	0.00	91.17		
2014	0.00	1.12	69.03	11.17	81.32	162.65		

Umbre (K) , Tal. Bhor, Dist. Pune, Area 525.82 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.99	45.68	143.86	85.63	35.00	311.16		
2013	15.52	102.73	246.72	32.81	47.66	445.44		
2014	0.00	0.00	0.00	0.00	0.00	0.00		

Ajara Ramtirth, Tal.Ajara, Dist. Kolhapur, Area 244.57 sq km							
Year	June	July	August	September	October	Monsoon Total in Mm3	
212	12.84	235.88	278.36	134.51	43.10	704.68	
2013	68.09	369.47	253.52	70.98	55.08	817.14	
2014	292.30	232.64	115.73	15.22	655.88	1311.76	

Belwade, Tal. Patan, Dist. Satara, Area 117.24 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	115.74	115.18	49.25	4.31	284.48		
2013	54.45	344.18	112.74	28.27	0.66	540.30		
2014	168.43	153.78	77.68	4.27	404.15	808.30		

	Gudhe, Tal. Patan, Dist. Satara, Area 229.92 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	0.00	38.22	130.06	60.61	48.26	277.16			
2013	0.00	208.31	131.85	32.66	15.29	388.11			
2014	92.11	230.23	165.44	100.94	588.73	1177.46			

Jambre Umgaon, Tal. Chandgad, Dist. Kolhapur, Area 26.43 sq km							
Year	June	July	August	September	October	Monsoon Total in Mm3	
2012	3.55	49.32	51.36	2.14	2.78	109.15	
2013	1.81	72.42	37.47	8.77	4.48	124.95	
2014	61.19	30.41	14.35	0.00	105.96	211.92	

ŀ	Kadal, Tal. Gadhinglaj, Dist. Kolhapur, Area 869.98 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	15.43	305.97	430.37	257.74	413.72	1423.23			
2013	127.46	636.44	391.90	107.99	309.80	1573.57			
2014	428.63	451.01	265.47	2.34	1147.45	2294.89			

K	Kagal (NH4), Tal. Kagal, Dist. Kolhapur, Area 642.71 sq km							
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	19.17	74.71	163.15	219.73	65.21	541.98		
2013	121.50	453.74	311.12	77.61	88.88	1052.86		
2014	285.29	256.49	245.43	62.66	849.88	1699.75		

Man	Mandukli , Tal. Gaganbavada, Dist. Kolhapur Area 107.01 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	28.85	155.98	155.93	112.81	31.59	485.16			
2013	70.71	383.68	184.52	48.42	35.25	722.58			
2014	244.94	182.18	119.18	11.53	557.83	1115.66			

	Mhaisal, Tal. Miraj, Dist. Sangli, Area 12740.59 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	39.33	997.82	1976.72	1550.76	889.73	5454.36			
2013	0.00	0.00	1309.04	758.08	541.00	2608.12			
2014	0.00	1445.45	1652.55	600.44	3698.43	7396.87			

Nad	Nadgadwadi , Tal. Chandgad, Dist. Kolhapur, Area 557.92 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	0.00	137.07	168.69	100.04	56.19	461.99			
2013	70.63	588.00	445.75	121.89	20.12	1246.39			
2014	291.82	395.13	306.75	78.67	1072.37	2144.73			

Nitwade, Tal. Karveer, Dist. Kolhapur, Area 600.30 sq km							
Year	June	July	August	September	October	Monsoon Total in Mm3	
2012	44.00	585.50	714.14	381.78	161.78	1887.20	
2013	289.48	1241.76	696.40	152.05	141.20	2520.90	
2014	835.68	728.35	446.31	80.04	2090.37	4180.75	

Pat	Patryachiwadi, Tal. Panhala, Dist. Kolhapur, Area 162.94 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	16.26	247.61	287.93	152.99	27.33	732.12			
2013	94.89	463.08	220.33	71.16	55.13	904.59			
2014	337.77	227.70	159.11	44.23	768.81	1537.62			

Sarud , Tal. Shhuwadi, Dist. Kolhapur, Area 362.64 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	0.00	0.00	0.00	0.00	0.00		
2013	74.13	654.57	324.20	17.62	10.53	1081.05		
2014	399.88	377.59	197.01	16.16	990.65	1981.29		

Shigaon, Tal. Walva, Dist. Sangli, Area 1806.45 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	70.53	632.66	1087.36	782.03	213.44	2786.02		
2013	0.00	0.00	0.00	0.00	0.00			
2014	996.62	1191.85	672.46	70.72	2931.65	5863.29		

Shivade, Tal. Karhad, Dist. Satara, Area 3261.03 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	30.02	5.68	190.59	237.73	465.45	929.47		
2013	67.59	474.11	409.76	254.65	203.02	1409.13		
2014	0.00	0.00	0.00	0.00	0.00	0.00		

Tarewadi , Tal. Gadhinglaj, Dist. Kolhapur, Area 326.71 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	1.27	427.52	588.27	231.80	109.93	1358.78		
2013	3.50	299.22	621.32	139.24	108.16	1171.43		
2014	411.08	317.67	17.47	53.32	799.55	1599.09		

Wadange (RT), Tal. Karveer, Dist. Kolhapur, Area 1940.34 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	128.80	1263.38	1680.63	954.02	243.45	4270.28		
2013	126.58	1494.35	2868.22	536.05	359.79	5384.99		
2014	1687.77	1446.95	800.72	103.82	4039.26	8078.51		

Ichalkaranji , Tal. Hatkanangale, Dist. Kolhapur Area 2374.74 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	1277.99	1936.67	1143.86	430.13	4788.65		
2013	0.00	0.00	1050.86	386.68	273.16	1710.70		
2014	1825.55	1747.51	1087.08	200.64	4860.79	9721.59		

	Bubnal , Tal. Shirol, Dist. Kolhapur Area 15391.71 sq km								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	107.42	2556.80	4276.81	3294.98	2274.30	12510.31			
2013	1034.58	8852.28	6547.37	2088.57	1884.25	20407.05			
2014	0.00	0.00	0.00	0.00	0.00	0.00			

4.3 Discharges at GD sites in Upper Godavari basin:

The catchment area of Upper Godavari Basin in Maharashtra is 71812 sqkm. There are 43 Gauge discharge stations in this catchment. Following table shows 3 years discharges for GD stations on which discharge data is available in this catchment.

	Aurad (Sh), Tal. Nilanga, Dist. Latur, Area 3145.00sqkm							
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	0.00	0.00	0.00	0.00	0.00		
2013	0	1.94	1.62	31.10	87.77	122.43		
2014	5.98	0.13	3.45	7.12	0.00	16.68		

	Diksal Par , Tal. Peth, Dist. Nashik, Area 193.15 sqkm							
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	3.21	20.52	74.24	48.99	0.23	147.18		
2013	5.06	76.70	63.22	56.28	43.45	244.71		
2014	0.00	78.52	70.18	59.80	10.74	219.24		

Kesrali, Tal. Biloli, Dist. Nanded, Area 2480.00 sqkm								
Year June July August September October To						Monsoon Total in Mm3		
2012	2.81	1.60	1.55	2.30	5.96	14.22		
2013	0.00	0.00	0.00	0.00	0.00	0.00		
2014	0.00	0.00	4.68	3.39	0.00	8.07		

Kopargaon, Tal. Kopargaon, Dist. Ahamadnagar, Area 7095.69 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	2.26	38.95	110.41	151.89	303.52		
2013	0.00	172.19	291.52	152.31	213.91	829.94		
2014	0.00	0.00	479.89	461.70	9.05	950.63		

Mahaldevi, Tal. Akola, Dist. Ahamadnagar, Area 449.92 sqkm							
Year	June	July	August	September	October	Monsoon Total in Mm3	
2012	30.14	38.97	98.72	126.58	124.42	418.84	
2013	39.20	47.59	307.61	146.51	116.68	657.59	
2014	39.00	34.91	100.62	220.38	39.04	433.95	

Nagamthan, Tal. Vaijapur, Dist. Aurangabad, Area 9399.47 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	0.00	137.25	524.07	1066.18	1727.50		
2013	0.00	0.00	0.00	0.00	0.00	0.00		
2014	39.00	34.91	100.62	220.38	39.04	433.95		

Nanded Nagapur , Tal. Nanded, Dist. Nanded, Area 53000.00 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	0.00	0.00	0.00	0.00	0.00		
2013	0.00	619.15	711.86	739.99	992.64	3063.65		
2014	0.00	0.00	0.00	0.00	0.00	0.00		

	Nashik, Tal. Nashik, Dist. Nashik, Area 727.23 sqkm								
Year June July August September October Monso Monso									
2012	0.00	0.00	0.00	0.00	0.00	0.00			
2013	0.00	8.92	65.07	11.02	3.50	88.51			
2014	0.00	53.54	79.70	159.50	0.00	292.74			

Potan	Potanandgaon, Tal. Parabhani, Dist. Parabhani, Area 7795.00 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	0.00	0.00	0.00	0.00	0.00	0.00			
2013	534.89	480.42	94.27	147.82	17.79	1275.20			
2014	0.00	0.00	0.00	0.00	0.00	0.00			

Samangaon(B), Tal. Nashik, Dist. Nashik, Area 1730.00 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	29.66	132.28	190.96	36.52	389.43		
2013	0.00	0.00	0.00	0.00	0.00	0.00		
2014	0.00	74.13	342.46	271.51	0.00	688.11		

Sangamner (Waghapur), Tal. Sangmner, Dist. Sangmner, Area 1470.32 sqkm							
Year June July August September October To							
2012	14.95	8.59	24.15	58.32	79.89	185.90	
2013	14.34	14.31	197.88	80.75	22.29	329.58	
2014	14.16	13.05	48.87	164.16	13.86	254.10	

Takli, Tal. Devni, Dist. Latur, Area 6571.00 sqkm								
Year June July August September October Total Mm								
2012	0.00	0.00	0.00	14.44	12.12	26.57		
2013	0.00	52.23	12.23	6.82	3.91	75.19		
2014	0.00	0.00	0.00	0.00	0.00	0.00		

Usthale, Tal. Peth, Dist. Nashik, Area 111.96 sqkm								
Year June July August September October Monso Monso								
2012	1.81	13.29	89.74	73.61	8.12	186.57		
2013	17.18	206.76	141.42	75.91	19.74	461.01		
2014	0.00	65.91	103.60	53.45	1.21	224.18		

	Zari, Tal. Prabhani, Dist. Parabhani, Area 5700.00 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	0.00	15.44	0.78	24.76	22.34	63.33			
2013	0.00	0.00	0.00	0.00	0.00	0.00			
2014	0.00	0.00	20.59	26.01	0.00	46.60			

4.4 Discharges at GD sites in Tapi basin:

The catchment area of Tapi Basin in Maharashtra is 55101.54 sqkm. There are 28 Gauge discharge stations in this catchment. Following table shows 3 years discharges for GD stations on which discharge data is available in this catchment.

Daryapur, Tal. Daryapur, Dist. Amrawati, Area 1309sqkm								
Year June July August September October Monso Monso								
2012	0.44	1.54	13.50	40.63	0.80	56.91		
2013	3.33	11.88	39.09	9.11	4.79	68.20		
2014	0.00	24.24	4.03	28.65	0.00	56.92		

Saragkheda, Tal. Shahada, Dist. Nadurbar, Area 55485 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	1455.04	2616.47	3453.83	0.00	7525.34		
2013	736.65	3063.83	5128.33	2366.82	1163.62	12459.26		
2014	0.00	2260.87	986.46	2143.21	0.00	5390.54		

Aurangpur, Tal. Murtizapur, Dist. Akola, Area 1418 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	20.39	12.58	29.56	125.26	13.71	201.50		
2013	34.11	92.37	75.81	25.98	53.49	281.75		
2014	2.14	110.35	53.83	142.33	9.16	317.81		

Bhusawal, Tal. Bhusawal, Dist. Jalgaon, Area 29871 sqkm								
Year June July August September October To More								
2012	24.42	1417.60	2503.44	2592.32	0.00	6537.78		
2013	612.82	2807.51	5036.40	1255.09	610.78	10322.61		
2014	0.00	1241.71	433.40	1649.13	0.00	3324.24		

	Khariya, Tal. Dharni, Dist. Amravati, Area 5945 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	24.95	1288.68	2540.32	2335.88	172.12	6361.96			
2013	289.90	1643.61	4515.11	551.26	552.63	7552.50			
2014	0.00	3032.20	691.79	1152.97	221.95	5098.91			

Manasgaon, Tal. Shegaon, Dist. Buldhana, Area 12016 sqkm									
Year	June	July	August	September	October	Monsoon Total in Mm3			
2012	33.46	75.62	230.28	1304.01	55.65	1699.03			
2013	228.63	639.08	1679.13	592.79	594.33	3733.96			
2014	7.32	853.47	318.15	590.80	60.39	1830.13			

	Sukwad, Tal. Sindhkhede, Dist. Dhule, Area 51916sqkm									
Year	June	July	August	September	October	Monsoon Total in Mm3				
2012	0.00	989.04	3082.31	4953.36	39.10	9063.80				
2013	0.00	2640.86	6621.85	2184.95	827.80	12275.47				
2014	0.00	3008.27	375.74	2834.70	0.00	6218.71				

Fardapur, Tal. Mehekar, Dist. Buldhana, Area 1250 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	3.10	2.88	1.57	6.08		13.62		
2013	0.00	15.48	60.06	33.94	42.13	151.60		
2014	0.00	0.00	8.17	23.07	0.93	32.18		

Jamner, Tal. Jamner, Dist. Jalgaon, Area 746 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	5.58	0.00	0.00	0.00	5.58		
2013	8.94	18.67	66.75	43.74	1.78	139.88		
2014	0.00	0.00	0.00	40.34	0.00	40.34		

Malegoan Girna, Tal. Malegaon, Dist. Nashik, Area 2741 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012						0.00		
2013	0.00	25.81	67.77	58.30	50.99	202.87		
2014	2.95	3.05	59.46	92.99	3.05	161.49		

Pal Tapi, Tal. Raver, Dist. Jalgaon, Area 253 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	29.39	30.78	38.32	117.88	0.00	216.37		
2013	0.00	0.00	161.01	199.30	0.00	360.31		
2014	0.00	86.97	134.54	220.47	0.00	441.98		

Sawkheda, Tal. Jalgaon, Dist. Jalgaon, Area 9349 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012						0		
2013	6.91	20.94	60.06	63.52	87.88	239.31		
2014	0.00	0.00	0.00	51.95	0.00	51.95		

Suple, Tal. Kalvan, Dist. Nashik, Area 157 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	3.52	10.67	98.14	101.41	0.00	213.74		
2013	6.62	147.50	147.69	118.58	122.07	542.47		
2014	0.00	46.23	114.25	76.35	0.00	236.83		

Tonda, Tal. Shirpur, Dist. Dhule, Area 1739 sqkm								
Year	June	July	August	September	October	Monsoon Total in Mm3		
2012	0.00	0.57	5.49	15.60	0.00	21.66		
2013	3.26	77.33	63.37	166.41	10.87	321.24		
2014	0.00	58.72	9.18	43.34	0.14	111.37		

4.5 Discharges at GD sites in West Flowing River basin:

The catchment area of West Flowing River basin in Maharashtra is 18062.29 sqkm. There are 44 Gauge discharge stations in this catchment. Following table shows 3 years discharges for GD stations on which discharge data is available in this catchment.

ALMAN, Tal. Wada, Dist. Thane, Area 647.51 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3	
2012	0.00	61.17	136.50	174.74	5.14	377.55	
2013	39.81	455.06	226.08	121.94	20.36	863.25	
2014	0.00	324.18	197.45	240.10	3.01	764.75	

ASGA, Tal: Lanja,Dist: Ratnagiri, Area 6.65 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3	
2012	0.56	8.63	5.85	5.38	3.50	23.91	
2013	3.95	14.53	3.29	1.97	1.67	25.40	
2014	0.21	9.74	7.08	4.34	1.41	22.79	

AW	AWALEGAON, Tal: Kudal, Dist: Sindhudurg, Area 67.32 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3		
2012	17.09	96.05	77.45	52.86	23.20	266.65		
2013	40.32	159.83	48.69	21.77	0.97	271.59		
2014	1.50	55.73	50.14	18.34	5.72	131.43		

	BHAVE, Tal: Deogad, Dist: Mahad, Area 45.62 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3			
2012		150.14	188.70			338.83			
2013	136.81	300.45	197.74	161.32	149.09	945.41			
2014	25.67	154.01	273.71	203.70	108.26	765.35			

BI	BIRWADI, Tal: Deogad, Dist: Sindhudurg, Area 338.80 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3		
2012	0.00	526.83	666.88	256.79	53.75	1504.25		
2013	432.86	1286.50	636.75	461.53	424.42	3242.06		
2014	63.79	1222.29	1861.39	815.79	343.97	4307.23		

	BURMALI, Tal. Sudhagad, Dist. Raigad, Area 61.74 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3		
2012	0.00	32.90	4.87	0.00	0.00	37.77		
2013	43.37	102.05	24.60	20.76	5.47	196.25		
2014	0.00	82.64	75.92	59.91	4.58	223.05		

	CHATAV, Tal. Khed, Dist. Ratnagiri, Area 116.09 sqkm							
Year June July August September October Man Mi								
2012	25.66	288.83	480.90	314.45	10.78	1120.61		
2013	244.64	720.14	364.06	88.54	117.47	1534.85		
2014	5.56	775.08	330.71	205.88	61.79	1379.02		

DUI	DUKANWADI, Tal. Kudal, Dist. Sindhudurga,Area 130.40 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3		
2012	22.18	175.05	188.44	109.50	49.01	544.18		
2013	49.91	319.37	156.32	59.04	57.78	642.41		
2014	1.18	128.08	115.62	88.91	39.47	373.25		

GADHI, Tal. Panvel, Dist. Raigad, Area 125.22 sqkm								
Year June July August September October Mans Mm								
2012	0.00	57.63	101.65	155.36	11.61	326.25		
2013	85.28	188.67	132.73	39.50	16.96	463.14		
2014	0.00	163.29	94.34	67.84	18.42	343.88		

GAHELI, Tal. Jawhar, Dist. Thane, Area 636.96 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3		
2012	0.00	104.22	134.38	137.81	12.56	388.98		
2013	0.00	0.00	0.00	0.00	0.00	0.00		
2014	0.13	444.85	242.86	298.91	22.94	1009.68		

GHONSARI (L), Tal. Kankavali, Dist. Sindhudurga, Area 48.29 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3	
2012	2.79	13.30	57.64	63.76	6.12	143.61	
2013	2.36	80.55	25.14	15.39	3.60	127.04	
2014	0.00	10.86	17.21	15.45	2.85	46.37	

HE	HET, Tal. Vaibhavwadi, Dist. Sindhugurga, Area 28.77 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3		
2012	8.86	55.53	45.90	44.33	24.99	179.61		
2013	17.84	100.57	66.43	39.84	20.26	244.95		
2014	0.01	62.90	55.01	45.23	12.65	175.79		

KAKEWADI, Tal. Rajapur, Dist. Ratnagiri, Area 13.95 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3	
2012	0.36	5.51	1.79	1.08	0.40	9.14	
2013	1.56	11.09	1.66	0.74	0.10	15.14	
2014	0.02	2.08	1.15	0.72	0.39	4.36	

	KALAMB, Tal. Karjat, Dist. Raigad,Area 110.85 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3			
2012	0.00	87.99	110.48	85.27	26.08	309.82			
2013	61.99	218.89	107.76	55.86	32.96	477.45			
2014	0.00	156.91	142.82	85.59	23.31	408.63			

KAMAN, Tal. Vasai, Dist. Thane, Area 12.44 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3		
2012	0.00	62.18	57.65	89.09	15.00	223.92		
2013	46.48	145.95	71.57	41.20	42.96	348.15		
2014	4.32	84.28	59.91	48.41	19.03	215.95		

	KANGULE, Tal. Poladpur, Dist. Raigad,Area 379.28 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3			
2012	0.00	270.25	542.88	172.97	90.71	1076.80			
2013	229.68	745.05	251.02	155.14	98.14	1479.02			
2014	22.01	525.95	388.48	254.35	79.24	1270.02			

KANPOLI, Tal. Panvel, Dist. Raigad, Area 31.35 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3		
2012	0.00	7.49	9.68	21.91	4.33	43.42		
2013	16.23	43.63	25.25	14.74	7.33	107.18		
2014	0.00	36.81	24.73	25.69	10.18	97.42		

KHAPARI, Tal. Murbad, Dist. Thane, Area 227.30 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3	
2012	0.00	188.19	281.98	202.78	87.10	760.05	
2013	119.32	753.07	539.89	108.38	95.49	1616.14	
2014	6.36	447.46	783.17	562.95	242.62	2042.56	

KOCHARA, Tal. Murbad, Dist. Thane, Area 203.76 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3		
2012	0.00	121.47	114.35	104.65	44.96	385.43		
2013	64.54	182.65	148.80	56.99	48.77	501.75		
2014	8.14	158.87	170.97	131.23	39.74	508.95		

KOKARE, Tal. Raigad, Dist. Mahad, Area 84.43 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3		
2012	0.00	49.91	39.56	28.57	4.92	122.97		
2013	32.21	163.34	41.24	10.83	9.49	257.12		
2014	0.87	73.47	51.02	26.45	9.16	160.97		

KOLHARE, Tal. Karjat, Dist. Raigad Area 306.04 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3		
2012	0.00	532.97	784.07	505.61	82.61	1905.25		
2013	120.05	786.30	450.94	293.50	78.78	1729.58		
2014	0.00	786.64	1049.44	304.09	77.62	2217.79		

KOTHURDE, Tal. Mahad, Dist. Raigad, Area 33.87 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3		
2012	0.00	52.31	67.58	39.90	11.52	171.32		
2013	29.89	96.83	29.70	11.69	9.46	177.56		
2014	1.18	60.13	35.64	22.89	6.91	126.74		

KUMBHARKHANI, Tal. Ratnagiri, Dist. Sangmeshvar, Area 143.53 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3		
2012	10.22	121.44	124.75	87.61	23.18	367.21		
2013	68.18	259.23	108.46	37.03	22.25	495.15		
2014	0.55	149.56	146.02	77.67	3.11	376.90		

MAHAN, Tal. Alibag, Dist. Raigad Area 29.96 sqkm							
Year June July August September October Mar Mi							
2012						0.00	
2013	33.29	140.93	34.71	22.87	15.58	247.38	
2014	3.43	84.85	93.37	78.92	21.00	281.57	

MIRVANE, Tal. Chiplun, Dist. Ratnagiri, Area 6.18 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3		
2012	2.83	13.24	10.83	6.77	2.04	35.71		
2013	10.98	22.82	9.65	5.31	4.74	53.50		
2014	1.53	17.32	10.31	8.32	1.58	39.06		

NALDHE, Tal. Karjat, Dist. Raigad Area 94.41 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3		
2012	0.00	62.16	106.95	56.13	9.39	234.64		
2013	0.00	0.00	0.00	0.00	0.00	0.00		
2014	0.00	94.64	91.58	38.91	6.11	231.24		

	PALI, Tal. Sudhagad, Dist. Raigad Area 308.82 sqkm								
Year June July August September October Total Mm									
2012						0.00			
2013	166.73	492.63	124.03	36.96	11.44	831.79			
2014	0.00	288.72	211.11	181.09	3.71	684.62			

PARALI, Tal. Wada, Dist. Thane, Area 136.06 sqkm								
Year June July August September October Tota Mn								
2012	0.00	145.10	221.68	185.08	50.44	602.31		
2013	72.18	392.32	191.58	144.27	55.81	856.15		
2014	0.17	306.73	189.38	187.17	21.72	705.15		

PASTEWADI, Tal. Sangmeshvar, Dist. Ratnagiri, Area 49.52 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3	
2012	6.32	54.57	41.38	33.08	13.70	149.05	
2013	22.97	82.41	31.09	11.97	8.96	157.40	
2014	1.04	50.65	31.15	24.29	3.22	110.35	

PAWARWADI, Tal. Lanja, Dist. Ratnagiri, Area 40.98 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3	
2012	10.54	50.22	37.84	25.72	17.77	142.09	
2013	26.51	92.25	38.43	25.37	13.39	195.96	
2014	0.98	68.47	49.22	34.43	12.26	165.37	

POYNAR, Tal. Khed, Dist. Ratnagiri, Area 30.77 sqkm								
Year June July August September October Mans Mm								
2012	6.62	33.78	34.22	17.13	7.58	99.33		
2013	32.35	69.58	20.02	5.58	13.72	141.25		
2014	0.21	82.71	33.89	45.56	6.48	168.85		

RAIPATAN, Tal. Rajapur, Dist. Ratnagiri , Area 91.08 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3	
2012	20.18	129.80	91.64	58.74	25.88	326.23	
2013	97.99	133.41	44.61	45.89	28.72	350.62	
2014	4.10	98.77	78.94	71.34	17.26	270.42	

SAIVAN, Tal. Vasai, Dist. Thane, Area 519.56 sqkm								
Year June July August September October Manso Manso								
2012	0.00	164.16	137.55	336.42	12.51	650.64		
2013	211.28	757.21	333.56	167.47	143.48	1613.00		
2014	1.47	465.12	394.94	205.66	2.45	1069.65		

SAJGAON, Tal. Khalapur, Dist. Raigad, Area 28.53 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3		
2012	0.00	52.60	75.09	89.20	50.55	267.44		
2013	131.03	191.41	107.84	65.42	24.66	520.36		
2014	0.00	132.78	105.89	111.44	49.36	399.47		

SALINDE, Tal. Pen, Dist. Raigad, Area 84.91 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3	
2012	0.00	0.00	0.00	0.00	0.00	0.00	
2013	38.55	162.08	29.09	27.18	10.72	267.63	
2014	0.00	98.03	85.40	54.91	4.30	242.64	

SANGULWADI, Tal. Vaibhavawadi, Dist. Sindhudurga, Area 50.28 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3		
2012	6.16	99.76	73.20	44.67	19.74	243.54		
2013	37.52	137.87	62.96	25.01	15.45	278.81		
2014	1.99	78.35	61.73	30.91	4.40	177.39		

SARAMBALA, Tal. Savantwadi, Dist. Sindhudurga Area 70.98 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3	
2012	29.08	105.87	128.03	77.91	44.25	385.13	
2013	62.68	213.29	111.43	53.58	39.73	480.71	
2014	16.01	131.55	139.25	86.92	44.82	418.55	

SHEMBAVANE, Tal. Rajapur, Dist. Ratnagiri, Area 15.97 sqkm								
Year	June	July	August	September	October	Manson Total in Mm3		
2012	10.96	10.17	12.59	10.84	6.91	51.48		
2013	12.66	59.57	7.79	6.15	6.46	92.63		
2014	3.93	23.74	10.15	11.74	6.54	56.09		

SHIRSHINGI, Tal. Savantwadi, Dist. Sindhudurga, Area 36.83 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3	
2012	2.61	58.10	73.19	25.38	4.25	163.53	
2013	12.20	94.66	43.25	15.54	10.36	176.01	
2014	1.30	71.86	39.75	17.81	1.01	131.73	

SHIVDAV, Tal. KAnkavali, Dist. Sindhudurga, Area 247.51 sqkm							
Year	June	July	August	September	October	Manson Total in Mm3	
2012	40.50	265.68	339.13	189.16	35.59	870.06	
2013	127.58	728.73	285.31	69.51	6.40	1217.53	
2014	0.00	340.73	375.15	116.87	0.76	833.51	

SUDKOLI, Tal. Roha, Dist. Raigad Area 37.42 sqkm						
Year	June	July	August	September	October	Manson Total in Mm3
2012	0.00	28.04	24.55	37.07	9.63	99.30
2013	19.16	54.55	20.51	19.23	14.00	127.46
2014	0.08	28.46	24.31	38.90	2.85	94.60

TURADE, Tal. Panvel, Dist. Raigad, Area 317.57 sqkm						
Year	June	July	August	September	October	Manson Total in Mm3
2012	0.00	154.97	181.21	183.97	20.00	540.15
2013	226.53	452.80	137.45	84.65	6.35	907.78
2014	0.00	409.15	155.55	108.92	7.46	681.08

V	VIRDI, Tal. Dodamarg, Dist. Sindhudurga Area 35.43 sqkm						
Year	June	July	August	September	October	Manson Total in Mm3	
2012	1.92	33.08	33.82	12.13	0.74	81.68	
2013	5.81	65.52	26.66	3.49	3.72	105.19	
2014	0.00	58.63	43.56	8.68	1.47	112.33	

WADI, Tal. Pen, Dist. Raigad, Area 138.26 sqkm						
Year	June	July	August	September	October	Manson Total in Mm3
2012	0.00	78.74	102.53	76.76	23.90	281.92
2013	82.05	182.02	57.39	27.81	2.76	352.02
2014	0.00	122.17	100.69	71.57	7.43	301.85

5. Interpretation Of Various Statistics presented in the Water Yearbook

Some important terms used in interpretation of various statistics are explained as follows:

5.1 Daily rainfall –Time frame of daily rainfall refers to:

All rainfall observations are made at 0830 hrs IST daily. The quantity of rainfall recorded at 0830 hrs is the rainfall of the preceding 24 hours ending at 0830 hrs of the observation day (Today's date). In other words, the rainfall of the day is the total rainfall collected in the rain gauge from 0830 hrs IST of previous day to 0830 hrs IST of the day and is recorded (entered) against today's date.

5.2 Mean Daily Runoff – The mean daily runoff is computed as follows:

To facilitate comparison between rainfall and runoff, it is usual practice to express values of rainfall and runoff in similar terms. Both may be expressed as a total volume over a specified period (in metre cube, thousand metre cube (TCM), or million metre cube (Mcum). Alternatively, discharge may be expressed as a depth in millimetres over the catchment.

Volume is simply the rate in metre cube /sec (Cumecs), multiplied by the duration of the specified period in seconds, i.e. for daily volumes in cubic metres with respect to daily mean flow *Qd* in cumecs following equation may be used:

Vd $(m^3) = (24 \times 60 \times 60 \text{ seconds}) \text{ Qd}(\text{cumecs}) = 86400 \text{ Qd} (m^3)$

Runoff depth (Rd) is the volume expressed as depth over the specified catchment area with a constant to convert units to millimeters; i.e. for daily runoff:

$$Rd(mm) = Vd(m^{3})*10^{3}$$

$$= Vd(m^{3})*10^{6}$$

$$= Vd(m^{3})$$

$$= Vd(m^{3})$$

$$= 86.4Qd (Cumecs)$$

$$= 86.4Qd (Cumecs)$$

$$= area(km^{2})$$

6. Water Quality Monitoring In Maharashtra

6.1 Introduction

The Water Quality Monitoring is carried out by various agencies in the Maharashtra State viz Central Water Commission (SW), Central Pollution Control Board, Groundwater Surveys & Development Agency (GW), Hydrology Project (SW), Maharashtra Pollution Control Board, Central Ground Water Board (GW), Directorate of Irrigation Research & Development (DIRD). Hydrology Project takes care of surface water quality through sampling stations spread over the State throughout the year. DIRD monitors dug wells in the command area of major and medium Irrigation Projects. Ground Water Surveys & Development Agency also monitors the dug wells as well as ground water levels of the State intermittently.

Sr. No.	Monitoring Agency	Water Quality Monitoring Sites
(A)	State	
1.	Water Resources Department, Hydrology Project (SW)	127
2.	Groundwater Surveys & Development Agency (GW)	1871
(B)	Central	
3.	Central Pollution Control Board (CPCB) (SW) through Maharashtra Pollution Control Board (MPCB)	48
4.	Central Water Commission (SW)	12
5.	Central Pollution Control Board (CPCB) (GW) through Maharashtra Pollution Control Board (MPCB)	25
6.	Central Ground Water Board (CGWB, NHNS) (GW)	803
	Total no. of stations for surface water	187
	Total no. of stations for ground water	2699

Table 6.1 Agency wise Water Quality Monitoring Details:

6.2 Hydrology Project and HIS

Hydrology Project (SW) aims at establishing a Hydrological Information System (HIS) in the state and the HIS includes Water Quality Monitoring of Surface Water. The basic objectives for WQ Monitoring are:

- a) Monitoring for establishing baseline water quality.
- b) Observing trend in water quality changes.
c) Calculating flux of water constituents of interest.

d) Control and management of water pollution.

Distribution of 127 WQ sampling locations is done amongst 5 Level-II laboratories located at different places i.e. Pune-25, Nashik-25, Nagpur-25, Aurangabad-20, and Kolhapur-32.

Table 6.2 The WQ Sampling location category & frequency of samplingdesigned for SW, Maharashtra:-

WQ Sampling Location Category	Sampling Frequency upto first 3 years	After 3 years monitoring
Baseline - 50 no.	Monthly One Sample	Break for 3 years
Trend - 65 no.	Fortnightly One Sample	After classification as 'Trend' monthly one sample
Flux - 09 no.	Fortnightly One Sample	After classification as 'Flux' fortnightly one sample
Trend / Flux – 03 no.	Fortnightly One Sample	After classification as 'Trend/Flux' fortnightly one sample.

Statement showing Frequency of Sampling & Parameters to be analyzed

Station	Sampling Frequency	Test Parameters	Remark
Baseline	Once in a month first 3 years	30 parameters for 1st sample 20 Parameters for remaining Sample	After 3 years monitoring break for 3 years
Baseline after 3 years break and classification as baseline stations	Once in 2 months	30 parameters for 1st sample 20 Parameters for remaining Sample	One year monitoring again break for 3 years.
Trend	Twice a month	do	Initially 3 year monitoring
Trend (after classification as trend)	Once in a month	do	Continuous monitoring
Flux	Twice a month	do	Initially 3 year monitoring
Flux (after classification as Flux)	Twice a month	do	Continuous monitoring with flow measurements
Reservoir and lakes (treated as Trend)	Twice a month	32 parameters for 1st samples.	Continuous monitoring

22 parameters for	
remaining sample	

Note: - The parameters to be analyzed as mentioned above are minimal requirement. This is not however restricted. Additional parameters shall be analyzed as per the requirement or on the basis of geographical location of stations or certain circumstances.

List of Parameters

Sr. No.	Parameter 32	Parameter 30	Parameter 22	Parameter 20
1	Colour	Colour	Colour	Colour
2	Odour	Odour	Odour	Odour
3	Temperature	Temperature	Temperature	Temperature
4	рН	рН	рН	рН
5	Electric Conductivity	Electric Conductivity	Electric Conductivity	Electric Conductivity
6	Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen
7	Turbidity	Turbidity	Total Solids	Total Solids
8	Total Solids	Total Solids	Dissolved Solids	Dissolved Solids
9	Dissolved Solids	Dissolved Solids	NO2	NO2
10	Suspended Solids	Suspended Solids	NO3	NO3
11	NH3-N	NH3-N	B.O.D.	B.O.D.
12	NO2	NO2	C.O.D.	C.O.D.
13	NO3	NO3	D3 Total Coliforms	
14	Total Phosphorous	Total Phosphorous	Faecal Coliforms	Faecal Coliforms
15	B.O.D.	B.O.D.	Turbidity	Turbidity
16	C.O.D.	C.O.D.	NH3-N	NH3-N
17	Potassium K+	Potassium K+	Total Phosphorous	Total Phosphorous
18	Sodium (Na)	Sodium (Na)	Chloride (Cl)	Chloride (Cl)
19	Calcium (Ca)	Calcium (Ca)	Alkalinity	Alkalinity
20	Magnesium	Magnesium	Sodium	Sodium
21	Carbonate (CO3)	Carbonate (CO3)	Total Kjeldhal Nitrogen	
22	Bi-Carbonate (H CO3)	Bi-Carbonate (H CO3)	Chlorophyll	
23	Chloride (Cl)	Chloride (Cl)		
24	Sulphate (SO4)	Sulphate (SO4)		
	Fluoride	Fluoride		

25			
26	Boron	Boron	
27	Total Coliforms	Total Coliforms	
28	Faecal Coliforms	Faecal Coliforms	
29	Alkalinity	Alkalinity	
30	Total hardness	Total hardness	
31	Total Kjeldhal Nitrogen		
32	Chlorophyll		

It is also decided to monitor water quality testing of reservoirs, lakes considering separate issue & frequency of sampling for such locations are considered twice in a month continuously & parameters are to be analyzed 32 for the first sample in the water year (June to May) and 30 parameters for rest of the samples.

7. Data Dissemination

7.1 Introduction

In the set up of the Hydrological Information System, the first question to be addressed is the type of information to be provided. This determines the layout of the observation network (parameters, network density, observation frequency, equipment, etc.) and the data available in the databases. The type of information to be provided requires an analysis of the potential hydrological data users. The Central and State Government agencies, which support the Hydrological Information System, are the major users of the generated information. There are sources of other governmental, non-governmental and private agencies also, which make good use of this information. It is obvious that the hydrological data needs of the users also change over time. Therefore, it is very important to identify the potential data users and regularly analyse their data needs. Normally, it is expected that the hydrological information service agencies satisfy most of the genuine data needs of the potential users in particular and society at large. For ensuring an optimal use of the public resources spent for maintaining such a Hydrological Information Service, it is therefore very essential to have a proper balance between the data needs of various users and mandate of various services supporting the hydrological information system. To ensure that the HIS output remains at all times 'demand driven' each state/agency has to constitute a Hydrological Data Users Group (HDUG). These HDUGs must represent all potential users within the State or intended to be covered by an agency.

Hydrological Data Users Group is a State or National Level Representative Group of current & potential large scale and repeat users of HIS data who have a stake in water resources utilization, assessment & management.

Purpose

- 1) To provide a common platform for discussion between hydrology data users & data provider.
- To create awareness amongst users about Hydrological Information System (HIS) data & educate them.
- 3) To understand, analyze & update information on the changing needs of data users.
- 4) To review & recommend addition /deletion in the data collection networks related to HIS, if appropriate.

Sr. No.	Data Type	No. of stations	Data Availability
1	Rainfall	506	Since 1976
2	River gauge	210	Since 1980
3	Climatic	67	Since 1980
4	Water Quality	127	Since 1999

Table 7.1 The extent of data availability

7.2 The user can request for the data as below

The HDUG member can request the data by filling the request form.

(Please see Annexure-B). Data is made available online/offline through any available media such as E-mail, Floppy, CD, Tape or hard copy against payment for the required data. Catalogue services are being lunched on central NIC server, shortly and will be available on Internet.

The registration form may be downloaded from our website

http://www.mahahp.gov.in

7.3 The pricing of data:

- 1 ARG Data..... Rs.225 /Station/Year
- 2 SRG Data..... Rs.225 /Station/Year
- 3 FCS Data..... Rs.225 /Station/parameter/Year
- 4 GD Data..... Rs.600 /Station/Year
- 5 Sedimentation Data.....
- 6 W.Q.Data
- Rs.600 /Station/Year
 - Rs.240 /Station/ parameter/Year

Discounts: -

- 1 For Research or Academic purpose, 25 % of above sanctioned rates will be charged.
- 2 Individual students having no grants for research from any source, data will be supplied free of cost.
- 3 For individual farmers, 50 % of above sanctioned rates will be charged.
- 4 For Private organisations, double of the above sanctioned rates will be charged as the data is used for commercial purpose.

7.4 The members of HDUG can be

- 1 Government Institutions.
- 2 Voluntary Non Government Organizations.
- 3 Universities, Educational & Research Institutions
- 4 Associations Farmers, Water users, Industrial
- 5 Individuals engaged in Operational Research & Development
- 6 All Professional Bodies
- 7 Consulting Representatives

7.5 Various Data Users:

Data Disseminated by this office is utilized by different categories as shown in the table below. Maximum data is utilized for educational research purpose. Many students from renowned colleges/institutes have utilized this data for their M.Tech, Ph. D degrees such as students from UNESCO-IHE Delft- Netherlands, IIT Mumbai, IIT Rurkee, IIT Kharagpur, different NIT's , College of Engineering Pune, Government college of Aurangabad, VJTI Mumbai, National Institute of Oceanography Mumbai, Nowrosjee Wadia College Pune, SP College Mumbai, VIT Pune, TERI University, , Indian Agricultural Research Institute New Delhi etc. These users have also submitted their project reports to this office as an acknowledgement of usage of data. Few references for the same are

- 1) Hydrologic modeling of runoff & sediment yield.
- 2) Rainfall runoff modeling using ANN.
- 3) Soil erosion modeling of agriculture watershed using GIS.
- 4) Study of estimating evaporation.
- 5) Silt load assessment & watershed management.
- 6) Watershed modeling using remote sensing & GIS.
- 7) Surface water quality analysis.
- 8) Spatiotemporal analysis of the effects of forest covers on water yield in the western ghats of peninsular India.
- 9) Multivariate Flood Frequency analysis using copulas.
- 10) Risk assessment of hydro climatic variability on ground water levels in Manjara basin aquifers using Archimedean copulas.

Data provided to the offices under Government category is utilized for the work of SWIP (Surface Water Integrated Plan for different basins of Maharashtra), Design of water resources structures (such as dams, barrages, KT Weir, Bridges etc.) Preparation of Master Plan, Hydro Power Potential, Irrigation Management, Water Quality etc.

		Cost of Data	Revenue
Sr No.	Category	Disseminated	generated
		(in Lakhs of Rs.)	(in Lakhs of Rs.)
1	Educational	111.95	1.36
2	Farmers	0.02	0.01
3	Government	16.6	9.26
4	NGO	0.62	0.62
5	Private	4.72	4.72
6	Semi-Government	0.07	0.07
	Total	133.98	16.04

Table 7.2 Revenue	generated fo	r period 2012	2 to 2014

Annexure : A

Date: / / 200

Ref: No. :

DATA REQUEST FORM

The Superintending Engineer, Data Analysis Circle, Hydrology Project (SW) Nashik- 422 004

Sub: Data Request Form

Sir,

The DRF is submitted herewith for the following data.

						Per	iod	
							From	То
1								
2								
3								
4								
5								
6								
Name:					Organization			
Phone Number: Email:								
Posta	al Address:							
Medi	a for Disseminat	tion *	Flo	oppy / Hard Copy / (CD / DAT Cartrido	je		
Form	at for Dissemina	ation *	MS	S Access / MS Ex	cel / CSV			
Purp	ose of Data *	 Academic / Research / Design of Water Resource Structures / Design of Roads, Rail, Bridges etc / Navigational Purpose / Hydro Power Potential / Irrigation Management / Sedimentation / Water Quality / Other (Specify) 					gn of ntial /	
Communication method for password of protected file. *			Tel	ephone / E-Mail / F	Post			

* Tick $\sqrt{Whichever}$ is applicable

Terms and Conditions:

I / We agreed hereby to abide by the following conditions in respect of the data requested:

- 1. The data will be used strictly for the said purpose for which the data has been asked for.
- 2. The data will not be supplied to any governmental/non-governmental or public sector undertaking without the prior concurrence/fresh permission from the owner agency.
- 3. The data will not be published in any form without the prior permission of the owner agency.
- 4. The data shall not be used for commercial purpose.
- 5. The data will not be put on Internet or NIC Net.
- 6. Any inference drawn based on these data will be the sole responsibility of the Users and the Owner agency will not be responsible for any kind of loss or damage in any form occurring due to the use of data.

Please send the Demand note of data pricing at the above address by Post / Email.

		Signature Name
For Office Use: HDUG Reg. No	Joining Date:	Category:

Annexure : B



Sample Daily Rainfall for Year 2014

	ANANTWADI	LOWERPUS	UPPERPUS
	MPS	MPS	MPS
01/08/2014	4.2	1	7
02/08/2014	0	2	0
03/08/2014	0	0	0
04/08/2014	0	0	0
05/08/2014	55	26	22
06/08/2014	25	4	9
07/08/2014	12.5	2	0
08/08/2014	0	0	0
09/08/2014	0	0	0
10/08/2014	0	0	0
11/08/2014	0	0	0
12/08/2014	0	0	0
13/08/2014	0	0	0
14/08/2014	0	0	0
15/08/2014	0	0	0
16/08/2014	0	0	0
17/08/2014	0	0	0
18/08/2014	0	0	0
19/08/2014	0	0	0
20/08/2014	0	0	8
21/08/2014	0	0	0
22/08/2014	32	0	0
23/08/2014	3.2	0	13
24/08/2014	0	2	0
25/08/2014	12.5	2	27
26/08/2014	55	11	10
27/08/2014	0	0	38
28/08/2014	28	23	10
29/08/2014	2	0	2
30/08/2014	42.5	27	4

Annexure C

Sample Twice Daily Climatic Data, Sept 2009

Station C	ode	: Bo	ri	i Station Name : Bori							
Local rive	ər	: D	ina				Sub	-Division	: SDDP	C, Chadrapur	
Day Hour	Min Temp	Max Temp	Temp dry Bulb	Temp wet Bulb	Relative Humidity	Inst Wind Speed	Av Wind Speed	Wind direction	Rainfall	Pan Evaporation	Temp - Pan water
1 08:30	23.50	31.00	29.00	27.00	85.00	2.00	0.62	SSW	1.40	0.00	28.00
117:30	24.00	32.00	27.00	25.00	84.00	0.00	1.98	NE	2.60	0.10	27.00
2 08:30	23.00	28.50	27.00	26.00	92.00	0.00	1.12	SE	0.40	0.00	26.00
217:30	24.00	31.50	29.00	27.00	85.00	2.00	1.41	SE	0.60	0.00	28.00
3 08:30	22.00	29.00	27.00	26.00	92.00	0.00	0.85	SW	26.80	0.50	25.00
317:30	23.50	31.50	30.00	28.00	85.00	0.00	1.65	SSW	0.00	1.00	29.00
4 08:30	22.00	28.50	26.00	24.00	84.00	0.00	0.44	SSW	3.60	0.10	25.00
417:30	23.50	26.50	25.00	22.00	76.00	0.00	0.77	SW	2.00	0.10	24.00
508:30	22.00	25.50	24.00	23.00	91.00	2.00	1.84	SSW	15.60	0.30	23.00
517:30	23.00	26.00	24.00	22.00	83.00	4.00	3.46	NW	7.60	0.30	24.00
6 08:30	22.50	26.00	25.00	24.00	92.00	4.00	3.21	SW	0.80	0.00	25.00
617:30	25.00	31.00	30.00	28.00	85.00	2.00	5.12	SSW	2.60	0.10	29.00
708:30	23.00	29.00	27.00	26.00	92.00	2.00	0.73	SW	0.00	0.00	26.00
/1/:30	25.50	32.00	30.00	27.00	78.00	0.00	2.46	NNE	0.00	1.00	29.00
808:30	23.50	30.50	29.00	28.00	92.00	0.00	0.28	NINW	1.20	0.00	27.00
0.00.20	22.50	20 50	20.00	20.00	05.00	0.00	0.00	INW C CW	0.00	1.00	29.00
908:30	25.50	22 50	29.00	27.00	67.00	4.00	2 45	Sam	0.00	2.00	20.00
10,00.20	23.30	22 00	20.00	27.00	07.00	4.00	1 66	SW CCW	0.00	2.00	28 00
1017.20	24.00	22.00	29.00	20.00	92.00	2.00	2 76	Sam	0.00	2.00	20.00
11 08.30	23.50	29 50	27 00	26.00	92 00	2.00	0.22	WC 722	3.00	0.10	29.00
11 17.30	24 50	31 50	30.00	27.00	78 00	0.00	0.54	SM	0.00	2 50	29.00
12 08 • 30	24 00	30 50	28 00	26.00	85.00	0.00	0.12	SSE	0.00	1 50	27.00
1217:30	24.50	31.00	29.00	26.00	78.00	0.00	2.93	NW	3.40	0.10	28.00
13 08:30	24.00	30.50	27.00	26.00	92.00	0.00	0.74	NNW	0.00	0.00	26.00
1317:30	25.00	32.00	30.00	27.00	78.00	2.00	2.60	SE	0.00	3.00	29.00
1408:30	24.50	30.00	28.00	27.00	92.00	2.00	2.98	NNE	0.00	2.00	27.00
1417:30	25.50	32.50	30.00	28.00	85.00	0.00	3.71	NE	0.00	2.50	29.00
15 08:30	25.00	31.50	30.00	29.00	93.00	0.00	2.07	NW	2.60	0.10	28.00
1517:30	23.50	31.00	29.00	27.00	85.00	2.00	3.05	SE	0.20	2.00	28.00
16 08:30	22.00	29.00	26.00	25.00	92.00	0.00	0.84	NNW	3.40	0.20	26.00
1617:30	21.50	27.50	25.00	23.00	84.00	6.00	2.31	NE	30.00	0.90	25.00
1708:30	21.00	26.50	24.00	23.00	91.00	0.00	1.23	SSE	0.30	0.30	24.00
1717:30	25.00	31.00	29.00	27.00	85.00	4.00	5.35	SE	3.00	3.00	28.00
18 08:30	24.00	30.00	28.00	27.00	92.00	0.00	0.04	NE	2.00	2.00	27.00
1817:30	25.50	33.50	32.00	30.00	86.00	2.00	2.68	NNE	3.50	3.50	31.00
1908:30	24.50	31.00	30.00	29.00	93.00	0.00	0.05	NE	2.00	2.00	30.00
1917:30	28.00	34.00	32.00	30.00	86.00	0.00	0.41	NNW	4.00	4.00	31.00
20 08:30	24.50	31.00	29.00	28.00	92.00	0.00	0.48	SSW	2.50	2.50	29.00
2017:30	26.00	34.00	30.00	27.00	78.00	0.00	2.30	NE	3.50	3.50	3.00
21 08:30	24.00	31.00	29.00	27.00	85.00	2.00	0.16	SSE	2.50	2.50	28.00
2117:30	26.00	34.50	32.00	29.00	79.00	0.00	3.63	SSE	4.00	4.00	31.00

	00.00	01 00		05 00	0.4 0.0		0 00	0.00		0.70	0.70	05 00
22	08:30	21.00	29.00	25.00	24.00	92.00	0.00	0.82	SSW	0.70	0.70	25.00
22	17:30	22.00	29.50	28.00	26.00	85.00	0.00	1.10	SSE	1.00	1.00	27.00
23	08:30	22.00	27.50	26.00	24.00	84.00	0.00	0.10	SE	0.00	0.00	26.00
23	17:30	23.50	31.50	30.00	27.00	78.00	0.00	0.64	NNE	3.00	3.00	29.00
24	08:30	23.00	29.50	28.00	27.00	92.00	2.00	0.33	SW	1.00	1.00	27.00
24	17:30	26.00	34.00	32.00	30.00	86.00	0.00	2.35	NNE	4.00	4.00	31.00
25	08:30	23.50	30.50	28.00	26.00	85.00	0.00	0.04	NNW	1.50	1.50	27.00
25	17 : 30	25.00	33.00	29.00	26.00	78.00	2.00	0.88	NE	2.50	2.50	28.00
26	08:30	23.00	31.00	27.00	26.00	92.00	0.00	0.86	SW	2.00	2.00	27.00
26	17:30	25.50	33.50	32.00	30.00	86.00	0.00	0.60	SSW	3.50	3.50	31.00
27	08:30	23.00	31.50	27.00	25.00	84.00	0.00	0.50	NNE	2.00	2.00	27.00
27	17:30	23.00	31.50	30.00	27.00	78.00	4.00	1.56	NE	0.20	0.20	29.00
28	08:30	21.00	30.00	25.00	24.00	92.00	0.00	0.55	NNW	0.70	0.70	24.00
28	17 : 30	22.50	30.50	29.00	27.00	85.00	2.00	4.16	NW	1.00	1.00	29.00
29	08:30	21.00	27.50	25.00	23.00	84.00	4.00	3.97	NW	0.40	0.40	25.00
29	17:30	23.50	31.00	30.00	27.00	78.00	2.00	4.07	NW	2.00	2.00	29.00
30	08:30	23.00	29.00	27.00	26.00	92.00	0.00	1.14	NE	0.20	0.20	27.00
30	17:30	22.50	28.50	26.00	24.00	84.00	0.00	2.54	SW	0.50	0.50	25.00
31	08:30	22.00	27.00	25.00	24.00	92.00	2.00	0.93	SW	0.40	0.40	24.00
31	17:30	22.00	28.50	26.00	24.00	84.00	0.00	2.26	NW	0.20	0.20	25.00

Note : Rainfall at 08:30 hrs is pertaining to previous day





Pan Evaporation at 08:30:00 hrs 📕 Pan Evaporation at 17:30:00 hrs

Plot of Twice Daily Wind Direction at Bori (Bori): August, 2014



🗕 Humber of Observations 米 Average Velocity





🛨 Max Temperature 🛨 Min temperature