International Workshop on E-flows Assessment & Implementation
21st October, 2019

Implementation of E-flows in Ganga Basin

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Outline

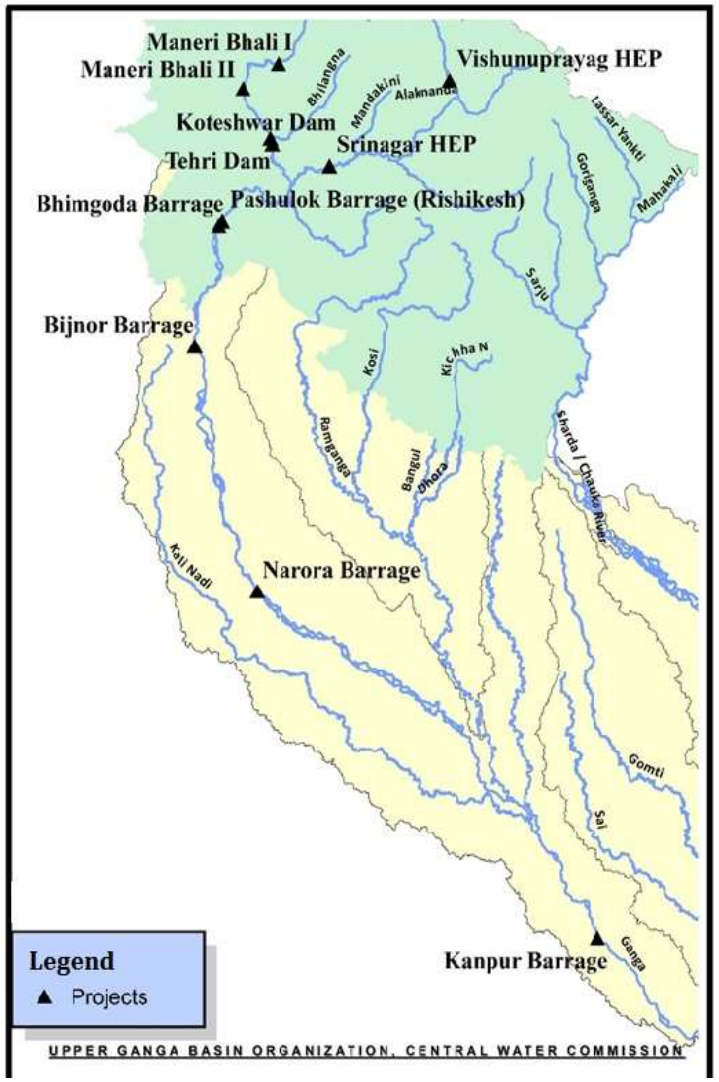
- E-flows Policy and Provisions in India
- Implementation of E-flows in Ganga River and Issues

Need For River Conservation in India

- The river system in India have so far been exploited for various human uses without looking at requirement of its own ecosystem.
- Flow discharges of certain magnitude, timing, frequency and duration are needed to sustain holistic flow regime for river dependent eco-systems ***primarily to ensure the health of the aquatic life in rivers*** and also to sustain various goods and services being otherwise provided by the rivers
- This aspect has been duly recognized in National Water Policy (2002, 2012).

E-flows Policy and Provisions in India

- **The environmental management plan is an integral part of planning of any water resources development project**.
- An Expert Appraisal Committee (EAC) for River Valley and Hydroelectric Projects, constituted by the Ministry of Environment, Forest and Climate Change (MoEF&CC) examine the study reports and recommends the required environmental flows in the affected river reach
- **E-flows are required to be assessed scientifically as per requirement of aquatic biota in the affected river reach in all season and provided.**
- Cumulative Impact Assessment Studies carried out for some of the important basins, are also referred while recommending the requisite e-flows.
- Some of the river reaches/sub-basins are declared eco sensitive zone barring any developmental project
- As such the current policy and practices duly emphasize on assessment and provision of requisite environmental flows in the affected river reach by any human intervention.



Provision of E-flows in Ganga River

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.

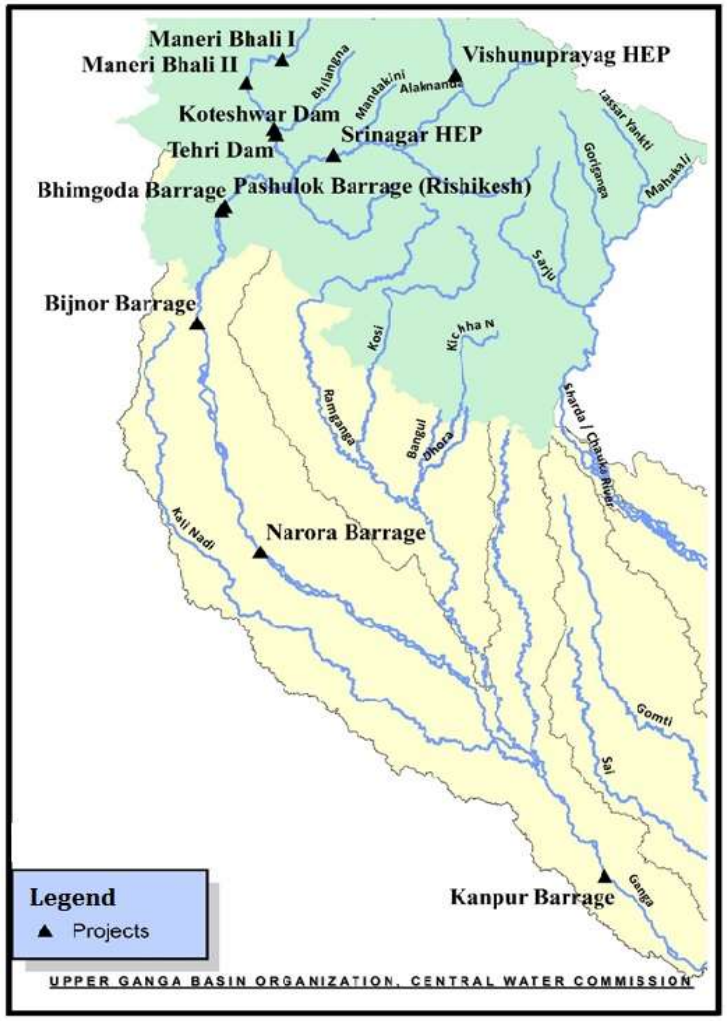
(A) E-flow Norms for Projects in Upper Ganga Basin up to Haridwar

SN	Season	Months	Percentage of Monthly Average Flow observed during each of preceding 10-daily period
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

(B) E-flow Norms for Projects in Main Ganga Stem from Haridwar to Unnao

SN	Location of Barrage	Minimum flow releases Immediately d/s of Barrages (In Cumecs) Non-Monsoon (October to May)	Minimum flow releases immediately downstream of barrages (In Cumecs) Monsoon (June to September)
1	Bhimgoda (Haridwar)	36	57
2	Bijnor	24	48
3	Narora	24	48
4	Kanpur	24	48



Implementation of E-flows in Ganga River

The Central Water Commission (CWC) has been entrusted the responsibility for supervision, monitoring, regulation of flows and reporting of compliance to NMCG.

The monitoring of projects for implementation of mandated E-flows has been commenced w.e.f. 1st January, 2019. Currently following projects are being monitored.

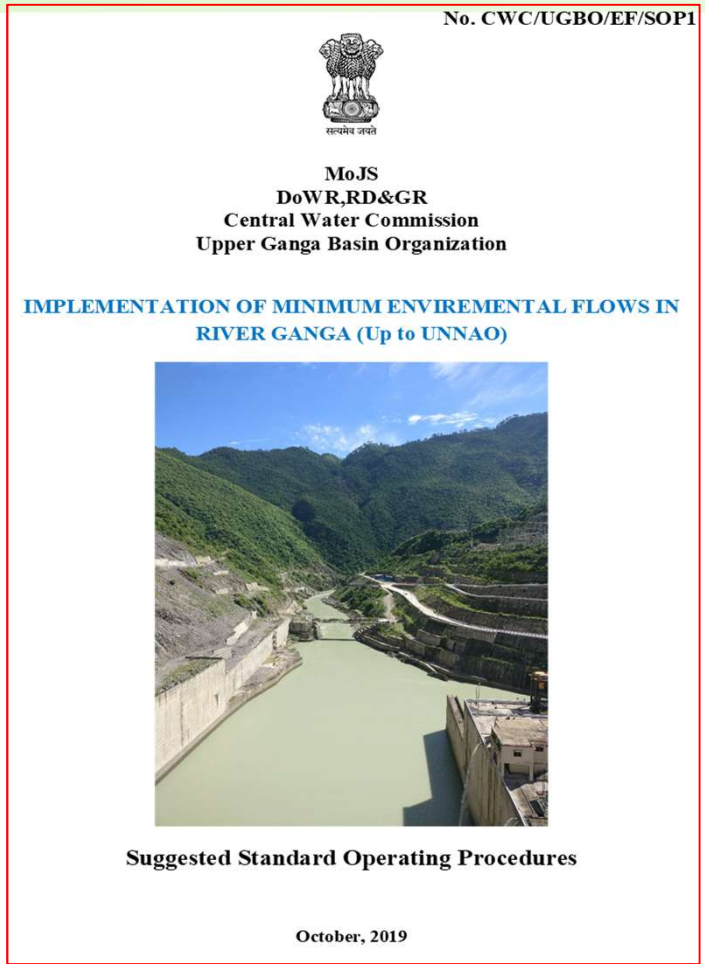
SN	Name of the Project	Owner Agency
1.	Maneri Bhali Stage-I	UJVNL
2.	Maneri Bhali Stage –II	UJVNL
3.	Tehri Dam	THDC
4.	Koteshwar Dam	THDC
5.	Vishnuprayag HEP	JPVL
6.	Srinagar	GVK
7.	Pashulok Barrage/ Chilla HEP	UJVNL
8.	Bhimgoda Barrage	UP. Irrigation
9.	Bijnor Barrage	UP. Irrigation
10	Narora Barrage	UP Irrigation
11	Kanpur Barrage	UP Irrigation

MONITORING AND COMPLIANCE PROTOCOL

- A Standard Operating Procedures for monitoring and implementation of environmental flows in river Ganga has been evolved based on discussions during review meetings and stake holders
- **Efforts have been made to keep the SOPs simple and easy to implement while keeping intact the sprit of Govt Order.**

Monitoring Interval

- The data of inflows, diversions, downstream releases and changes in storage to be monitored on hourly basis.
- The flow data of each project shall be transmitted to E-flow Web Portal/ CWC on real time basis (preferably on hourly basis)
- Till installation of automatic data acquisition and transmission, the hourly flow data for the entire previous day shall be transmitted by project authorities to CWC on daily basis by 11am.



No. CWC/UGBO/EF/SOP1

सत्यमेव जयते

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

IMPLEMENTATION OF MINIMUM ENVIREMENTAL FLOWS IN RIVER GANGA (Up to UNNAO)

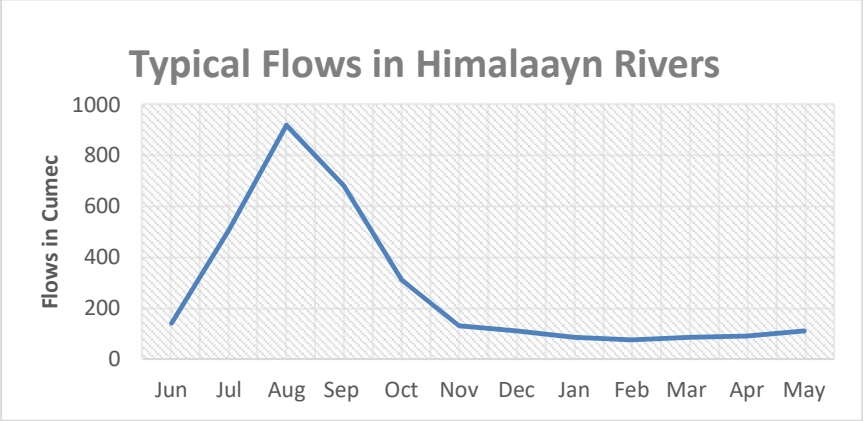
Suggested Standard Operating Procedures

October, 2019

SOPs for Projects in Upper Ganga River Basin up to Haridwar

(i) Dry and lean Period

- Flows during lean and dry periods are mainly contributed by base flows and snow melt and are quite steady.
- As there are not much day to day variations in inflows during this period, e-flow targets may be defined on 10 daily period.
- For the ease of monitoring and compliance, the e-flow targets for given ten daily period may be assessed based on the inflows during previous ten daily period.

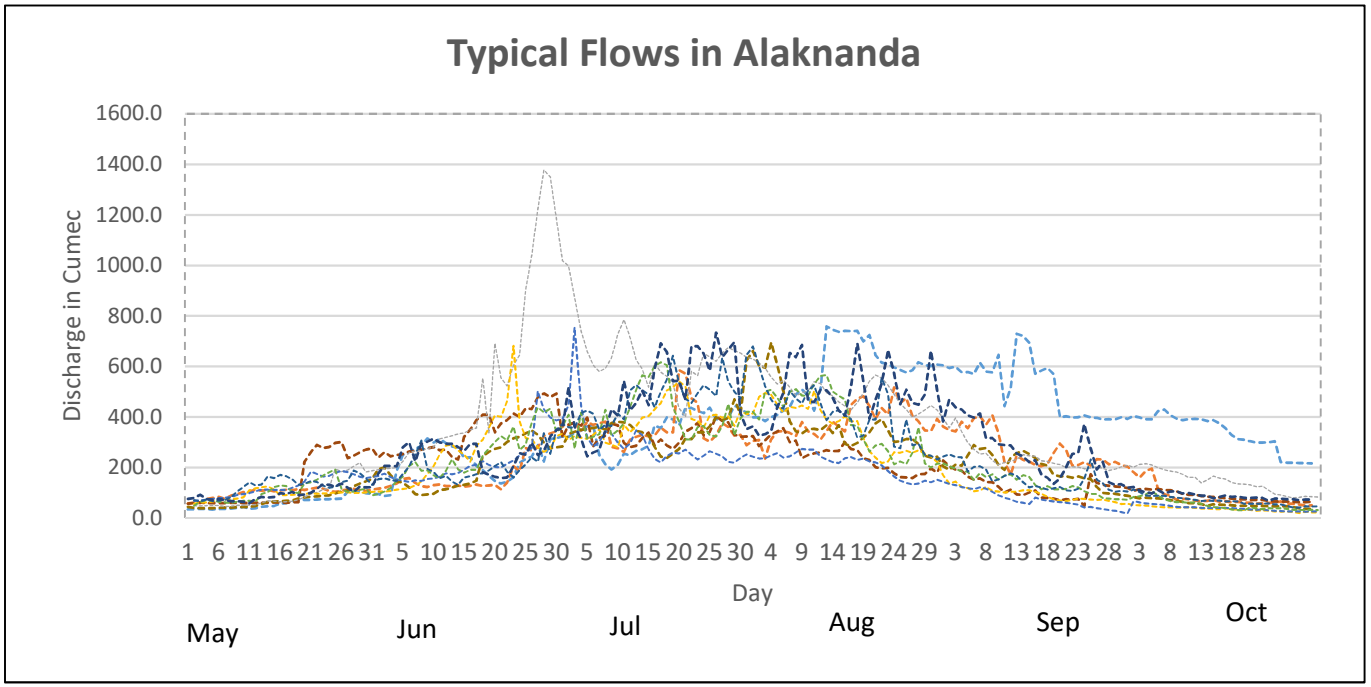


Sl No	Season	Months	Mandated E-flows
1	Dry	November to March	20 % of average inflows observed during each of preceding 10-daily period For example, required E-flows during December 11-20 ten daily period shall be 20 % of average inflows observed during 1-10 December ten daily period.
2	Lean	October, April and May	25 %of average inflows observed during each of preceding 10-daily period For example, required E-flows during March 11-20 ten daily period shall be 25 %of average inflows observed during 1-10 March ten daily period.

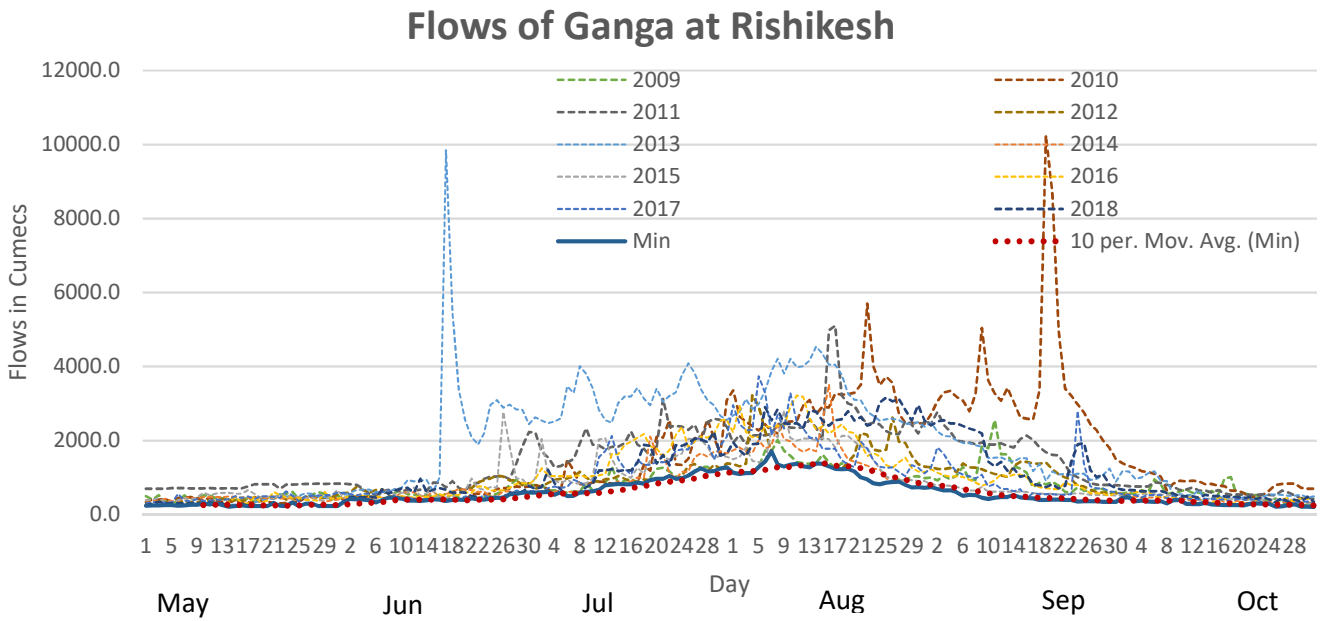
- To account the diurnal variability in the inflows, the e-flow release rate (discharge) during the day may vary within 20 percent range of target e-flow rate for the day. However, the flow volume released during day shall not be less than the targeted daily volume of e-flow release.

SOPs for Projects in Upper Ganga River Basin up to Haridwar

(ii)**During June to September (Monsoon Period)**



Lot of variability in flows during flood period and setting targets to E-flows is a big challenge



Flows at any location can be split into two parts:

Baseline flows, Baseline flows may be defined as the lower envelope of flows observed during past years say last 10 years. These baseline flows normally follow the seasonal trend, being highest in the month July or August. This component of flows are normally stable and predictable.

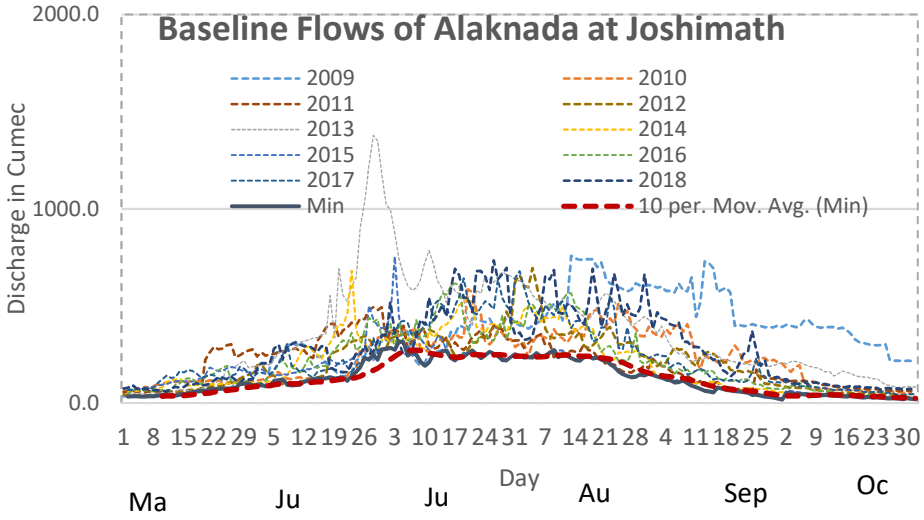
Flood fluxes which is the component of variable flows resulted from high rainfall in the catchment. The flood fluxes last for few days and are stochastic in nature. Their occurrence is random and is difficult to predict.

Suggested E-flow Norms For Monsoon Season (from June to September)

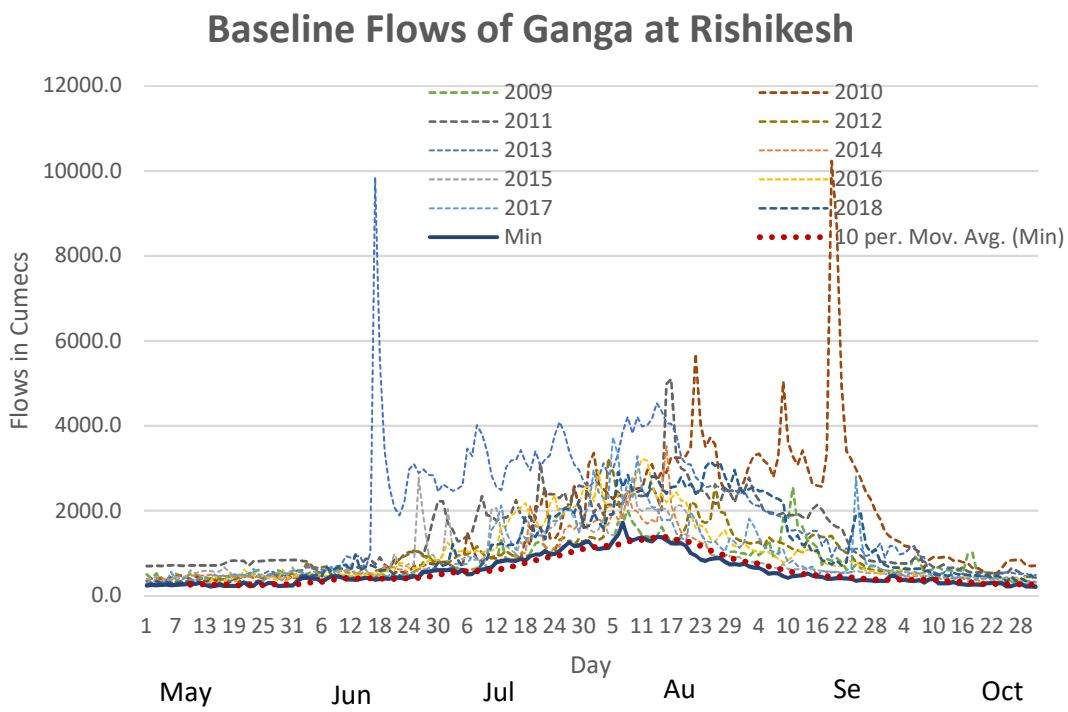
Looking at the characteristics of flows during monsoon period, the E-flows may constitute of two components, one based on baseline flows and other based on flood fluxes.

(a) E-flow Component based on Baseline Flows

As baseline flows would be available in a given 10 daily period with high degree of dependability, 30 percent of baselines flows in a given 10 daily period of the month would be made be available to e-flows.



10 daily Period	**10 Daily Average of Moving average of Baseline flows** (Cumecs)	Baseline E-flows (Cumecs)
Jun-I (Jun 1-10)	96	29
Jun-II (Jun11-20)	112	34
Jun-III(Jun21-30)	158	47
Jul-I(Jul1-10)	259	78
Jul-II(Jul11-20)	243	73
Jul-III(Jul21-31)	247	74
Aug-I (Aug1-10)	242	73
Aug-II (Aug11-20)	240	72
Aug-III (Aug21-31)	192	58
Sep-I(Sep1-10)	130	39
Sep-II (Sep 11-20)	83	25
Sep-III (Sep21-30)	56	17

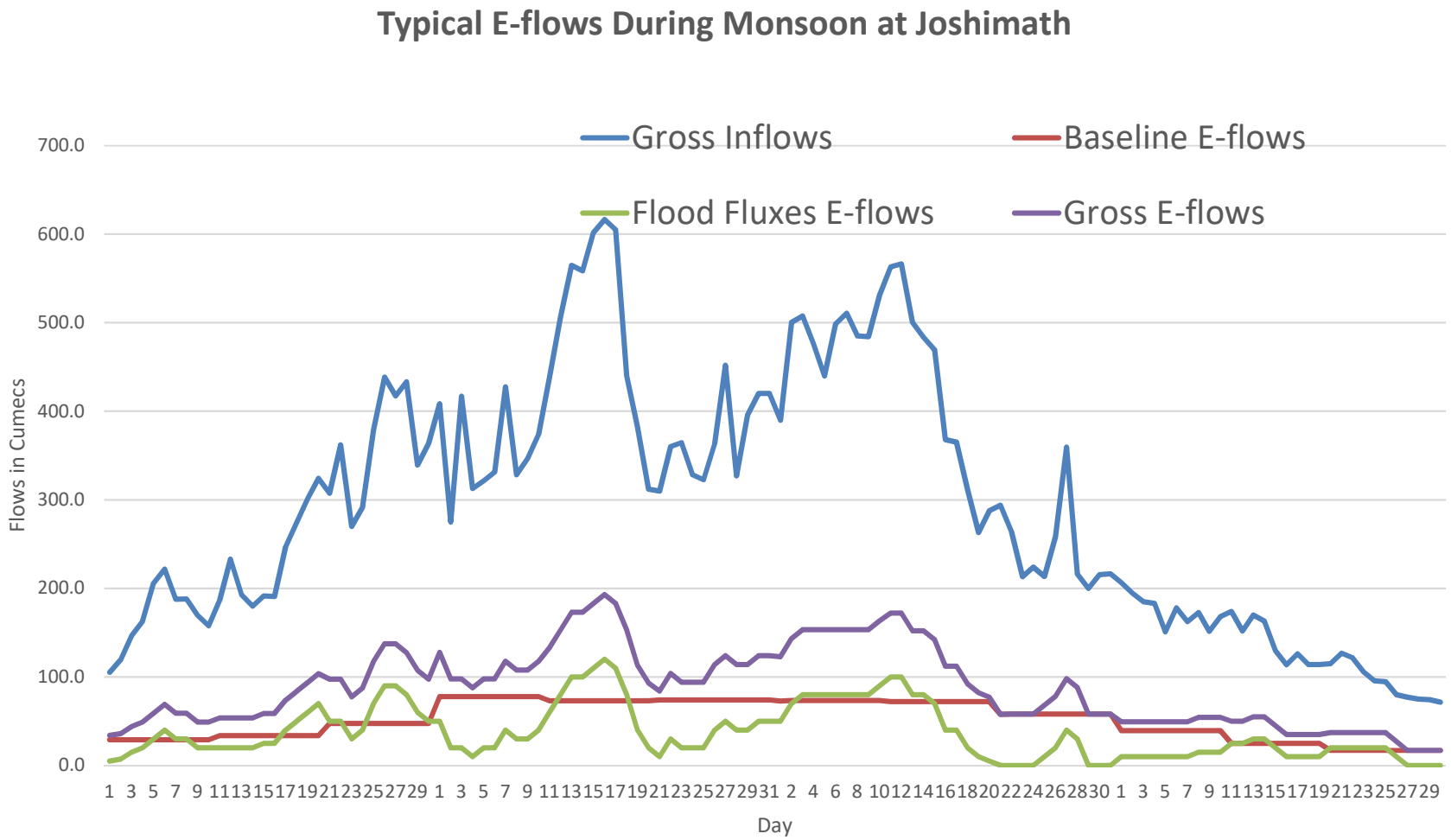


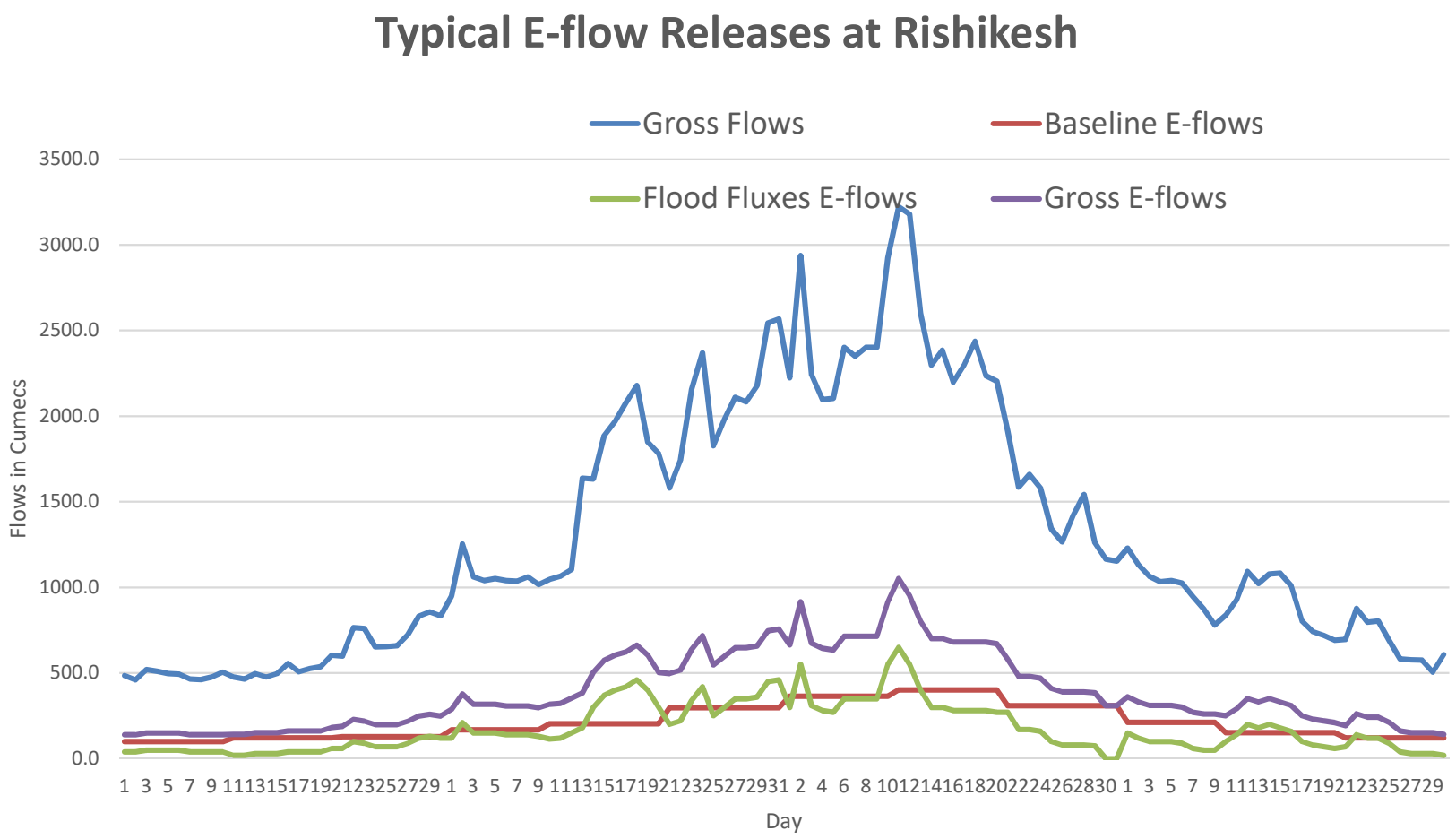
10 daily Period	**10 Daily Average of Moving average of Baseline flows** (Cumecs)	Baseline E-flows (Cumecs)
Jun-I (Jun 1-10)	332	100
Jun-II (Jun11-20)	405	121
Jun-III(Jun21-30)	430	129
Jul-I(Jul1-10)	560	168
Jul-II(Jul11-20)	678	203
Jul-III(Jul21-31)	991	297
Aug-I (Aug1-10)	1217	365
Aug-II (Aug11-20)	1339	402
Aug-III (Aug21-31)	1033	310
Sep-I(Sep1-10)	704	211
Sep-II (Sep 11-20)	503	151
Sep-III (Sep21-30)	405	122

Suggested E-flow Norms For Monsoon Season (from June to September)

(b) Flood Fluxes E-flows

As flood fluxes are stochastic in nature, e-flows corresponding to flood fluxes may be released any time during the month preferably at the time of high flood wave(s). **The project authorities shall be at liberty to release the E-flows corresponding to flood fluxes at any time during the month. However, the quantum of flood fluxes e-flow component should be adequate so as to meet overall target of e-flows (30 percent of gross inflows during the month including baseline e-flows).**


Typical E-flows During Monsoon at Joshimath
Gross Inflows
Baseline E-flows
Flood Fluxes E-flows
Gross E-flows
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Flows in Cumecs
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Day


Typical E-flow Releases at Rishikesh
Gross Flows
Baseline E-flows
Flood Fluxes E-flows
Gross E-flows
Flows in Cumecs
3500.0
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
1 3 5 7 9 11131517192123252729 1 3 5 7 9 11131517192123252729 31 2 4 6 8 10121416182022242628 30 1 3 5 7 9 11131517192123252729
Day

Projects in stretch of main stem of River Ganga from Haridwar, Uttarakhand to Unnao, Uttar Pradesh

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

To account the diurnal variability in the inflows, the e-flow release rate (discharge) during the day may vary within 20 percent range of target e-flow rate for the day. However, the flow volume released during day shall not be less than the targeted daily volume of e-flow release.

Monitoring Reports

No. CWC/UGBO/EF/SR 1

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

IMPLEMENTATION OF MINIMUM ENVIREMENTAL FLOWS IN RIVER GANGA (Up to UNNAO)

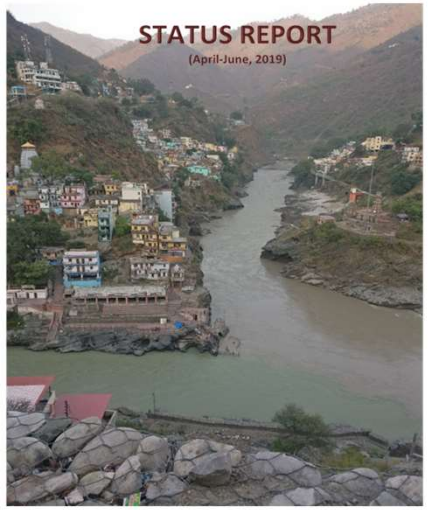
STATUS REPORT

April, 2019

No. CWC/UGBO/EF/SR 2

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

IMPLEMENTATION OF MINIMUM ENVIREMENTAL FLOWS IN RIVER GANGA (Up to UNNAO)



July, 2019

No. CWC/UGBO/EF/SR 3

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Central Water Commission
Upper Ganga Basin Organization

IMPLEMENTATION OF MINIMUM ENVIRONMENTAL FLOWS IN RIVER GANGA (Up to UNNAO)

STATUS REPORT
(July - September, 2019)

Oct, 2019

Issues in the implementation of e-flows in Ganga river

- Seamless data flow on real time from each project to web portal/CWC
- Many of the existing projects were not planned and accounted for the recent e-flow norms and adhering to these norms may impact their commercial interest and meeting their water demands.
- Policy decisions to be taken by project authorities for adhering to E-flow norms and taking up requisite measures like revising PPA, improving water use efficiency etc
- Enforcement mechanism for non compliance

Current Focus Areas by CWC

- **Development of Data Framework for Assessment of E-flows. Preparation of Habitat Atlas for all major rivers in the country**
- **Standardise the methodology(ies) for assessment of E-flows for different hydro-climatic regions in the country including model/software requirement**
- **Framework for integrated basin planning and management for optimal and sustainable allocation/utilization of limited water resources of a basin duly safeguarding the river ecology**
- **Evolve a mechanism for assessing quantitatively the socio-economic benefits/impacts of E-flows/ river eco services**
- **Strategy for implementing E-flows**


Thanks