



Determination of environmental flows for Teesta IV Hydropower project, Sikkim (Case study): a decadal change in approach and methodologies



A.K.Sahoo, *PhD*
Sr. Scientist



©ICAR-CIFRI





National Water Policy (2002), draft (2012)



Water Usage and Demand

- I. Drinking water
- II. Irrigation
- III. Hydropower
- IV. Ecology
- V. Agro-industries and
non agricultural industries
- VI. Navigation

Of the total water usage

92% - Agriculture

5% - Domestic

3% - Industrial

- Overall water demand is supposed to increase from 552BCM to 1050 BCM by 2025

- Average urban water usage: 135lit/person/day

- Demand from the industrial and domestic sectors is expected to increase with the growing population, urbanization and industrialization

- 86% of population has access to improved water use

- Only 33% of population has access to improved sanitation



Central Inland Fisheries Research Institute
(Indian Council of Agricultural Research)
Barrackpore, Kolkata - 700120





National Water Policy draft (2012):

Ministry of water resources, river development and
Ganga rejuvenation



3. USES OF WATER

3.3 Ecological needs of the river should be determined through scientific study, recognizing that the natural river flows are characterized by low or no flows, small floods, large floods etc and should accommodate developmental needs. A portion of river flows should be kept aside to meet ecological needs ensuring that the low and high flows releases are proportional to the natural flow regime, including base flow contribution in the low flow season through regulated ground water use





Project Background:2009 (NHPC, Teesta IV)



ToR by Ministry of Environment, Forest & CC:

*“An estimation to be made for environmental flows downstream for sustenance of aquatic environment and for downstream uses, considering details of streams joining the river below the proposed dam site with their approximate distance from the dam site, their nature (whether perennial or seasonal) etc. A detail environmental flow study shall be carried out through the premier institutions such as Central Inland Fisheries Research Institute (CIFRI), Barrackpore and National Institute of Hydrology (NIH), Roorkee for **biological** and hydrological components”.*



©ICAR-CIFRI





CIFRI's responsibilities:

- Assessment of present status of aquatic habitat in terms of fishes and fish food organisms.
- Estimation of minimum flow requirement for sustenance of fishes in down stream of the proposed dam.





Sampling design



Total length of river for study:

- **7.5 Km (Dam axis to Teesta V reservoir)**

Sampling Sites:

- **184 m D/S of Dam Axis (E: 707m)**
- **1250 m D/S of Dam Axis (E: 690m)**
- **7184 m D/S of Dam Axis (E: 670m)**

Sampling Period:

- **2009-2010 (9 months): Pre-monsoon, Monsoon and Post-monsoon**
- **2018: Non-lean/Non-monsoon**

Sampling Parameters:

- **Fish, plankton (phyto and zoo), periphyton, water and soil**





Recommendations: (2009)



- A minimum discharge of **10.0 cumecs** from the dam axis during the lean period is needed for sustenance of aquatic life in the 7.5 km stretch.
- Methods such as creating pool riffle habitat units at the confluences should be explored to maintain river bed submergence. It is to be ensured that the **connection between different pools** created are maintained.
- The percentage volume of water available in main channel may be increased by adopting a suitable operation policy of the turbines (NIH)



©ICAR-CIFRI





2018: E-flows (MoEFCC)



No to Minimum flows (Mimicking natural flows)

(Sahoo et al., 2015, Current science)

Objective: (NHPC, Teesta IV HEP)

- To determination of environmental flows for non-lean and non-monsoon period in river Teesta only in 7.3 km stretch downstream of the proposed Teesta IV HE Project





Decadal change (E-FLOWS)?

APPROACH

MINIMUM FLOWS
(2009)

LEAN FLOWS
MONSOON FLOWS
NON-LEAN/NON-MONSOON
FLOWS
(2019)

METHODOLOGY

TENANT/HYDROLOGY (FDC)
(2009)

HABITAT SIMULATION
HOLISTIC METHOD
(2019)





NEED OF THE HOUR!

1. Standardization of methodology based on the habitat and ecological sensitive species
2. Time for call as ecological flows
3. Creating sensitisation among the different stakeholders (water regulators, managers, fisheries, forestry, etc)
4. Strict policy through solid scientific study/observations





Thank You!



©ICAR-CIFRI

