Moving Towards Environmentally Sustainable Water Allocation in South Asia

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Introduction

In South-Asia, procedures for effective water allocation are not well-defined, and even if allocation is mentioned in water policies (e.g., India), it only lists "allocation priorities" or water sharing arrangements. Water allocation is understood by the clear and stable apportionment of a specified quantity of water, to a user or sector, with a specified security of supply that accounts for natural variation in water resource availability, and contains provisions for changing the allocation in times of low water availability. In South Asia, water use for agricultural growth as well as urban and industrial use have taken center stage and in some cases are exceeding the availability of renewable water. Agro-ecosystem dynamics and excessive infrastructural development have resulted in haphazard, over commitment of water. This particular approach to water resources management and development has led to significant degradation of various ecosystems (Pearce, Atkinson and Mourato, 2006; Falkenmark, Finlayson, Chiuta and Gordon, 2007). Sustainable allocation is important not only when most of the utilizable water has been depleted as in the case of basins such as the Krishna or Ganges in India but also in countries where water resources development is just beginning (e.g., Nepal). Furthermore, to address the challenge of producing even more food under uncertain climate conditions, clearly defined water allocation strategies will be needed.

This paper highlights the need in South Asia for basin-wide water allocation plans that include environmental requirements. This paper also describes the application of a basin planning model (i.e., Water Evaluation and Planning model or WEAP) to assess present and alternative water management options which incorporate environmental flows in the Upper Ganges River in India (total area: 87000 km^2). The paper summarizes the environmental flow assessment methodology which was conducted through a multidisciplinary, multi-stakeholder approach (Building Blocks Methodology or BBM). This is the first time that a comprehensive environmental flows assessment has been done in India.

Key Issues and Challenges

Allocation of river water to cities, industries and agriculture has been a common practice in river basin planning and management and it is now widely accepted that water also needs to be allocated for aquatic environment—alongside the demands of other users. However, in South Asia, economically and socially or politically powerful users have comparatively well-developed methods for quantifying and justifying their water needs, and the ecosystems continue to be the silent and weak water user which have not yet received the required attention in water policies (Venot et. al., 2008). Minimum flows which consist of 10% of low flows continue to be the standard practice for environmental water allocation. Minimum flows however, do not fulfill the environmental requirements of rivers and can sometimes even harm riverine ecology during the dry season where the natural flows might be less than 10% of low flows.

Environmental Flows Assessment

The term "environmental flows" (EFs) is now commonly used to refer to a flow regime designed to maintain a river in some agreed ecological condition. EFs are not just about establishing a 'minimum' flow level for rivers. All of the elements of a natural flow regime, including floods and droughts, are important for protecting the characteristics and diversity of natural communities in a river. All components of the natural hydrological regime have a certain ecological significance. For example, high flows with return periods of 5 to 2 years ensure channel maintenance and riparian wetland flooding. Moderate flows occurring 30–60% of the time may be critical for cycling of organic matter from river banks and for fish migration. Low flows in the 70-95% exceedence range are important for fish spawning, algae control and use of the river by local people. In regulated basins, the magnitude, frequency and duration of some or all flow components is modified and the suite of acceptable flow limits for such modifications can ensure a flow regime capable of sustaining some target set of aquatic habitats and ecosystem processes. EFs can therefore be seen as a compromise between river basin development on the one hand and maintenance of river ecology on the other (Tharme, 2003, Smakhtin and Anputhas, 2006, Smakhtin and Eriyagama, 2008). Furthermore, in South Asia, rivers are widely revered and are an integral part of the culture and society. Therefore, the spiritual and direct social uses of the river are considered very important by the stakeholders and need to be integrated into the EFs assessment process.

The Living Ganga Program

Under the living Ganga program, which was coordinated by WWF-India, EF assessments were carried out under the current as well as future projected climate systems (WWF, 2012, Bharati, 2011). For this study, the Building Block Methodology (BBM) was selected for the assessment of EFs. This methodology allows the user to integrate local requirements, for instance, in case of River Ganga, the spiritual and cultural aspects are of immense importance and thus require due consideration. In addition to the spiritual and cultural aspects, the following sub-components were identified: Fluvial Geomorphology, Biodiversity, Livelihoods and Water Quality. The quantified EF requirements were then incorporated into a basin planning model (WEAP) to look at alternative management practices which assessed basin water re-allocation and the effect of adding EF requirements on water demands in the UGB under both the past and future climate conditions.

The results obtained from this study show that the problem of unmet demands, i.e., not enough water for planned use, occurs only during the winter months of December and January under the past climate and during December, January and February under climate change projected data. Adding EF demand will also increase the unmet demands within the same winter months. During the other months, i.e., March-November, the unmet demands were under 5 MCM.

As agriculture is the largest water user, scenarios with changes in agricultural practices were tested. Results showed that reducing crop type to less water intense crops was more effective in reducing unmet demands than decreasing the cropped area. Furthermore, decreasing water use by only 10% through better irrigation systems, reduced the unmet demands by 22% during the water scarce months. Therefore, investing in water saving technologies as well as increasing irrigation productivity could be good adaptation strategies.

Conclusion

With the increasing population in South Asia as well uncertain future climate conditions, the issue of balancing the needs of the freshwater ecosystems and other water users, becomes critical. As many countries are still in the process of developing infrastructure projects, it is important to also consider EF requirements in the planning stages. For basins, where all the utilizable water has already been allocated, assessment for re-allocation, which includes the environmental demand, is necessary. Effective water allocation frameworks will allow transparent and sustainable use of available water resources.

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