Global Water Partnership
South Asia

asia pacific ADAPTATION NETWORK

Policy Brief 2013

Coping with the increased intensities of floods and droughts in South Asia: *The way forward*

According to the United Nations World Water assessment Programme's Global Trends in Water Related Disasters (2009), disasters triggered by hydro meteorological events outnumbered all other disasters combined. The South Asia region's rainfall varies from year to year, causing droughts and floods that result in deaths along with social and economic shocks. The horrific scale of the flood disaster in June 2013 in the Mahakali basin of Nepal and Uttarakhand in India is an example of the magnitude of the climate change induced water disasters happening in South Asia. Bangladesh potentially the most vulnerable country in the region, one of the most densely populated countries of the world, will experience grave consequences with an increase in cyclones, extreme flooding and higher than average sea level rise. The floods in 2010, 2011 and 2013 in Pakistan with alarming figures of deaths and destruction of infrastructure reconfirms the importance of developing resilience against water related disasters. In India an extreme wet monsoon that currently has a chance of occurring only once in 100 years is projected to occur every 10 years by the end of the century. Almost every country of South Asia faces droughts of varying magnitudes at regular intervals and north-western India, Pakistan and Afghanistan are severely affected. In the recent years Afghanistan faced continuous drought during 1997-2002 and 2007-08 which reduced agricultural production by about thirty percent. India faced droughts in 2002 and 2009 which were no less severe than the droughts of the mid-sixties. Pakistan encountered severe droughts during 1998-2001 in the entire provinces of Sindh and Baluchistan. Similarly Bangladesh faced drought during 1994-95 and 2009, Nepal in 2006 and 2009 and Sri Lanka in 2001 and 2004. Maldives have been facing hydrological droughts during dry season[1]. Over one billion people in South Asia depend on agriculture related livelihoods and predominantly poor are exposed to high level of vulnerability to drought.

Current responses to both floods and drought in the region are dominated by humanitarian relief, without concurrent development of long-term adaptive mechanisms with functioning institutional support. The countries in the region must take steps to prevent the harmful aspects of water related disasters by improving planning, putting in effective infrastructure and establishing disaster preparedness. The aim of this policy brief is to highlight the trends and impacts of extremes in the region in order to raise the awareness of decision-makers and relevant stakeholders regarding the need to re-assess the tools and capacities to cope with such extremes.

Investing on Disaster Risk Reduction and Early Warning in South Asia

In the South Asia region, there is a need to shift emphasis from disaster response to risk management; to improve flood and drought forecasting; to establish early warning systems, and to improve the communication flow. It is advised that comprehensive response plans include technical protocols and guidelines, disaster preparedness policies with allocated resources, decentralised coordination mechanisms, gender policies for implementation, and access of women and children to all interventions in order for the early warning system to be effective.

1. SAARC DMC. 2010. Proceedings SAARC workshop on Drought Risk management in South Asia, 8-9 August, 2010. Kabul, Afghanistan

Comparatively flood forecasting systems are strong in Pakistan and Bangladesh than other countries in the South Asia. Nepal, India Joint Food Forecasting system initiated in 1998 is one of the successful forecasting systems that exist in the region. However, there was lack of preparedness, sharing of information and resources and coordination on both sides of the Mahakali River (which forms boundary between Nepal and India at major stretches) that caused devastating floods in June 2013. In 1996 both the governments entered into a treaty concerning river's integrated development. The treaty has been ratified by both the parties and is in operation. Surprisingly, there was no river-level hydrological monitoring station on the Mahakali River for flood forecasting and early warning[2]. If there was a river monitoring station for early warning that could have provided people with some lead-time and improve flood forecasting and management in the Mahakali basin before the devastating floods. Having early warning systems for floods and embankments when there are floods to protect crops and fields and to prevent destruction of the urban infrastructure and regular drills would save human lives and minimise economic losses. How a prepared India saved lives during monster storm Phailin is a fine example for how South Asia can cope with the increased intensities in climate change related disasters. Both the Indian states affected by Phailin have their own disaster management departments and have built hundreds of cyclone shelters along the coast. One of the major limitations towards disaster preparedness in South Asian is the short range forecasts of floods. In order to make forecast usable, the existing lead time needs to be increased from days to month (seasonal).

Droughts are particularly well suited to early warning systems because the disasters have a slow onset. Seasonal forecasting can greatly assist in managing drought risks in agriculture, particularly in risk-prone rain-fed environments, by providing planners and farmers with timely information, allowing them to decide upon the most suitable coping strategies over short time scales. However, the usefulness of seasonal climate forecasts depends on the capacity of farmers and extension officers to access and utilise climate information and react to it in a timely manner.

A validated system of early warning on drought is unavailable in any of the South Asian countries. The only system available in most countries is the post drought losses recording/evaluation to compensate the victims on a case by case basis. Except India and Pakistan, technical and institutional capacity development is required for most of the leading agencies responsible for early warning in each South Asian country. Some of the state institutions in India have established 24 hour help desk to support farmers with drought information with NGOs building the capacity of farmers.

	1 Existence of Drought Early Warning System (DEWS)	2 Capability to contribute to South Asia DEWS	3 Requirement for infrastructural support	4 Rating of usefulness of South Asia DEWS
Bhutan	No	Very low- Daily and seasonal rainfall prediction	Very high-satellite images of moisture contents, hydrological models, forecast products	*"Important"* ✓
Bangladesh	No	Medium-experience in flood warning, usage of drought prediction tools	High-technical support and training needed	*"Very essential to ensure food security"* ✓
Nepal	No	Low- experience in collecting post-drought information	Very high-more hydro-met stations required	*"One of the best initiatives in the region and my country"* ✓
India	Yes- Especially powerful in certain regions	Very high- experience in usage of different drought indices	Medium-nationalized institution needed who can run a DEWS	*"Extremely useful and essential"* ✓
Pakistan	Yes	Very high- weather radar and GIS special integration systems capability to identify drought	Medium-information for specific drought prone areas needed	*"Moderate in own country"* ✓ *"Strong in South Asia"* ✓
Sri Lanka	No	Low-capacities exist, but need improvement	Very high-information tailored to the areas is needed	*"Very useful"* ✓

Overview of the responses (GWP South Asia. 2013. Summary Report of the Need Assessment Survey on Development of Drought Monitor Prototype for the South Asia)

min → max

2. Jalsrot Vikas Sanstha (JVS) /GWP Nepal. 2013. Overview of June 2013 Floods and landslides with focus on Darchula Disaster

Pakistan has the ability to predict on-set of drought reasonably well, whereas predictability of long term drought requires considerable collaboration and information from international sources. Climate variations, changes and impacts including spatial extent, pre-information on possible drought to timely information to farmers and government for necessary preparedness to cope with drought are essential.

Plan Water Infrastructure to Cope with Disaster

Disasters that occur due to weather extremes affect the existing infrastructure and other built assets results in significant losses. Extreme weather events can increase water insecurity by affecting the functioning and operation of water infrastructure, including hazard protection, storage and delivery capacity, and pollution and wastewater management. The harmful effects of floods and droughts can be reduced by building codes, legislation to relocate structures away from flood-prone areas, planning appropriate land use and migration measures[3]. Therefore, city planning must incorporate climate change adaptation as an integral component. Green engineering and sustainable design has the potential to interact with the hydrologic cycle intercepting storm-water runoff and putting it to beneficial use[4].

In planning water infrastructure attention has to be given to:

- the need to cope with greater variability in river flow due to changes in temperature and precipitation, with possible damage to water supply infrastructure during heavy rains or droughts;
- salinisation of coastal groundwater reservoirs;
- vulnerability of water services designed for steady conditions under new, highly variable conditions, such as floods and droughts;
- likelihood that water supply, treatment and desalination options will become increasingly energy intensive and expensive, while climate change may cause conflicts between mitigation and adaptation policies.

a) Rain Water Harvesting (RWH)

To alleviate water scarcity, in 2011 the city of Dhaka, Bangladesh announced it would amend its building code to require rooftop RWH systems in new buildings. RWH systems have been established on all the islands in Maldives and each household has 2,500 litre water tank to store water. Regrettably the rainwater storage capacity is inadequate at household and community levels to supply water throughout the dry seasons. In 2012, emergency water was supplied to more than 55 islands. For the last

seven years the country spent more than US$ 2 million to provide emergency water during the dry spell (Ministry of Water and Environment, Maldives). Sri Lanka has since 2009 legislated that every new building in urban and municipality area should have a RWH system to collect rain water[5]. Despite this there are few RWH systems in use in these areas today. If properly done, "rainwater harvesting appears to be one of the most promising alternatives for supplying freshwater in the face of increasing water scarcity and escalating demand", according to the UN Environment Programme. The installation of RWH will increase the cost marginally (0.5%) but is a viable low cost option to overcome water shortage during droughts[5].

b) Water Supply and Sanitation Infrastructure

Many adaptation policies often focus mainly on long-term water resource management or on improving forecasting abilities, sometimes neglecting the management of new risk elements, such as water supply and sanitation in adverse weather. Water quality will be a major end point of the pressure applied by extreme weather events to water supply and sanitation systems and current adaptation policies should address this issue. Managing risks and building capacity to deal with unpredictable events should be a priority, especially among the most vulnerable rural and urban poor. Floods in dense, poorly serviced settlements can lead to other hazards, such as water borne diseases, which have a significant impact on the health of urban poor residents. Systematic assessments of climate change resilience of all utilities, including rural water and sanitation programmes, are needed. 'No regrets' investment schemes are needed for both 'hard' adaptation measures such as infrastructure and 'soft' adaptation measures such as incentives and demand management.

A significant modification of strategies, infrastructure, systems and practices will be needed. Such approaches are currently being adopted by many water and wastewater utilities in pan-European region[6]. Knowledge of these issues should be made available within water utilities in South Asia region in order to facilitate direct involvement in

3. Bingunath Ingirige, Keith Jones. 2013. Improving resilience of existing infrastructure and built assets against extreme weather. International Journal of Disaster Resilience in the Built Environment, Vol. 4 Iss: 3

4. Green Building Council of Sri Lanka, Sustainable Building Design Guideline for Sri Lanka http://srilankagbc.org/ape/Green_Design_Guidelines.pdf

5. Strand, A. 2013.Urban Rain Water Harvesting and sustainable water management in Sri Lanka

6. UNECE, WHO. 2010. Guidance in Water Supply and Sanitation is Extreme Weather Events

developing adaptation strategies. Appropriate adaptation measures for infrastructure and the overall system ability to cope in extreme weather event situations should be carefully assessed in view of emerging risks.

c) Flood Water Harvesting Practices

Delaying the flow of water during the wet season and building water storage infrastructure to hold water for distribution in the dry season is important to mitigate floods and drought. Flood storage can be used to improve water based rural livelihoods particularly agricultural production and reduce adverse impacts from extreme events. Technologies to harvest and store surface water runoff for productive use, have evolved over the millennia throughout water scarce regions of the world, especially in Sri Lanka in South Asia. One drawback is the large areas required for the construction of the flood retention structures in order to be effective and can be heavily affected by evaporative losses. However, there are new developments such as Underground Taming of Floods which is applicable to vulnerable cities[7].

The following should be considered in designing flood water harvesting practices.

(i) identification and assessment of the specific areas with greatest opportunity for floodwater harvesting and need for additional water;
(ii) in-depth investigations to assess local site suitability;
(iii) engagement between the farming and water resources sectors to arrive at an effective implementation model; and
(iv) establishment of demonstration sites to show technical and economic feasibility and develop guidelines that incorporate workable institutional arrangements.

7. Bharati, L.; Lacombe, G.; Gurung, P.; Jayakody, P.; Hoanh, C. T.; Smakhtin, V. 2011. The impacts of water infrastructure and climate change on the hydrology of the Upper Ganges River Basin. Colombo, Sri Lanka: International Water Management Institute. 36p.(IWMI Research Report 142)

The way forward

Country level monitoring and Flood/Drought Early Warning System facilities are required to develop and strengthen national capacity, help scale down data required for impact analysis, improve early warning system at local level, and make the institution responsible to provide updated information to the users and help reduce the adverse impacts of flood/drought on climate vulnerable communities. The countries are encouraged to develop facilities at the country level and make public institutions responsible to operate and provide regular updates to minimise losses from floods and drought. Improvement of collection and dissemination of climate related data and information by improving hydrological monitoring station networks to strengthen monitoring of extreme events is of utmost importance in establishing regional early warning systems in South Asia. Information delivered to decision makers in a timely and appropriate format can reduce impacts if mitigation measures and preparedness plans are in place.

Developing seasonal climate predictions to assist farmers and improving national agricultural extension services in order to secure farmers' self-reliance by providing better information about effective weather and climate risk management and sustainable use of natural resources for agricultural production will reduce the impact of floods and drought on food production.

Hard infrastructure recommendations are in six areas: planning and design, water capture and storage, water and wastewater reuse, storm water management and flood control, urban agriculture and greening, and buildings[8]. There is a need to re-examine natural and artificial storage options in the light of climate change and overall national water needs, and develop a comprehensive plan for storage development in the countries of South Asia especially in the Himalayan region. Implementation of existing RWH policies and amending the building codes to make use of the rainwater is of utmost importance in coping with droughts in South Asia. Creation of an enabling environment and supporting policies for the use of unconventional water sources, such as wastewater management, for the redeployment, recovery and reuse of water for human and other competing uses is needed.

There are many efforts in practice to improve Integrated Water Resource Management (IWRM) and early warning capacities. However, the region has not yet fully reconciled how IWRM can be applied from the perspective of mitigating extreme events whilst maximising water security and water productivity at the river basin level. It is no longer only a question of engineering or financial solutions; as a matter of urgency an overall assessment is required of new risks for water availability and quality in extreme situations. Technical solutions are possible, but these solutions must also take into consideration unresolved development problems, such as the growing population and highest Global Hunger Index Score which indicate emerging food insecurity in South Asia.

8 Asian Development Bank. 2013. Guidebook: Increasing climate change resilience of urban water infrastructure—Based on a case study from Wuhan City, People's Republic of China