

Critique on the GoI report on E-flows in India

Can our rivers hope to flow 'Aviral'?*

If the Ministry of Water Resources is serious about the implementation of its recently published three member committee report on 'Assessment of Environmental Flows in India' then there is still some hope left for our rivers! Probably for the first time, two Ministries of the Government of India namely the Ministry of Environment and Forests and Climate Change and the Ministry of Water Resources River Development and Ganga Rejuvenation have joined hands to give a report with far reaching recommendations on a subject as critical as environmental flows. The 32 page report has been prepared by a three member committee consisting of Dr. Vinod Tare, Professor, IIT, Kanpur, Dr. Sashi Shekhar, Special Secretary, MoEF & CC and Dr. Amarjeet Singh, Special Secretary, MoWR RD&GR. The Committee is said to have met four times and consulted with experts in Central Water Commission (CWC), New Delhi, National Institute of Hydrology (NIH) Roorkee, International Water Management Institute (IWMI), Sri Lanka and World Bank, India. The Committee has also referred to the reports of the 7 IIT Consortia (IITC) which is engaged in preparing the Ganga River Basin Management Plan (GRBMP) and the BK Chaturvedi Inter Ministerial Group Report for Ganga basin.

The most significant statement in the report, 'The objective of E-flows is to recognize the physical limit beyond which a water resource suffers irreversible damage to its ecosystem functions, and systematically balance the water needs of a society in a transparent and informed manner', is going to decide the hydrological and ecological limit to the number of hydro electric and irrigation projects that can be allowed across a river if taken in its true spirit and content by the GoI. Meanwhile one cannot accept the Committee's statement that e flows is 'one of the' central elements in water resources planning and management for sustainable development; indeed it is 'the' central element!

Interpretation of e-flows could be more holistic

The Brisbane Convention in 2007 attended by 750 delegates from over 50 countries (the author was one of the signatories of the Brisbane Declaration which was the outcome of the deliberations at the Convention) was the first consolidated global effort to interpret e flows and urge the nations across the world to estimate environmental flow needs immediately and to integrate environmental flow management into every aspect of land and water management¹. The Committee while recognizing the Brisbane Declaration, describes e-flows as the temporal and

¹ <http://www.eflownet.org/viewinfo.cfm?linkcategoryid=4&linkid=64&siteid=1&FuseAction=display>

spatial variations in the quantity and quality of water required for freshwater and estuarine systems to perform their natural ecological functions (including material transport) and supports the spiritual, cultural and livelihood activities that depend on them. The report states that the river should carry both suspended load and bed load in approximately the same proportions as in virgin flows which is a major admission in the e-flows discourse in the country. However, the relation of e-flows with land use and status of the catchment are not seen factored into the interpretation. The interpretation of e-flows by the Forum for Policy Dialogue on Water Conflicts in India, 'the flow regime to be left for the environment, right from the first order stream watersheds to the main river basin, denotes the water for environmental needs at a river basin level. Herein lies the significance of a watershed based approach to river basin restoration and management, which would automatically ensure that water is left for fulfilling its various evolutionary and ecological needs, which in turn would ensure the healthy status of river systems for society'² integrates the land use and watershed aspects.

E-flows Methodology recommended has grey areas

The committee strongly recommends the Building Block Methodology (BBM) as a robust and scientifically most suitable methodology. At the same time the term Bigger Block used in the NGRBMP (IITC) replaces Building Block the reason for which is not clear from this report. Here it is pertinent to note that e-flows application is mostly focused on regulated rivers (river flows which have been blocked by dams or barrages). Unregulated streams / rivers may not be affected by major dams or diversions but their flow regimes would have been affected by 'incremental development'³. Incremental development may include small dams, check dams, lift irrigation schemes or ground water development by individuals or collectively. In India we have a situation where in both regulated and unregulated rivers have been subject to incremental development. The committee's predominant focus seems to be with respect to the e flows assessment of those rivers where large dams are planned as in the Himalayas.

Keystone species are being recommended as the determinants of the river depth required for e-flows. The methodology also considers the temporal variations in the depth of flow with respect to the geo morphological aspects of longitudinal and lateral connectivity while assessing e-flows which is a welcome step ahead. However, while longitudinal connectivity is recommended for all seasons, lateral connectivity of active flood plains need be maintained only for 18 days in the monsoon to submerge sand bars and riparian vegetation. Now this is an incorrect assumption to make ecologically. Riparian ecosystems are a key element of riverine ecosystems, providing many ecological, aesthetic and economic benefits, including terrestrial wildlife habitat structure, food

² Joy K. J., Priya Sangameswaran, A. Latha, Shripad Dharmadhikary, M. K. Prasad, K. P. Soma, 2011, 'Life, Livelihoods, Ecosystems, Culture: Entitlements and Allocation of Water for Competing Uses', (position paper by the thematic subgroup on Water Entitlements and Allocations for Livelihoods and Ecosystem Needs), Pune: Forum for Policy Dialogue on Water Conflicts in India.

³ LWRRDC.1998. Comparative Evaluation of Environmental Flow Assessment Techniques: Review of Methods', Angela H. Arthington and J.M. Zalucki (Eds), LWRRDC Occasional Paper 27/98.

resources, stabilising geomorphic properties along banks and floodplains⁴. Riparian vegetation which has evolved in the context of flowing rivers requires flowing water in all seasons though the depths and flows are subject to seasonality and requirements for its growth, life cycle and survival. The link between riparian forests / riparian lands and flowing river is a mutual give and take dynamic process which requires careful assessment. Studies are emerging on the environmental flow regimes for riparian vegetation. Moreover, the character of rivers and riparian vegetation in the Western Ghats and Central India is different from those in the snow fed Himalayas which would need a different approach to estimation of water depths in relation to river ecology and geomorphology. For instance in the Western Ghats rivers the connection of the river flows with the riparian vegetation atleast with the roots is very much needed in summer to maintain water quality for the river as well as for adjacent water sources like wells and ponds and for the dependent population. In tropical forest ecosystems like the Western Ghats, the relations of ecological stresses in riparian zones created by intrusions like dams, sand mining etc. on the river flows, energy flows and movement of sediments and nutrients needs proper assessment before determining the e-flows.

The Committee puts forward the term Minimum Ecological Requirement (MER) which means the minimum depth of flows required for sustenance of keystone aquatic species. As per MER, flows corresponding to the depth D_1 are required for the movement of keystone species and flows corresponding to depth D_2 prescribed for spawning period of keystone species. The Depth D_3 meanwhile factors in both the longitudinal connectivity for all seasons and lateral connectivity of active flood plain for the historically observed number of days which comes to 18 days in monsoon season. In other words D_3 flows would correspond to high monsoon flood flows requiring increased discharges. The Upper Ganga basin sites have been taken as examples to prove their recommendations. The keystone species selected by the Committee are snow trout and golden mahseer (see below the illustration of a site in Upper Ganga Basin taken from the report).

Globally, of the 200 odd methodologies developed for e flows assessment, about 70 percent are based largely upon minimum flow (ecological) requirements (taking flow depths and current velocity) primarily for fish⁴. The recommended depths of D_1 and D_2 however need to be re examined in the context of river systems in different ecological and geo morphological settings and the riparian ecosystem needs. The committee's assertion that e flows that maintain the geomorphology and biodiversity can fulfill and support the socio cultural and livelihood based aspirations also needs to be relooked into. Will the MER at D_1 and D_2 ensure and support the lateral connectivity between the riparian vegetation and flowing river in non monsoon season is not clear. In other words since the riparian vegetation life cycles are sensitive to seasonal water depths, assessing flow requirements in relation to riparian vegetation needs to factor in these life cycle requirements. Similar is the case with sand bars that are a product of geo morphological and ecological process within a river.

⁴ Pusey B.J. & Arthington A.H. 2003. Importance of the riparian zone to the conservation and management of freshwater fish: a review. *Marine and Freshwater Research*, 54, 1–16.

Environmental flows are computed in the report based on the MER and is done separately for monsoon (wet) and non monsoon season (dry). Daily average flows and 90 percent dependable flows computed from historic flows is being used for arriving at the e flows curve. The e-flows for non monsoon will mimic 90 percent dependable flows and would correspond to the MER for non monsoon season. The computation for the monsoon season meanwhile would remain below the maximum e-flows but above the D_2 level.

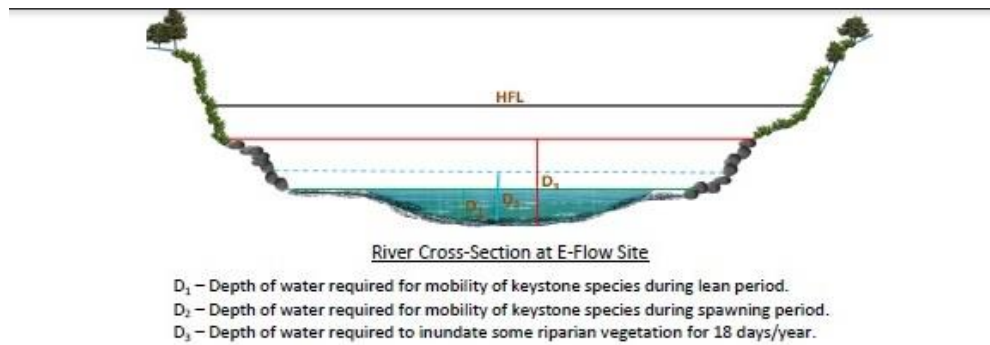


Figure 5.4: E-Flows Assessment – Conceptual Diagram

A. E-Flows at Site 1: Ranari, Dharasu (Lat 30°43'02"N, Long 78°21'17"E):

Geomorphic Attributes: Confined, incised river channel with coarse bed material in degradational regime in Himalayan steep valley.

Cross-Section at Site:



Figure 5.5: River Cross-section at Ranari, Dharasu

| Keystone Species | Required Depths for E-flows | | |
|---|-----------------------------|-------|--------|
| | D_1 | D_2 | D_3 |
| Snow Trout (<i>Schizothorax richardsonii</i>) | 0.5 m | 0.8 m | 3.41 m |
| Golden Mahseer (<i>Tor putitora</i>) | | | |

While the report is purported to be for the whole of India, there is a room for doubt if the report was not prepared in a haste to cater to the requirements of hundreds of dams coming up in the Himalayas alone! The report should have touched upon the flow regimes in non snow fed rivers of

Peninsular India and the West flowing Western Ghats rivers which have an altogether different geomorphology and related ecology. Moreover e-flows are not only related to dams though dams are the irreversible flow regulators in the whole gamut of river basin management. Sand mining, riparian ecosystem degradation, mangrove destruction, catchment degradation, pollution load etc. too have a decisive role in determining the quality of flows, sediment and nutrient transport right upto the sea which are key elements in any e flows assessment discourse. It has been widely recognized that e – flows is not only a techno – economic river engineering process but also a social choice wherein the people who directly depend upon the river have to be involved in deciding how much water should be left for atleast the basic and ecosystem needs. Hence there should atleast have been a section outlining the important objectives of setting e-flows in the context of Indian rivers. This would have brought out the different requirements in the context of different rivers both regulated and unregulated but flow affected and to be affected in future development. This is a major lacuna of the report. The report limits itself to the technical aspects of e- flows assessment. The simplification of the methodology to keystone species can also be interpreted as a compromise / dilution on the actual environmental flows required by a river.

River Health Regime – what are we aspiring for?

For the first time MoWR introduces the concept of River Health Regime (RHR) and e flows as a step towards determining the RHR which is indeed a major positive step with far reaching implications for river basin management . The report divides the rivers into five flow regimes whose limits are decided by four factors namely average virgin flows, 90 percent dependable flows, E - flows and Minimum Ecological Requirement. While MER decides the lower limit, average virgin flows decides the higher limit. Based on these limits the rivers in India are classified into *Pristine* (river flow matching the average flow regimes), *Near Pristine* (river flow between 90 percent dependable flows and average flows), *Slightly Impacted* (flow regimes between e-flows and 90 percent dependable flows) , *Impacted* (flow regimes above MER and below E flows) and *Degraded* (flow regime inferior to the MER). In reality, a Pristine river (the main river) would be nonexistent under Indian conditions. Of course some tributaries in upstream forested or snowy catchments maybe still be retaining their Pristine nature. Most of our main rivers would range from Slightly Impacted to Degraded regimes based on the scale of use, dams and extraction. The report rightly states, ‘ Achieving a certain RHR may warrant (1), policy decisions to set boundary conditions for certain planned actions (irrigation and hydro power projects which are at planning stage) and / or (2) reversal of trends in ongoing activities (hydro power projects and water diversion projects that are operational)’.

Here the critical question that arises is that what is the RHR the Government is aspiring for in those rivers where new dams are being planned and in those which are heavily dammed, diverted and with incremental development already undergoing? What would be the trade offs involved which is inevitable? And while working towards RHR, critical issues like equity, sustainability, user rights, prioritization etc. need to be addressed carefully. Of course the RHR of the main river would

depend upon the healthy flows of the tributaries draining into it. There is a need for further assessments of all these critical aspects.

Can we hope for better flows ?

The Committee has taken the discourse of environmental flows few steps ahead by introducing river health regime. Such a recommendation would have implications for all the interstate interlinking projects already in operation like the Mullaperiyar, Parambikulam Aliyar Projects and for the grand plan for the proposed Inter Linking of Rivers (ILR) ongoing. This would definitely set the boundaries on the bumper to bumper dams coming up in the North East and Uttarakhand Himalayas and the irrigation projects in Peninsular India. However, it remains to be seen if the MoWR and the MoEF would take up this critical recommendation seriously and give directions to the Environmental Appraisal Committee for River Valley Projects to set boundaries to projects pending before the committee based on this report as well as set norms for the projects already granted environmental clearance based on shoddy e flows assessments. Those rivers already saturated with dams, diversions, over extraction of surface and ground water, pollution, sand mining and catchment degradation are also in dire need of restoring their lost flows to the sea both quantity and quality wise. This is also true for the projects under consideration in the Supreme Court now. Hence all the projects must go through this exercise as recommended by this report. Without such assessment and implementation, there is no possibility for the river to perform its minimum functions and no possibility of Ganga Rejuvenation, promised by the current government from day one⁵. Based on this report can MoWR and MoEF atleast take urgent steps to jointly delineate all the river systems in the country into the five categories at the earliest and take steps towards policy decisions to set boundary conditions and / or reverse the trends as recommended? In the case of already heavily flow regulated rivers, reversal of trends would not also mean reservoir re-operation strategies, conservation strategies towards reduce, reuse, recycle norms by all users, zero discharge of pollutants, rain water harvesting, more crop per drop of water, afforestation of catchments and restoration of riparian zones to name a few as part of strategies to set better flows in the river. The Committee needs to widen its ambit for sure.

^{*}Comments on the **MoWR RD & GR Report of the Three Member Committee on Assessment of Environmental Flows in India submitted in March 2015** prepared by Latha Anantha PhD of the E- flows thematic group of the Forum for Policy Dialogue on Water Conflicts in India. The opinions expressed are purely from personal point of view and need not reflect the Forum's views (latha.anantha9@gmail.com). The report submitted in March 2015 is surprisingly not yet put up on public domain till the day this critique is written. The Forum E flows thematic group comprising Latha Anantha PhD, Shripad Dharmadhikary, Partha Jyoti Das PhD, Gorky Chakraborty and Malavika Chauhan PhD are presently engaged in carrying out e flows assessment of Mahanadi basin in the context of river basin planning.

⁵ <https://sandrp.wordpress.com/2015/04/15/mowr-report-on-assessment-of-e-flows-is-welcome-needs-urgent-implementation/>