Policy Brief
Water Resources Management

CLIMATE TALKS

Climate-informed Water Accounting: the need for measuring to plan and manage water resources in South Asia

This brief explores the need for water accounting to help governments better plan and manage water resources that are already threatened by the impacts of climate change. Water management policies have profound impacts on all aspects of human settlements. Therefore, water management policies should be grounded in robust science-based information underpinned by socio-political and economic considerations including attention to marginalized regions and segments of the society. This brief is an outcome of the reflections of speakers in a panel discussion organized by Asian Disaster Preparedness Center (ADPC) under the "Climate Talks" series. The topic of the discussion was *Climate-informed Water Accounting: need for measuring to plan and manage water resources in South Asia.*

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Water management and paucity: South Asia faces dual challenge

Countries in South Asia face different levels of water stress. The United Nations Water Development Report 2020 suggests that snowmelt and the loss of glacial buffering in the Hindu Kush–Himalayas will affect the seasonal water supply for a significant proportion of South Asia's population (UNESCO, UN-Water, 2020).

Making up 23.7% of the global population, South Asia has only 4.6% of the world's renewable water resources. According to the World Bank, the key challenges include ensuring there is a reliable supply of water for daily life while ensuring that the consequences of extreme hydrometeorological events are better managed (Hirji et al., 2017). In addition to regional challenges in the water sector, countries have specific and contrasting needs and challenges.

In Bangladesh, most of the rivers are transboundary in nature. Being the largest dynamic delta of the world, along with a growing population base, Bangladesh faces a unique situation in terms of water resource management that is further compounded by rising sea levels and frequent flooding (GED, 2018). Enhanced water security and efficiency of water usage is important for the country to achieve optimal and integrated use of land and water resources. Priorities also include addressing flooding, tidal waves and seawater intrusion into aquifers (CDKN, 2019).

Pakistan's water sector is facing challenges of increased demand of water supply for growing agricultural and domestic needs, whereas the water profile of the country has changed drastically from being a water abundant country to one experiencing water stress (MoPDSI, 2014). Population growth, water-intensive obsolete farming practices, urbanization and impacts of climate change has increased the demand for water. The annual water availability is less than 1,000 cubic meters per person, which is likely to drop to 860 cubic meters by 2025 as documented in the National Water Policy 2018. Pakistan is among the top ten countries with the largest water withdrawal for agriculture. Climate change is also contributing to the depletion of groundwater resources of the country by disrupting the natural hydrological process of groundwater recharge combined with over-extraction. The coastal areas face issues of seawater intrusion and salinity of groundwater.

In Nepal, challenges revolve around extreme temporal and spatial water variability in supply and demand. Around 80% of Nepal's annual average rainfall of 1,858 mm (DHM, 2015) occurs during the summer monsoon period of June to September, when the agricultural demands are lower and a severe shortage of water occurs during the rest of the year resulting in the drying up of springs, rivers and other natural water sources. Optimizing hydropower usage and other instream and offstream usages do remain a challenge.

Globally, South Asia has a high reliance on groundwater for irrigated agriculture production (Sikka et al., 2020). Even though the region hosts several of the high groundwater-producing aquifers, it is running short of water.

Climate change is likely to exacerbate water stress in the region unless current practices to manage and govern water are improved. Water management policies have profound societal impacts. Therefore, water management policies and practices should be based on scientific information underpinned by socio-political and economic considerations focusing on marginalized regions and segments of society.

If you cannot measure it, you cannot manage it

Water is a fugitive resource. Accessing the stock and flow and variation of the resource is difficult and defining the boundaries of these resources is also challenging (van der Zaag and Savenije, 2015). The complexity lies in this fugitive attribute of water. In the field of water management or water resource management, focusing on these attributes and managing them comprehensively can help address existing water challenges.

Water accounting is an integral part of Integrated Water Resources Management (IWRM), which captures the systemic acquisition, analysis, and communication of information related to stocks, flows, and fluxes of water in natural as well as engineered environments (Batchelor et al., 2017). The uniqueness of water accounting is that it takes into consideration both the supply and demand. The water supply refers to availability, capacity, condition, operation, and maintenance of structures

whereas demand refers to the pattern of use and level of service expected by users. Climate change has significant impacts on water supply, while the demand is affected by water scarcity or availability. Water accounting helps water managers to take a more integrated approach that reflects the reality of water use more accurately.

Climate-informed water accounting and auditing are essential for efficient, equitable, and sustainable development and management of the world's freshwater resources. The process of communicating information related to water resources in a geographical domain can be done effectively through water accounting.

Water shortage and scarcity vs. demand and supply

The water management challenge is connected to its temporal-spatial distribution and the biggest issue is that it is not always available at the right place and at the right time (van der Zaag and Savenije, 2015). Consequently, plans to assess and account for the stock and flow of the available freshwater resources face two challenges—shortage and scarcity.

Water shortage is primarily driven by bio-physical factors such as precipitation, land use, geology, or the status of the infrastructural supply systems. On the other hand, water scarcity can be defined both as water shortage and a multitude of factors that drive water demands including population increase. Other elements include user's access to water that is of acceptable quality, social exclusion, poverty, unreliable power supplies, and conflicts, etc.

Demand and supply scenarios will differ in changing and stable climate conditions. Therefore, it is crucial to have actionable information about the impact of climate change on the water budget—demand-supply scenario. Without any knowledge of existing resources or rising demands, countries cannot allocate to the areas that are in need of water supply or make the best use of water. Thus, water accounting is vital to better optimize resource allocation, ensure integrated water resources management and climate adaptation.

How tools and data can guide to adaptation to climate change

Adaptation to change is intuitive. Human settlements along river regions often adapt their lifestyle and integrate different practices according to the environment. The hill tribes of Nepal have been practicing terrace farming for centuries. Ponds have been an integral part of villages in Bangladesh, India, and Pakistan. Areas with limited rainfall or highy vulnerable to flash floods build check dams across streams and rivers to delay the flow of water and augment the groundwater recharge. Building ponds, water tanks, trenches, and water channels are some of the ancient examples of water resources management that are still in practice which not only help in adapting to adversity but also support inter sectoral water sharing as part of integrated water resources management.

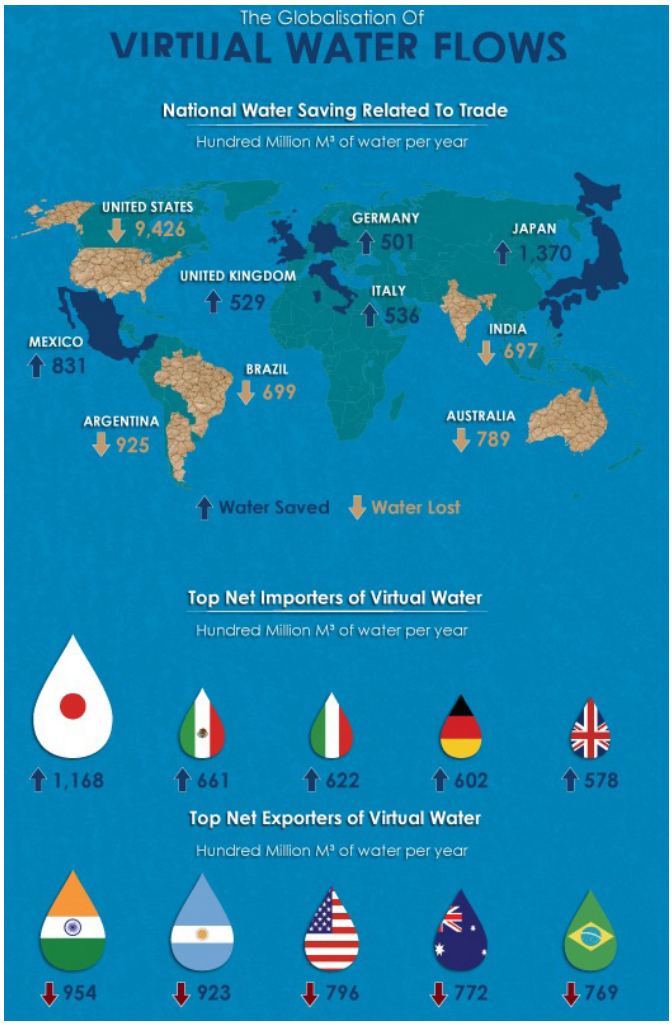
Unlike olden times, the subject of water resources management is more complex and requires concerted efforts by a wide range of stakeholders. Adequate tools and data is a prerequisite to meeting challenges posed by competing uses exaceberated by increasing population, urbanization, life-style changes and climate change.

Water trade: is it too expensive to export?

An improved water management system across sectors, especially for agriculture, is key to managing the crisis of water scarcity. Almost 90% of the available water in South Asia is used for agricultural purposes (Scott et al., 2019). Effective governance, strong institutions, secure water tenure and rights underpinned by water accounting and auditing are important to improve water management across sectors and ensure global food security.

Indian states—Uttar Pradesh, Punjab, Haryana and Tamil Nadu—which are groundwater-stressed based on current supply and future availability—produce 30% of rice and 53% of sugarcane, both water-intensive crops (GoI, 2017). Without water accounting and auditing, these states may continue to grow water-intensive crop varieties that can lead to more water shortage and food insecurity.

In 2018 and 2019, India exported an estimated 25 billion cubic metres of water through grains including rice, maize and wheat through virtual trading of water (DGCI, 2019; Mekonnen et al., 2010). This refers to exports and imports of virtual water through products or commodities that are abundant or surplus in a country. Without having an effective water accounting, however, this may lead to a country's inability to accurately estimate the true price of surplus crops grown in water-stressed and climate change vulnerable regions.



Global Virtual Water Flow (Source: Mekonnen et al., 2011)

Water resources management support through CARE for South Asia project

ADPC has recently launched a World Bank-supported five-year project "Climate Adaptation and Resilience (CARE) for South Asia" focusing initially on Bangladesh, Nepal, and Pakistan, in which integrated water resources management is one of the focused sectors. In the three project countries, accounting of water demand and supply is a key driver to achieving climate adaptation and resilience particularly because agricultural practice and trade is dominant in all of them.

> *Ninety-three percent of water in Bangladesh is consumed by agriculture, however, the government is planning to reduce the stress on groundwater for irrigation by 3% by 2030.*

Ninety-two percent of Bangladesh's all water resources are external as they flow into Bangladesh through transboundary channels (Hirji et al., 2017; Rahaman, 2009) that are largely affected by the changing climate and causing concerns around the country's vulnerability to future projections of water availability. Numerous studies have recommended reforms in this sector, especially on water demand. However, a limited body of knowledge is available on water supply. Against this background, ADPC is developing a climate-informed water accounting framework focusing on agriculture that will enable the agricultural sector to better understand demand-supply needs.

Similarly, 70% of Nepal's water supply comes through the monsoon season that lasts for three to four months in the year, however, changes in the Hindu Kush Himalayan region due to climate change have increased uncertainty in water supply. To tackle this, Nepal needs to better adapt to the increasingly volatile monsoon season by developing efficient systems for rainwater harvesting. ADPC, through the CARE for South Asia project, is working on rainwater harvesting and water accounting to better understand its demand-supply equation.

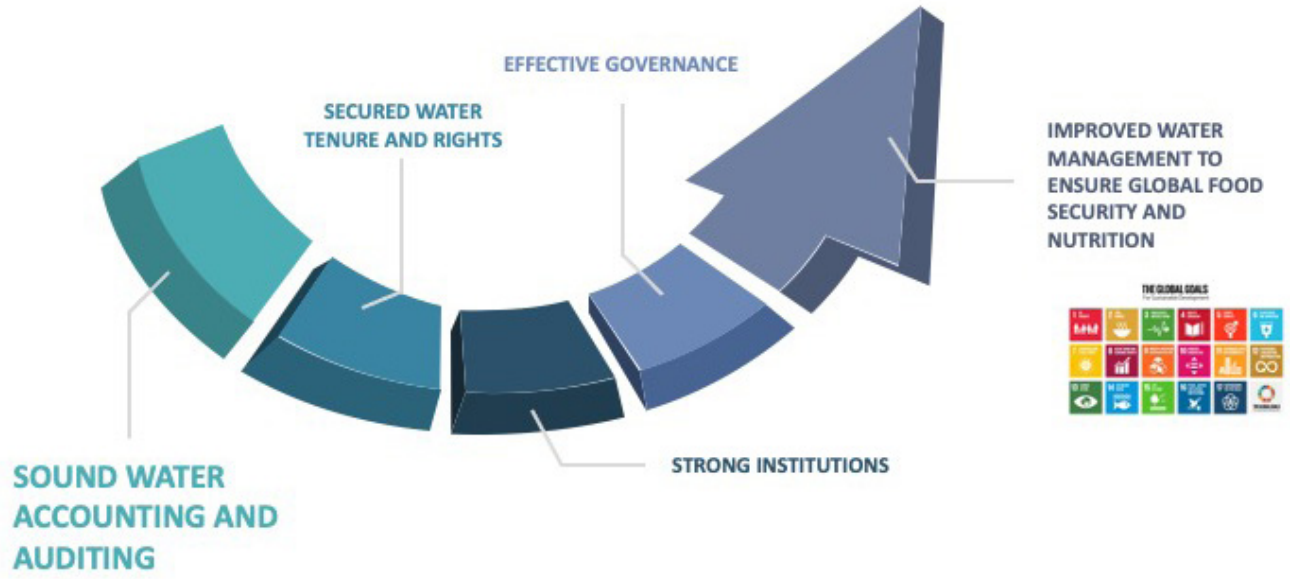
A majority of the recent reports highlight the emergence of water scarcity in Pakistan. Without carrying out water accounting and subsequent policy interventions for water management, Pakistan may become the first water-scarce country in South Asia.

Excessive and unplanned withdrawal of groundwater, compounded with changing climate conditions and variability of precipitation patterns, is adding an additional strain to Pakistan's water resources. Therefore, ADPC is working on a groundwater strategy for drought-affected districts of Pakistan focusing on water demand and supply.

Towards a water-secure future

The emerging water crisis in the region can be avoided through good governance and adaptation strategies by adjusting the ways in which water is managed and governed. ADPC provides the following recommendations:

- Adopt science-based approach in quantifying water and understanding its distribution and subsequent allocation;
- Formulate policies, establishing institutional cooperation and implementation of water adapatation options in the context of Integrated Water Resources Management;
- Ensure social equity which means access to water either in terms of quality or quantity should be equal for all irrespective of gender, wealth, and position;
- Consider economic efficiency which means water should be used for high economical values without financial burden on communities. Water management policies should be based on the current and future sustainable social and environmental future of a community;
- Maintain ecological sustainability which means an ecosystem has to be given priority when designing water management policies. Water is for the ecosystem and the ecosystem is for water;
- A comprehensive legal framework should be developed to locate and generate resources as well as to discourage the exploitation of groundwater, supported by institutional capacity to ensure application of this legal framework;
- Promote climate-smart agriculture, adopt efficient technologies, and introduce crop varieties that are more water-efficient, improve soil conditions and enhance productivity;
- Gender mainstreaming in IWRM projects can enhance effectiveness and efficiency whereas women should be recognized as central to the provision, management and safeguarding of water;
- Capacity building and awareness raising to introduce communities to critical aspects and practical application of integrated water resources management.



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Panelists: Dr. Niladri Gupta, Mr. Adil Foisal, Dr. Laxman Sharma, and Mr. Zamir Soomro Water Resources Management Specialists from ADPC participated as panelists.

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For more information:
Vidya Rana, Communications Manager, ADPC
Email: nusrat.rana@adpc.net

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Asian Disaster Preparedness Center
SM Tower, 24th Floor 979/66-70 Pahonyothin Road
Phayathai, Bangkok 10400 Thailand
Tel: +66 2 298 0681-92
Fax: +66 2 298 0012
E-mail: adpc@adpc.net
www.adpc.net

www.adpc.net
Asian Disaster Preparedness Center - ADPC
@ADPCnet
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