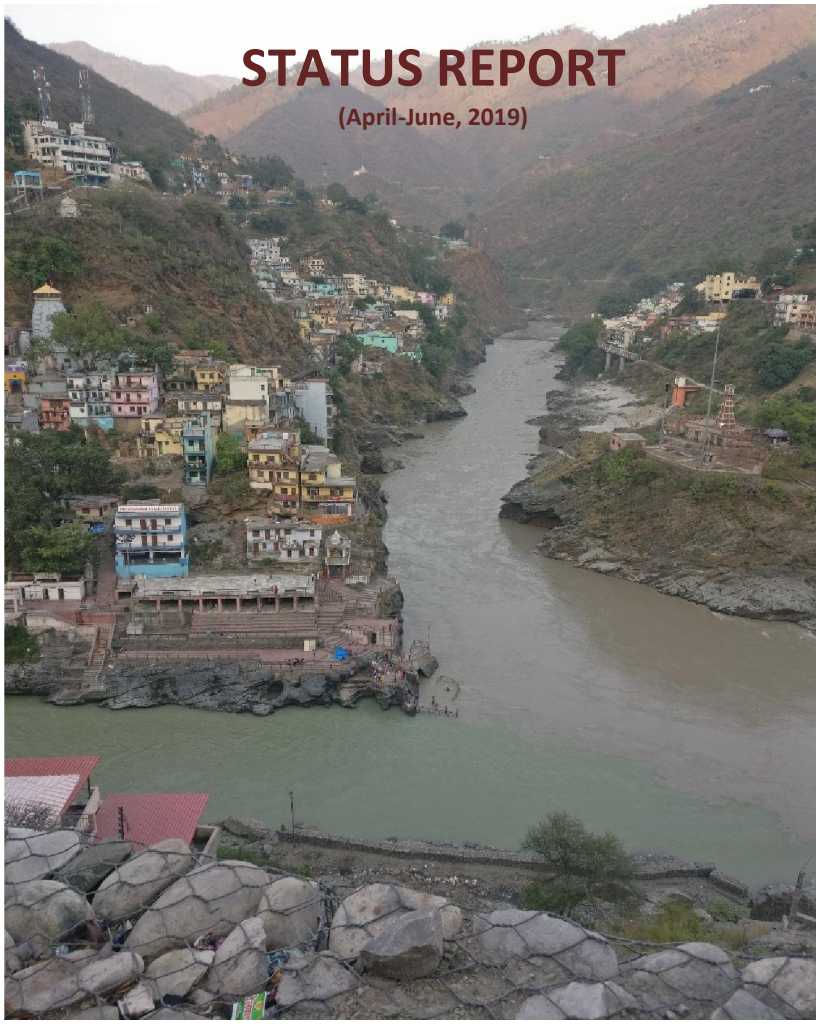
No. CWC/UGBO/EF/SR 2

सत्यमेव जयते

DoWR,RD&GR
Central Water Commission
Upper Ganga Basin Organization

IMPLEMENTATION OF MINIMUM ENVIREMENTAL FLOWS IN RIVER GANGA (Upto UNNAO)



July, 2019

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EXECUTIVE SUMMARY

Vide Gazette Notification dated 9th October, 2018, the Government of India has notified the minimum environmental flows for River Ganga that has to be maintained at various locations on the river. The order applies to the upper Ganga River Basin starting from originating glaciers and through respective confluences of its head tributaries finally meeting at Devprayag up to Haridwar and the main stem of River Ganga up to Unnao district of Uttar Pradesh. CWC has been entrusted the responsibility of monitoring the compliance by project authorities on maintenance of desired E-flows. Monitoring of E-flows is being carried by UGBO, CWC since 1st January, 2019. The current monitoring status report covers the compliance on e-flows during 2ndquarter i.e. from April-June, 2019.

Most of the projects provided the flow data in desired format regularly except Tehri, Bhimgoda barrage and Kanpur barrage. The data from Tehri and Bhimgoda projects are being received regularly but on daily basis instead of hourly basis. The data is transmitted to CWC manually through e-mail. The project authorities have been requested for installation of automatic data acquisition and transmission system at the earliest.

Based on the data supplied by project authorities, the following **three** projects are not meeting the mandated E-flow requirements for most of the period:

- **Maneri Bhali Phase 2**
- **Vishnuprayag HEP**
- **Srinagar HEP**

Maneri Bhali Phase 1 and Pashulok Barrage are in partial compliance i.e. on some occasions, the outflows were below the mandated e-flow requirement.

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1.0 BACKGROUND

Ecological needs of the river have been recognized as one of the uses of water in the National Water Policy (2012). In the Preamble of the policy, it is mentioned that '*water is essential for sustenance of eco-system, and therefore, minimum ecological needs should be given due consideration'*. Clause 3.3 specifies that "*A portion of river flows should be kept aside to meet ecological needs ensuring that the low and high releases are proportional to the natural flow regime, including base flow contribution in the low flow season through regulated ground water uses*".

Vide Gazette Notification dated 9th October, 2018, the Government of India has notified the minimum environmental flows for River Ganga that has to be maintained at various locations on the river. Environmental flows are the acceptable flow regimes that are required to maintain a river in the desired environmental state or predetermined state. The maintenance of minimum e-flow in the river would not only ensure sustenance of aquatic life but also go a long way in ensuring its *Aviralta* or continuous flow in the river. It will ensure that the river has at least the minimum required environmental flow of water even after the river flow gets diverted by projects and structures for purposes like irrigation, hydropower, domestic and industrial use etc.

The above order will apply to the upper Ganga River Basin starting from originating glaciers and through respective confluences of its head tributaries finally meeting at Devprayag up to Haridwar and the main stem of River Ganga up to Unnao district of Uttar Pradesh. The compliance of minimum environmental flow is applicable to all existing, under-construction and future projects. The existing projects which currently do not meet the norms will have to ensure that the desired environmental flow norms are complied with within a period of three years. The mini and micro projects which do not alter the flow characteristics of the river or stream significantly are exempted from these environmental flows.

The flow conditions in these river reaches shall be monitored at hourly intervals from time to time. The Central Water Commission has been entrusted the responsibility for supervision, monitoring, regulation of flows and reporting of necessary information to the appropriate

authority as and when required and also take emergent decisions about the water storage norms in case of any emergency.

The concerned project developers or authorities will have to install automatic data acquisition and data transmission facilities at appropriate locations at project sites within six months. The Central Government through National Mission for Clean Ganga may direct release of additional water in the River Ganga to meet special demand as and when required.

2.0 GANGA PHYSIOGRAPHY

The Ganga river basin is the largest river basin in India in terms of catchment area, constituting 26% of the country's land mass (861,404 sq. km) and supporting about half a billionpopulations. The drainage area of the basin lies in 9states covering Uttarakhand, Uttar Pradesh, Madhya Pradesh, Bihar, Rajasthan, West Bengal, Haryana, Himachal Pradesh and the Union Territory of Delhi. It traverses a course of 2525 km before flowing into the Bay of Bengal. It has a large number of tributaries joining it during this journey.The main physical sub-divisions are the Northern Mountains, the Gangetic Plains and the Central Highlands. Northern Mountains comprises the Himalayan ranges including their foot hills. The Gangetic plains, situated between the Himalayas and the Deccan plateau and covering most of the basin, are ideally suited for intensive cultivation. The culturable area of Ganga basin is about 57.96 M. ha which is about 29.5% of the total culturable area of the country.

In the monitoring reach of river Ganga upto Unnao, there are many manmade interventions utilizing the water for various developmental needs such as drinking water, irrigation, hydro power etc. These projects impact thenatural flows in the river. In upper Ganga basin upto Hardwar, there are a number hydro-electric projects. The most of the projects are run-of-the river (ROR) projectsexcept Tehri being a major storage project having gross storage of 3.54 BCM, live storage 2.615 BCM.At Haridwar, Ganga opens to the Gangetic Plains, where Bhimgoda barrage diverts a large quantity of its waters into the Upper Ganga Canal and Eastern Ganga Canal, to provide water for irrigation and other consumptive uses. Further, about 76 km downstream of Haridwar, at Bijnore, another barrage diverts water into the Madhya Ganga Canal but only during monsoon months. At Narora, there is further diversion of water into the Lower Ganga Canal from Narora barrage, about 155 km downstream of Bijnor barrage. From

the barrage at Kanpur, Ganga water is being diverted to meet the drinking water requirements of Kanpur town.

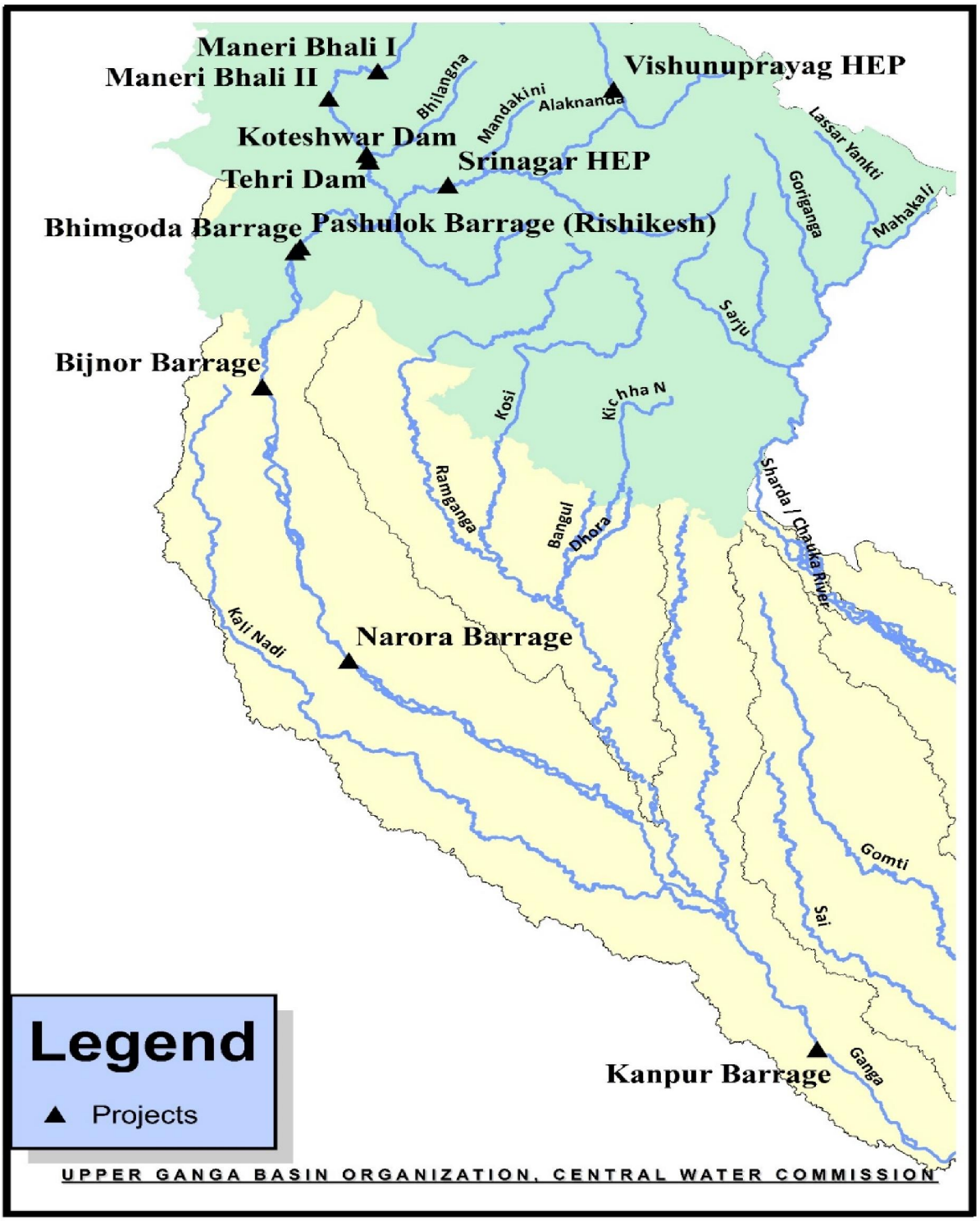

Figure 1. Map Showing key Projects in Ganga Basin Upto Unnao

3.0 MINIMUM E-FLOWS NORMS

The e-flows notified by the Government of IndiaVide Gazette Notification dated 9th October, 2018 are as follows:

3.1 Upper Ganga River Basin Stretch starting from originating glaciers and through respective confluences finally meeting at Devprayag up to Haridwar:

Table 1- E-flow Norms for Projects in Upper Ganga Basin upto Haridwar

Sl No	Season	Months	(%) Percentage ofMonthly Average Flow observedduring each ofpreceding 10-dailyperiod
1	Dry	November to March	20
2	Lean	October, April and May	25
3	High Flow	June to September	30*#

*# 30% of monthly flow of High flow season.

3.2 Stretch of main stem of River Ganga from Haridwar, Uttarakhand to Unnao, Uttar Pradesh

Table 2- E-flow Norms for Projects in Main Ganga Stem from Haridwar to Unnao

Sl. No.	Location of Barrage	Minimum flow releases immediately downstream of barrages ***(In Cumecs)*** **Non-Monsoon (October to May)**	Minimum flowreleases immediately downstream ofbarrages ***(In Cumecs)*** **Monsoon (June to September)**
1	Bhimgoda (Haridwar)	36	57
2	Bijnor	24	48
3	Narora	24	48
4	Kanpur	24	48

The copy of the Gazette Notification dated 9th October, 2018 is enclosed at **Annex-I**

4.0 PROJECTS UNDER MONITORING

In upper Ganga river basin upto Hardwar, rivervalley projects are largely non-consumptive and are mainly used for hydro power generation. Few minor projects are also being used for

irrigation and drinking water purposes. The list of existing, ongoing and contemplated projects is enclosed at **Annex-II.** From Hardwar onwards beginning with Bhimgoda Barrage, projects are being used for water diversion for irrigation and domestic uses.

The key projects in Ganga upto Unnao are listed below:

Table 3: Key projects on River Ganga up to Unnao

SN	Name of Project	River/Tributary	Place/State	Status
Projects on Alaknanda and its tributaries				
1.	Vishnuprayag HEP (400 MW)	Alaknanda	Joshimath/Uttarakhand	
2.	PeepalKoti HEP (444 MW)	Alaknanda	PeepalKoti/Uttarakhand	Under construction
3.	Srinagar HEP (330 MW)	Alaknanda	Srinagar/Uttarakhand	
4.	TapovanVishnuprayag HEP (520 MW)	Dhawli Ganga	Uttarakhand	Under construction
5.	Kund HEP	Mandakini	Uttarakhand	Mini HEP
Projects on Bhagirathi and its tributaries				
1.	ManeriBhali Phase-I HEP (90 MW)	Bhagirathi	Uttarakhand	
2.	ManeriBhali Phase-I HEP (304 MW)	Bhagirathi	Uttarakhand	
3.	Tehri HEP (1000 MW)	Bhagirathi	Uttarakhand	
4.	Koteshwar HEP (400 MW)	Bhagirathi	Uttarakhand	
5.	Ghansali HEP (23 MW)	Bhilangana	Uttarakhand	Mini HEP
6.	Rech HEP (8 MW)	Bhilangana	Uttarakhand	Mini HEP
7.	Buda Kedar HEP (5 MW)	Bal Ganga	Uttarakhand	Mini HEP
Projects on Ganga Main Stream				
1.	Pashulok Barrage, Rishikesh (Chilla HEP, 143 MW)	Ganga	Uttarakhand	
2.	Bhimgoda Barrage (Irrigation)	Ganga	Uttarakhand	SCADA system installed
3.	Madhya Ganga Barrage (Chaudhary Charan Singh Barrage) (Irrigation)	Ganga	Uttar Pradesh	
4.	Narora Barrage (Irrigation& Industrial)	Ganga	Uttar Pradesh	SCADA system installed
5.	Kanpur Barrage (Drinking Water)	Ganga	Uttar Pradesh	

Considering the extent of modifications of flows by the projects, following projects are being monitored presently for implementation of E-flows w.e.f. 1st January, 2019.

Table 4: List of Projects being monitored presently

Sl. No.	Name of the Project	Agency
1.	ManeriBhali Stage-I	UJVNL
2.	ManeriBhali Stage –II	UJVNL
3.	Tehri Dam	THDC
4.	Koteshwar Dam	THDC
5.	Vishnuprayag HEP	JPVL
6.	Srinagar	GVK
7.	Pashulok Barrage/ Chilla HEP	UJVNL
8.	Bhimgoda Barrage	UP Irrigation&WRD
9.	Bijnor Barrage	UP Irrigation&WRD
10	Narora Barrage	UP Irrigation&WRD
11	Kanpur Barrage	UP Irrigation& WRD

Salient features of the above projects are enclosed at **Annex-III.**

5.0 DATA COLLECTION NETWORK AND TRANSMISSION STATUS

Status of data collection network and transmissionsystem at above projects is as under:

Sl. No.	Name of the Project	Agency	Data Collection Network	Data Transmission system
1.	ManeriBhali Stage-I	UJVNL	Manual	Through email
2.	ManeriBhali Stage –II	UJVNL	Manual	Through email
3.	Tehri Dam	THDC	Automatic sensors	Through email/SMS
4.	Koteshwar Dam	THDC	Automatic sensors	Through email/SMS
5.	Vishnuprayag HEP	JPVL	Manual	Through email
6.	Pashulok Barrage/ Chilla HEP	UJVNL	Manual	Through email
7.	Bijnor Barrage	UP. Irrigation	Manual	Through email
8.	Srinagar	GVK	Manual	Through email
9.	Bhimgoda Barrage	UP. Irrigation	Automatic sensors	Through email. Also,the data is available in public domain
10	Narora Barrage	UP Irrigation	Automatic sensors	Through email Also, the data is also available in public domain
11	Kanpur Barrage	UP Irrigation	Manual	Through email

5.1 Data Transmission Status

The flow data is being received from all the 11 projects under monitoring. Few of projects are not sending the flow on hourly basis. The matrix showing the status of data transmission from the project authorities to CWC in the last week of June month is given below in Table 5.

Table 5. Data Transmission Status Matrix

S.No.	Project Name	22 Jun	23 Jun	24 Jun	25 Jun
1	Maneri Bhali-1	B	B	A	A
2	Maneri Bhali-2	A	B	A	B
3	Koteshwar Dam	A	A	A	A
4	Tehri Dam	C	C	C	C
5	Bhimgoda Barrage	C	C	C	C
6	Vishnuparayag	B	A	A	A
7	Bijnor Barrage	B	A	A	A
8	Pashulok Barrage	A	A	A	A
9	GVK Srinagar	B	A	B	A
10	Narora Barrage	A	A	A	A
11	Kanpur Barrage	D	D	D	D

A	Hourly flow data received timely
B	Hourly flow data received late
C	Data received but not in desired format
D	No data received

It can be seen from above matrix that flow data on hourly basis is being received regularly from all the projects except Tehri, Bhimgoda barrage and Kanpur barrage. Now data has started coming from Kanpur barrage also after visit to the project on 2nd July, 2019. The data from Tehri and Bhimgoda projects are being received regularly but on daily basis instead of hourly basis the project authorities are being pursued to provide the data in desired format on regular basis.

5.2 Status of Installation of Automatic System for Data acquisition and Transmission

An expert team visited recently in the month of June, 2019 to see the existing arrangements for release of mandated e-flows and installations of automatic data acquisition and transmission system. SCADA system is already installed at Bhimgoda and Narora barrages for automatic data acquisition. The project authorities have been requested to devise a system for automatic data transmission to CWC. Other projects have not installed the automatic data acquisition and

transmission system till date. However, project authorities have promised to explore the installation of the automatic monitoring system at the earliest possibly by December, 2019. The copy of Inspection Report of the team is enclosed at **Annexure-IV** for reference.

6.0 CURRENT STATUS OF IMPLEMENTATION OF MINIMUM E-FLOWS

Project wise status of fulfilling the requirement of releasing stipulated environmental flows is given below:

6.1 MANERI BHALI PHASE-I

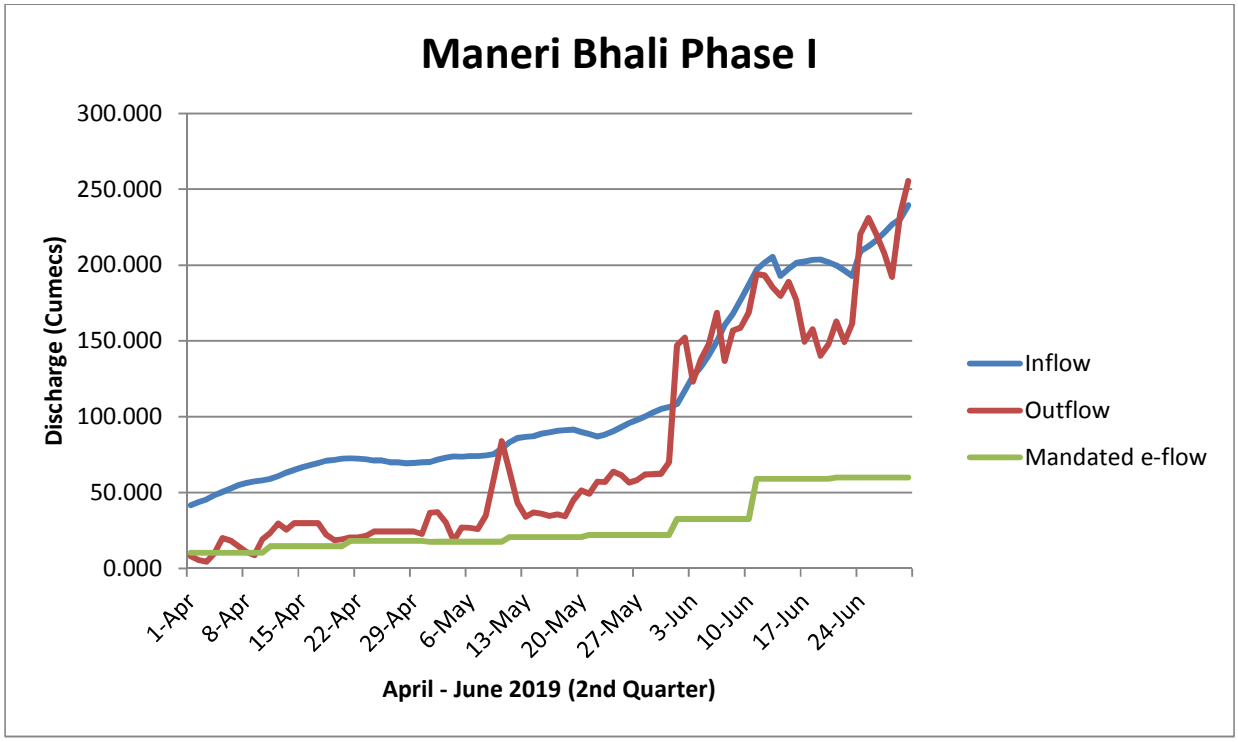

Figure 2: Graph showing status of implementation of e-flows at ManeriBhali Phase I Project.

As seen from above plot, the project is meeting e-flow norms except one or two days.

6.2 MANERI BHALI PHASE-II

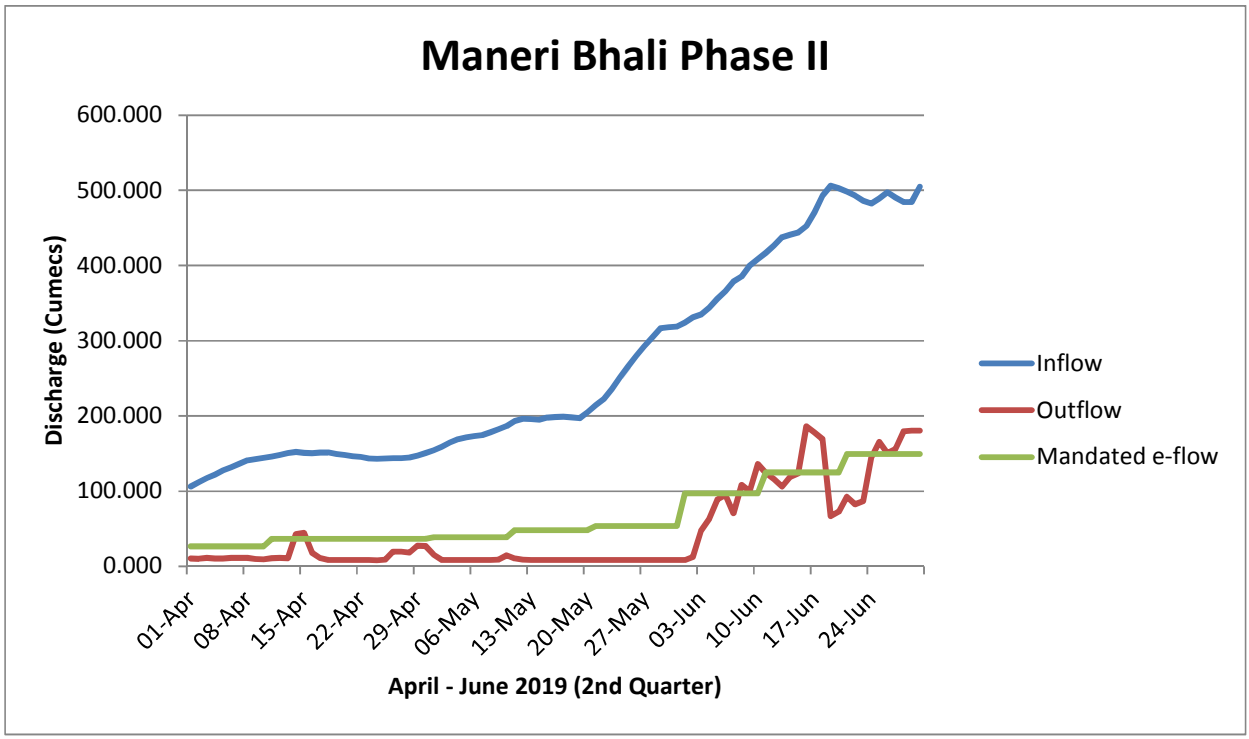

Figure 3: Graph showing status of implementation of e-flows at ManeriBhali Phase II Project.

The project was not meeting the e-flow norms in the month of April and May. Now with increased flows in the later part of June, the project was able to meet the E-flow norms.

6.3 TEHRI DAM

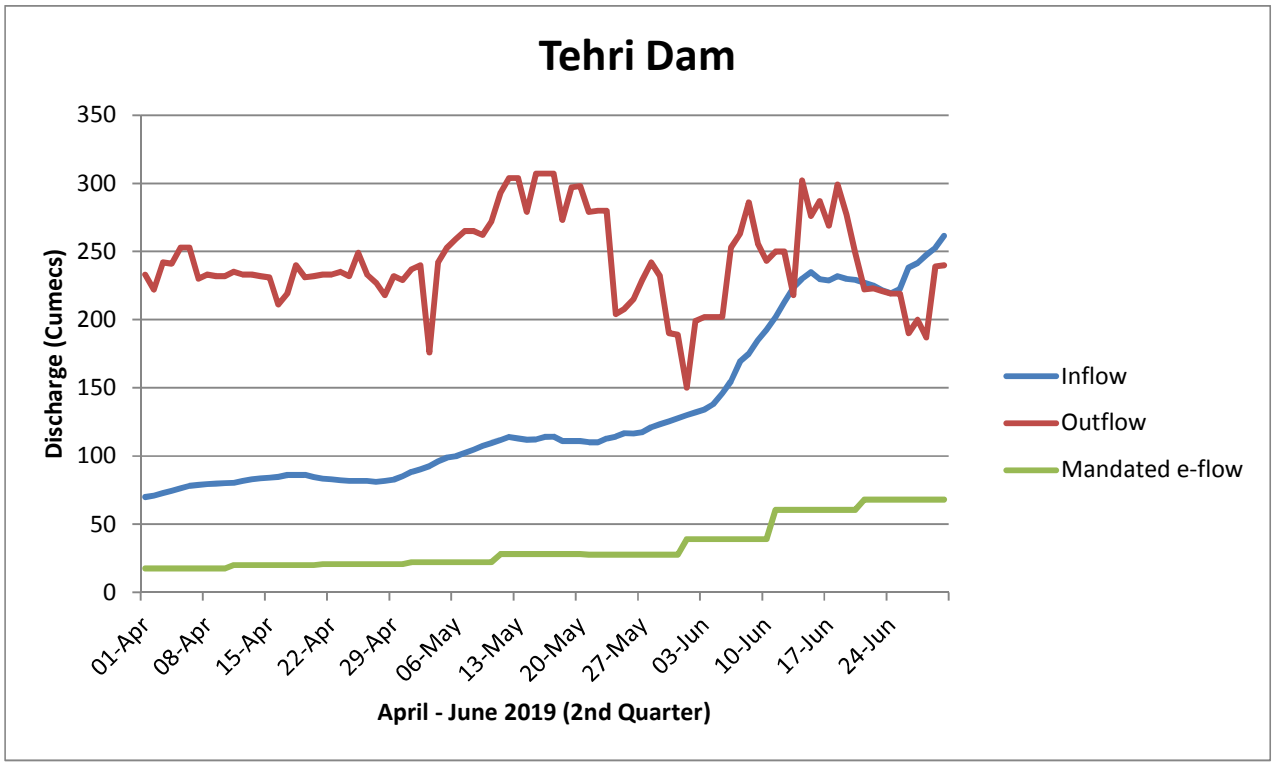

Figure 4: Graph showing status of implementation of e-flows at Tehri Dam Project.

The e-flow norms are met by the project through there may be significant diurnal variation in the flows.

6.4 KOTESHWAR DAM

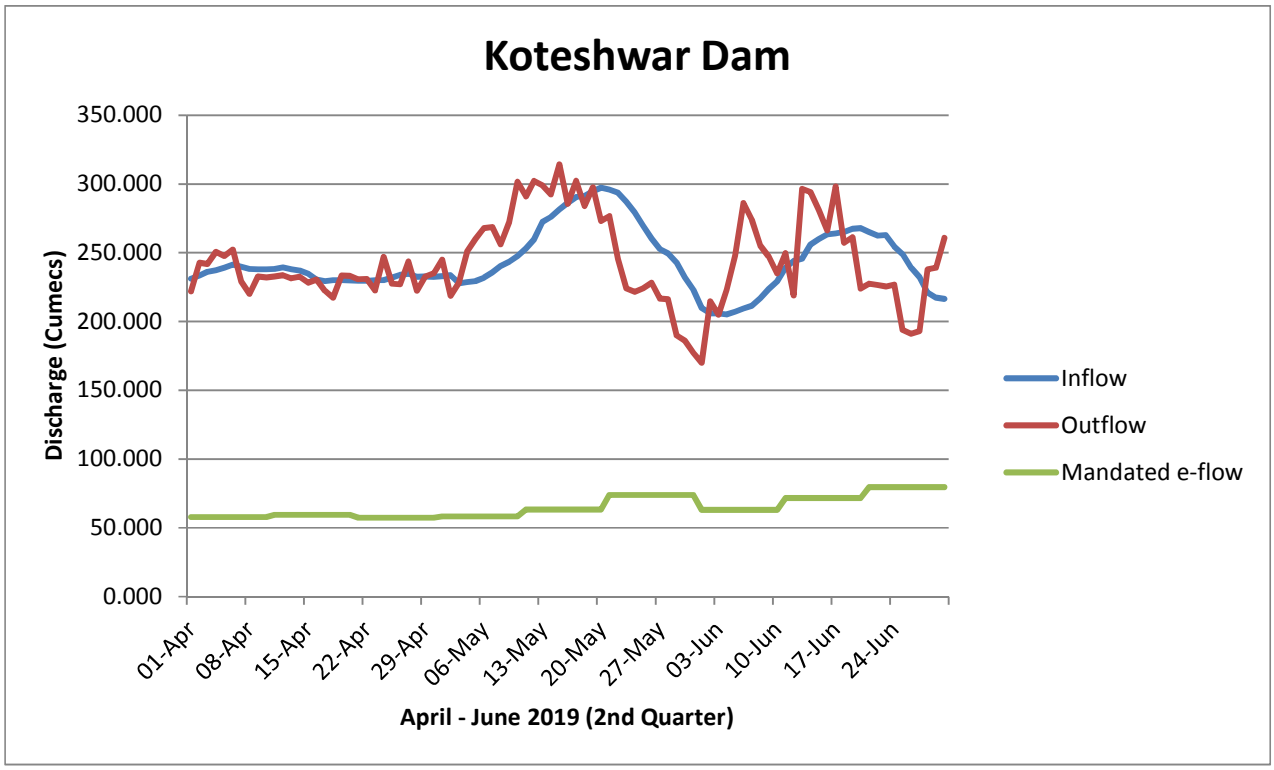

Figure 5: Graph showing status of implementation of e-flows at Koteshwar Dam Project.

The project is meeting the e-flow norms.

6.5 VISHNUPRAYAG HEP

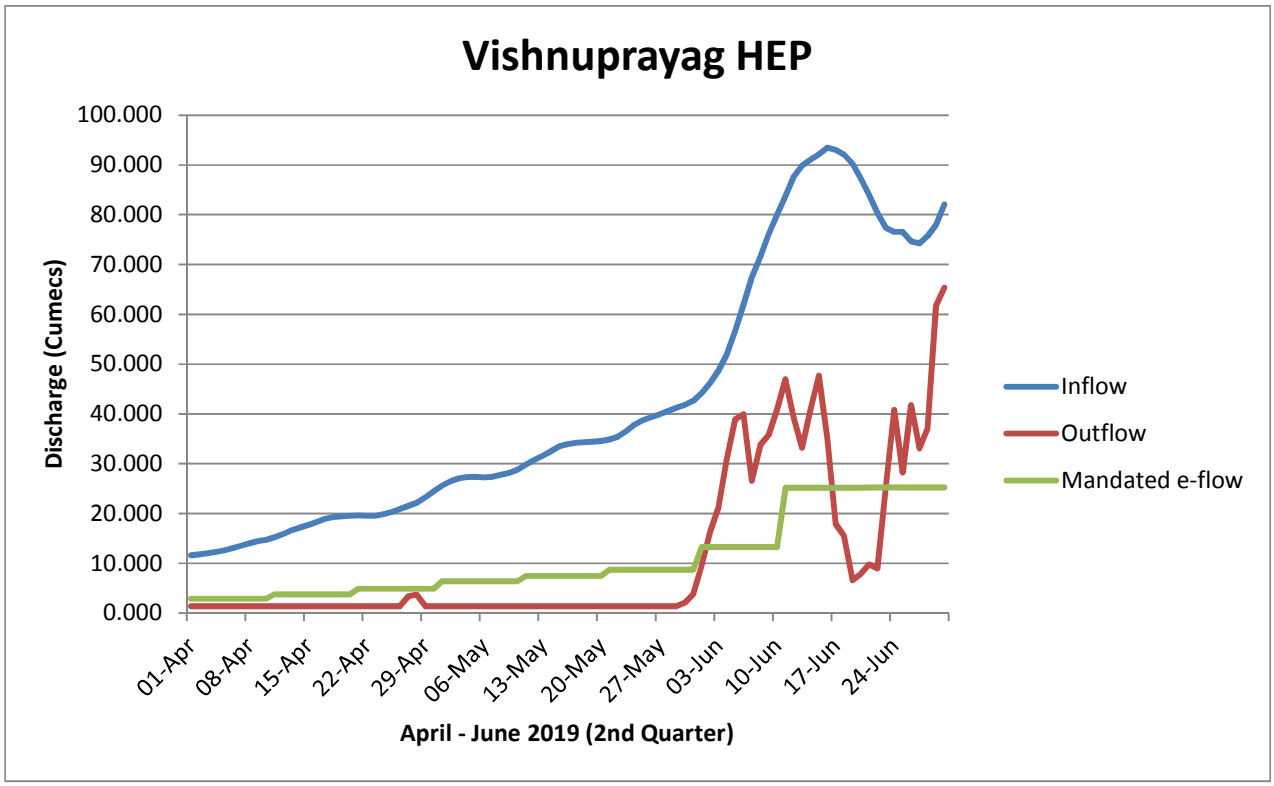

Figure 6: Graph showing status of implementation of e-flows at VishnuprayagProject.

As seen above, the project is not meeting the e-flow norms. As discussed during inspection visit, the project is releasing about 1.4 cumecs till inflows are upto 50 cumecs. Inflows above 50 cumecs are naturally released in the river (intake capacity being about 50 cumecs). From June end onwards, with increased inflows, the e-flow norms are being met.

6.6 SRINAGAR DAM

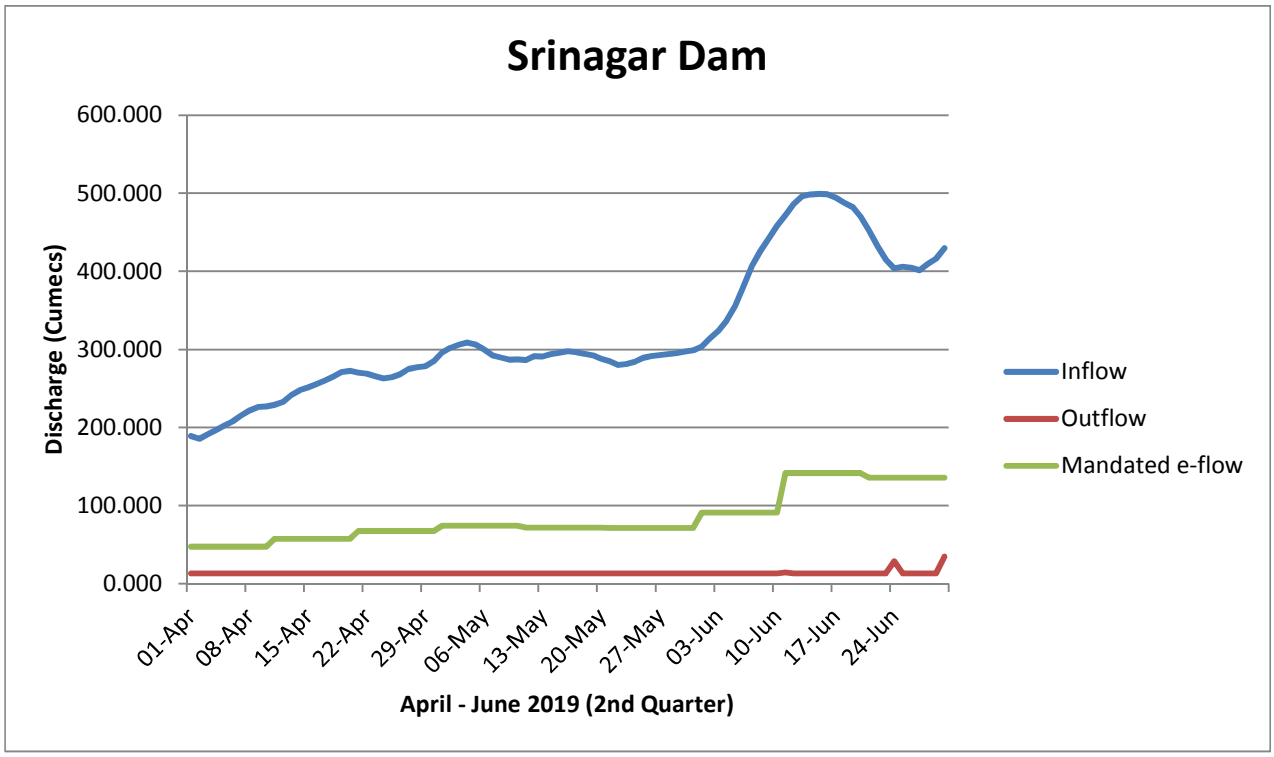

Figure 7: Graph showing status of implementation of e-flows at Srinagar Dam Project.

As seen from above, the project is not meeting the e-flow norms and is releasing about 13 cumec of water to the river.

6.7 PASHULOK BARRAGE

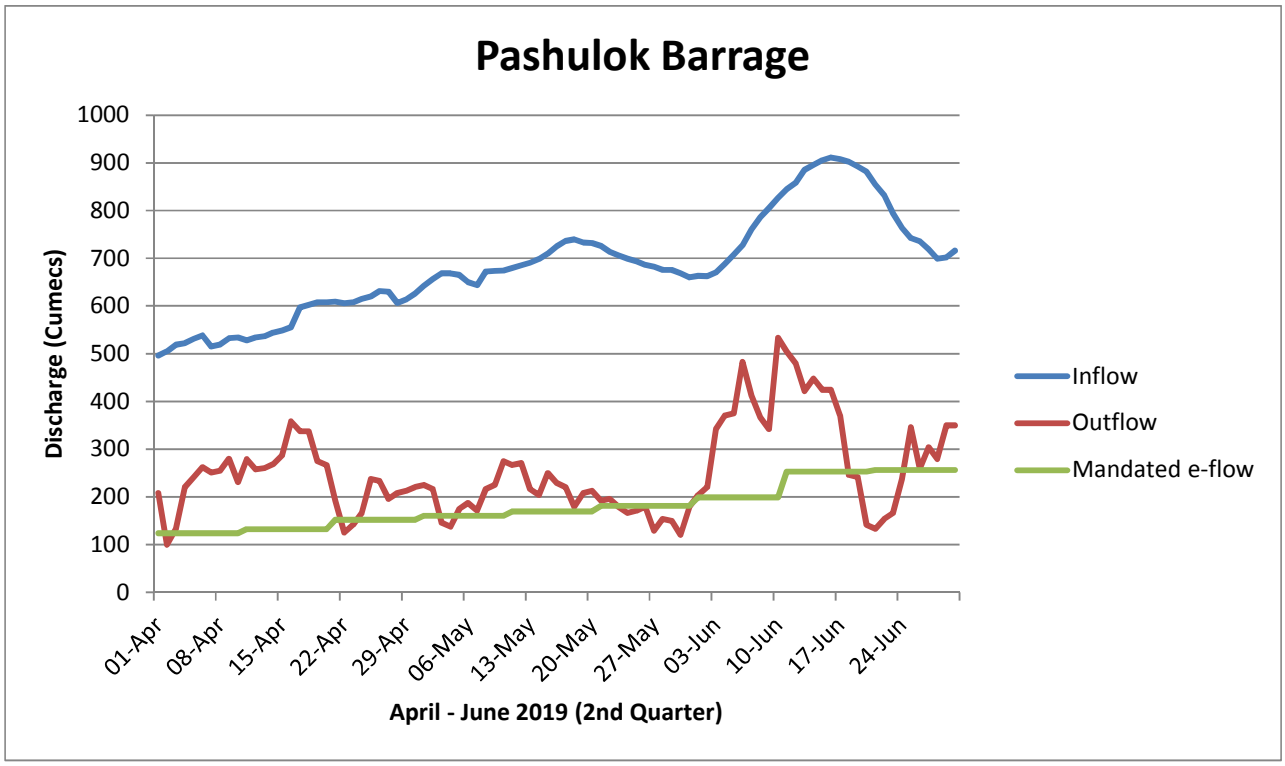

Figure 8: Graph showing status of implementation of e-flows at Pashulok Barrage Project.

The project is meeting the e-flow norms for most of the period except few days.

6.8 BHIMGODA BARRAGE

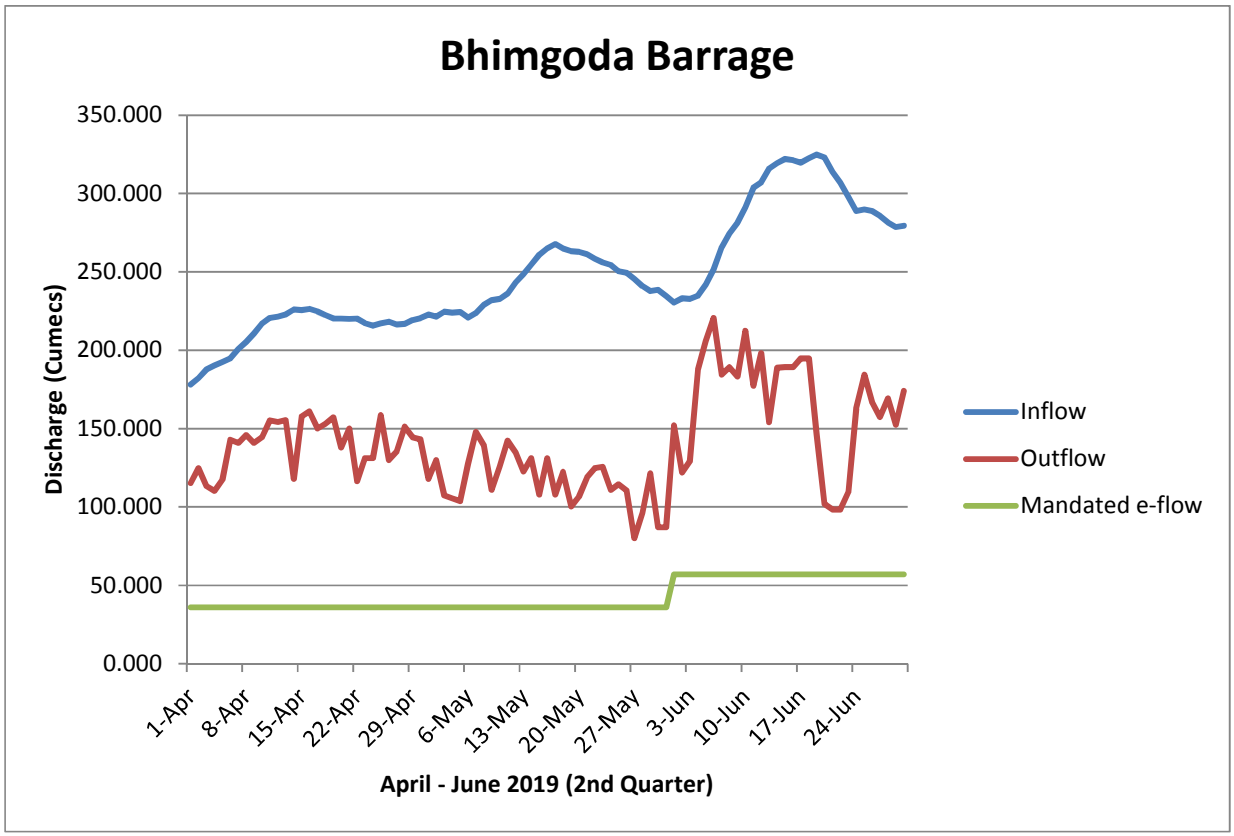

Figure 9: Graph showing status of implementation of e-flows at Bhimgoda Barrage Project.

The project is meeting the e-flow norms.

6.9 BIJNOR BARRAGE

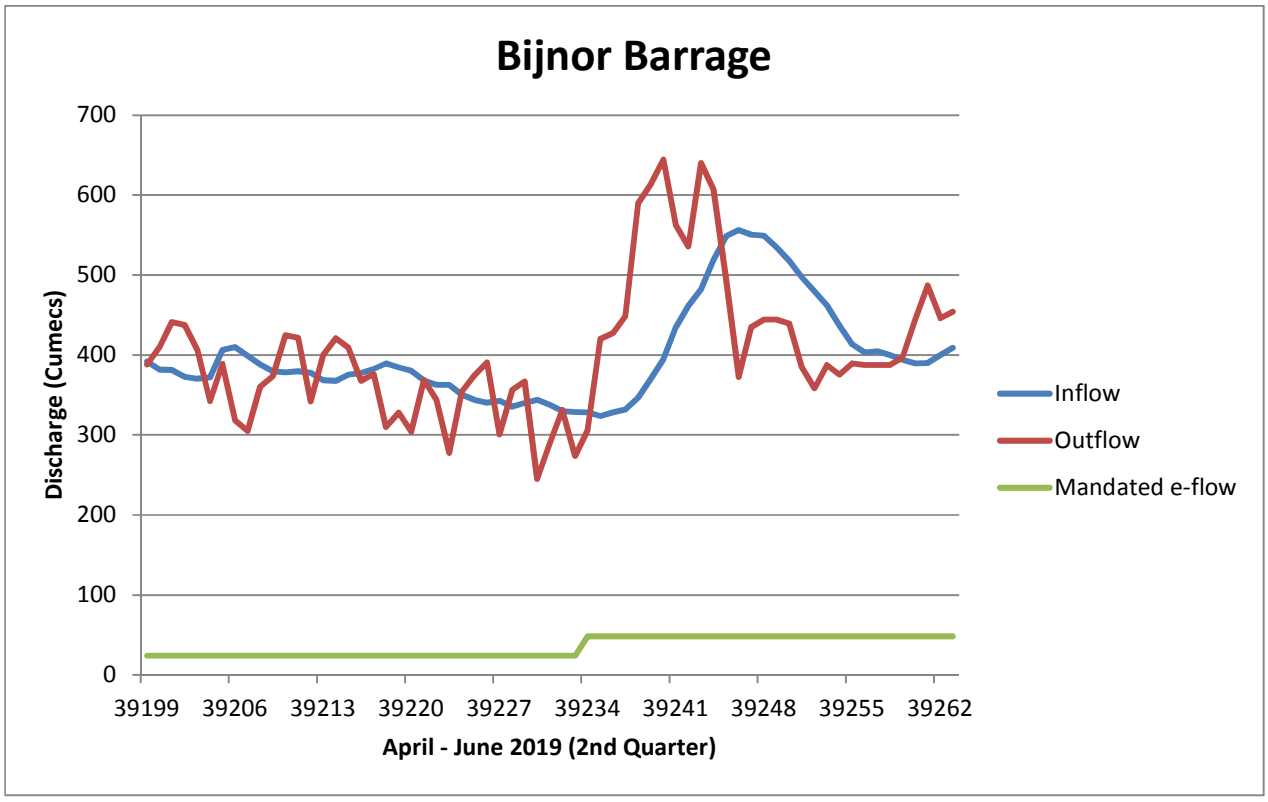

Figure 10: Graph showing status of implementation of e-flows at Bijnor Barrage Project.

The project is following the E-flow norms.

6.10 NARORA BARRAGE

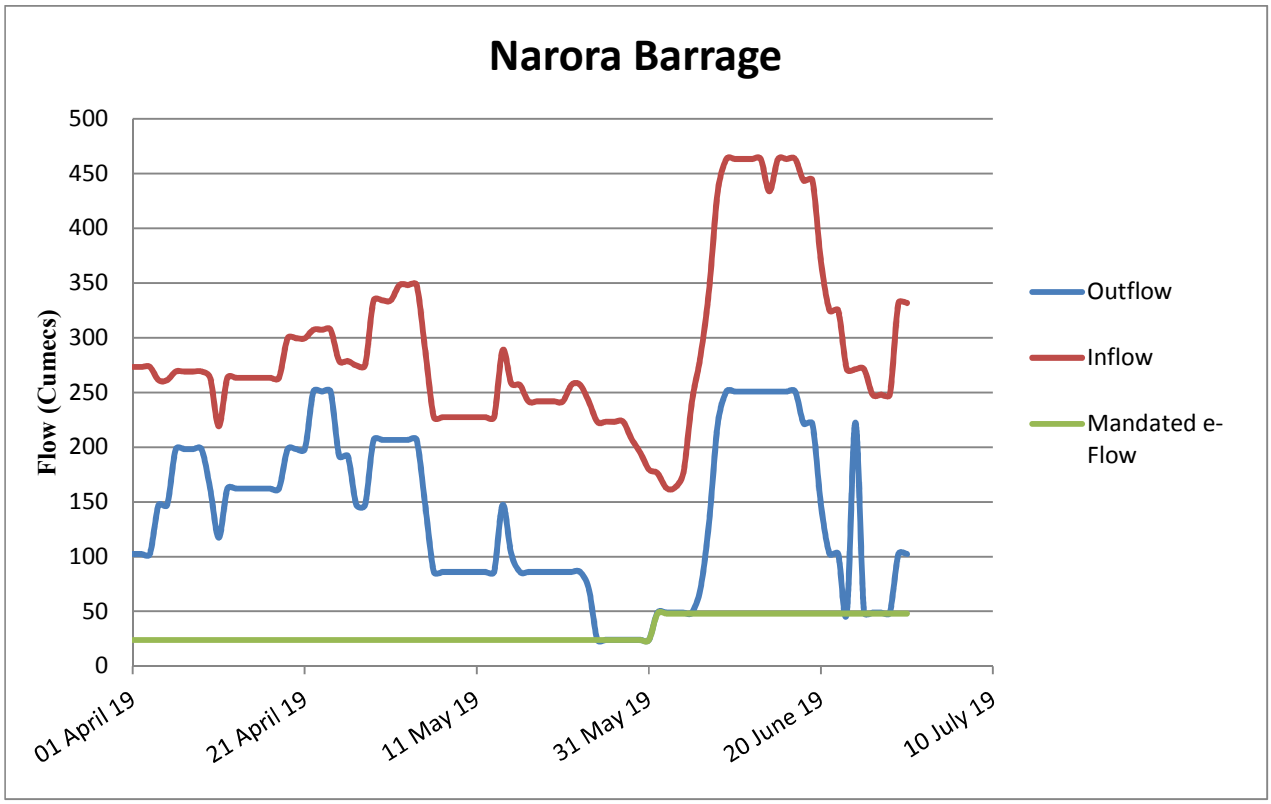

Figure 11: Graph showing status of implementation of e-flows at Narora Barrage Project.

The project is broadly following the e-flow norms.

6.11 KANPUR BARRGE

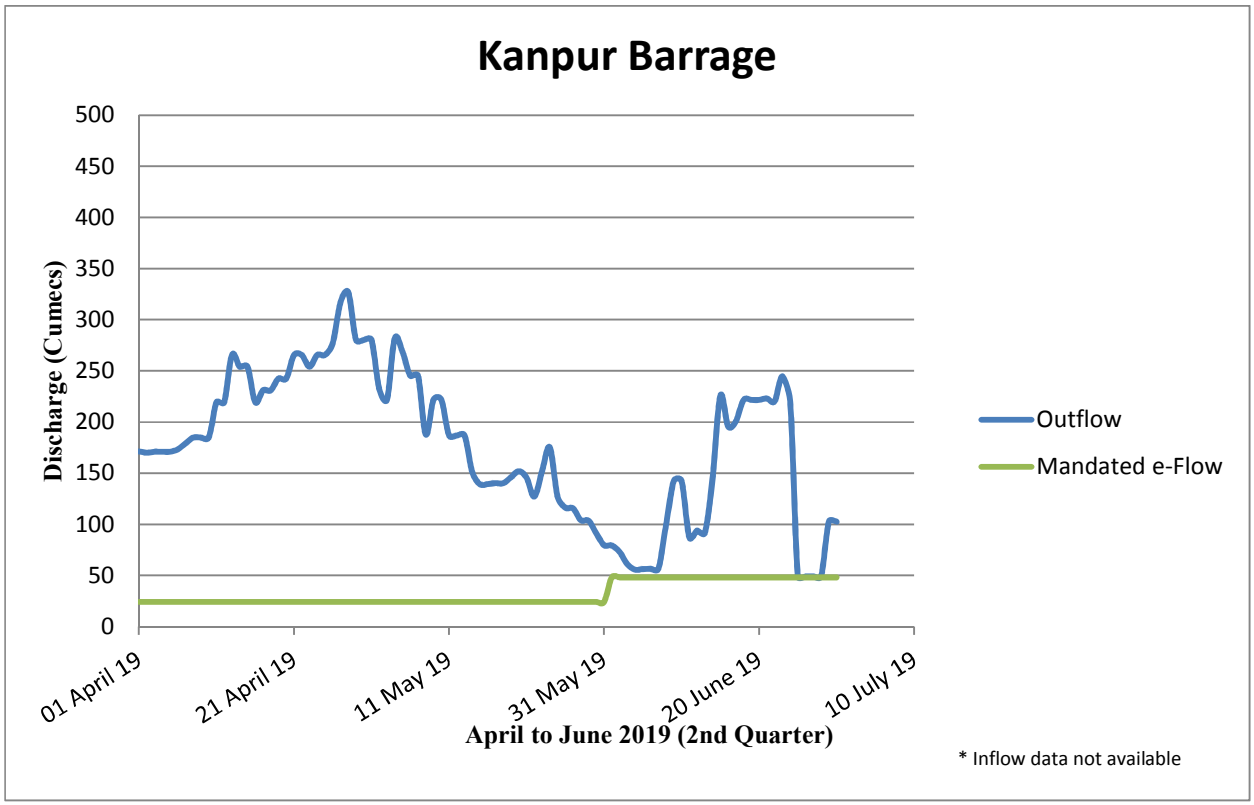

Figure 12: Graph showing status of implementation of e-flows at Kanpur Barrage Project.

7.0 CONCLUSIONS

7.1 Most of the projects are providing the flow data on hourly basis regularly except Tehri, Bhimgoda barrage and Kanpur barrage. Now data has started coming from Kanpur barrage also. The data from Tehri and Bhimgoda projects are being received regularly but on daily basis instead of hourly basis the project authorities are being pursued to provide the data in desired format on regular basis.

7.2 The automatic data acquisition and transmission system have not been installed on projects so far except at Tehri, Koteshwar dam, Bhimgoda barrage and Narora barrage. During the visit of expert team during June, 2019, the project authorities were requested to install automatic system at the earliest. Project authorities have promised to explore theinstallation of the automatic monitoring system at the earliest possibly by December, 2019.

7.3 Based on the data supplied by project authorities, the following three projects are not meeting the mandated E-flow requirements for most of the period:-

- Maneri Bhali Phase 2
- Vishnuprayag HEP
- Srinagar HEP

Maneri Bhali Phase 1 and Pashulok Barrage are in partial compliance i.e. on some occasions, the outflows were below themandated e-flow requirement.