PROCEEDINGS REPORT

Regional Day Programme of GWP South Asia on

"From Risk to Resilience: South Asia Regional Framework for Sustainable Water Management"

15 January 2015,
Pragati Maidan, New Delhi, India




INDIA WATER WEEK-2015

Organized By

India Water Partnership

In Association With

Global Water Partnership South Asia,
SAARC Disaster Management Centre,
WAPCOS Ltd. and
Asia Pacific Adaptation Network

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Proceedings Report:

Regional Day Programme of GWP South Asia on "From Risk to Resilience: South Asia Regional Framework for Sustainable Water Management", 15 January 2015, Pragati Maidan, New Delhi, India

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Inaugural Session

PROCEEDINGS REPORT

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15 January 2015, Pragati Maidan, New Delhi, India

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ACRONYMS

APAN	Asia Pacific Adaption Network
BhWP	Bhutan Water Partnership
CBFEWS	Community Based Flood Early Warning Systems
CCA	Climate Change Adaptation
DRR	Disaster Risk Reduction
GAN	Global Adaptation Network
GPRS	General Packet Radio Service
GWP	Global Water Partnership
GWP SAS	Global Water Partnership South Asia
ICIMOD	International Centre for Integrated Mountain Development
ICT	Information and Communications Technology
IDMP	Integrated Drought Management Programme
IPCC	Intergovernmental Panel on Climate Change
IWP	India Water Partnership
IWRM	Integrated Water Resources Management
KSNDMC	Karnataka State Natural Disaster Monitoring Centre
NDMC	National Disaster Management Centre
OECD	Organisation for Economic Co-operation and Development
SAARC	South Asian Association for Regional Cooperation
SDMC	SAARC Disaster Management Centre
SEARCA	Southeast Asian Regional Centre for Graduate Study and Research in Agriculture
UNDESA	United Nations Department of Economic and Social Affairs
WACREP	Water and Climate Resilience Programme

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Background and Rationale

Impacts of disasters have long been considered as tragic interruptions to the development processes. Disasters, in the past two decades, in general have spread their wings all across South Asia and other parts of the globe. Disasters, over the years, have consumed millions of lives and precious infrastructure. Because of disasters, the infrastructures created over the years in different sectors - health, education, roads, communication, power, irrigation, housing, agriculture etc., generally have premature death (without giving intended services). The affected countries begin their development activities from the same point from where they started by diverting their development funds to reconstruction of infrastructure. Additional aid is also directed to relief and reconstruction needs to get the country 'back on track' towards economic and social development.

South Asia is most vulnerable to the climate change. The most visible impacts can be seen in terms of melting of glaciers; landslides, cloudburst and disasters like Tsunami. The climate change has not only adversely affected the water resources but has also made the region vulnerable to various hydrological shocks posing huge long term recovery challenges. Due to a variety of complex issues including climate change, depletion of water resources has become a looming crisis in South Asia.

Keeping the above issues in view, the Global Water Partnership South Asia (GWP SAS) launched a programme in 2013 namely; Water and Climate Resilience Programme (WACREP) which envisaged a high level consultation among the SAARC countries to foster regional cooperation in tackling the climate change impacts. This was one of the activities among the various activities in the South Asia Region under WACREP.

With the above backdrop, India Water Partnership (IWP) in association with SAARC Disaster Management Centre (SDMC), GWP SAS , WAPCOS Limited and APAN organised the Regional Day Programme of GWP SAS on "From Risk to Resilience: South Asia Regional Framework for Sustainable Water Management"on 15 January 2015 at Pragati Maidan, New Delhi during India Water Week-2015.

Main Objective

Main objective of the programme was to draw upon regional experience, knowledge and case studies to discuss how increasing the water efficiency can help create a society that is more resilient to climate change and natural disasters.

The Programme

The programme was divided into four sessions viz;

(i) Inaugural Session;
(ii) Technical Session-I;
(iii) Technical Session-II, and
(iv) Valedictory Session.

View of the Inaugural Session

Setting the Context

Dr Veena Khanduri, Executive Secretary-cum-Country Coordinator, India Water Partnership (GWP-India) and Focal point

While setting the context, Dr Veena Khanduri welcomed the Chief Guest, Ms Uma Bharti, Honourable Minister of Water Resources, River Development and Ganga Rejuvenation, Government of India; the dignitaries on the dais and the participants on the occasion of Regional Day Programme of GWP SAS. She informed about the purpose and objectives of the programme. She said that today's discussion will come out with framework for action with wide range of issues. She also emphasized that further consultations through GWP-SAS, SAARC and APAN may continue on a regular basis, but it is necessary that the member countries start implementing the programmes that are of emergent nature or of high priority, and share their experiences from time to time. This would help in developing a Regional tool box of good practices and would also enrich the tool box of GWP.

> It is necessary that the member countries start implementing the programmes that are of emergent nature or of high priority, and share their experiences from time to time

Opening Remarks by **Dr Veena Khanduri**

Welcome Address

Mr R. K. Gupta, President, IWP and Chairman-cum-Managing Director, WAPCOS Ltd.

In the welcome address, Mr R. K. Gupta, President, IWP and Chairman-cum-Managing Director, WAPCOS Ltd. said that water plays a critical role in all aspects of life and livelihood of people as well as in development of national economies. With increase in population and development, the pressure on water resources intensifies due to rise in demands in domestic, agriculture and industrial sectors, leading to excessive pressure on environment.

He further said that in recent years the incidences of natural disasters like droughts and floods have resulted increase in diseases and deaths along with causing acute social and economic shocks as well as chronic stresses.

Welcome Address by **Mr R. K. Gupta**

> There is a need to distinguish the critical knowledge gaps and issues in science, policy and practice and to address them through collective wisdom and collaborative action at the regional level in the South Asia. As also highlighted in the post-2015 framework for Disaster Risk Reduction (Hyogo Framework Action 2) in the SAARC region, one of the key focus areas is to collaborate and work together as a region to address the various risks through early warning mechanism, regional response mechanism, knowledge management etc.

The World Bank-2014 recent report says that the South-Asian Sub-Continent is home to more than one fifth of the world's population i.e around 1.5 billion people, and water forms a part of the cultural, social, economic and political fabric of the lives of these people. At the same time the region is also among the most water stressed regions of the world. The report of UN Water also suggests that by 2020, around 120 million people will experience increased water stress in South Asia and South East Asia.

Mr Gupta added that keeping in view the above issues, cooperation and management in water resources could do much to mitigate vulnerabilities through enhanced protection and management of water resources, equitable distribution and timely disaster warnings as well as agricultural forecasts. It could also become a powerful entry point for wider regional integration. However, it requires policy makers, researchers, advocacy groups and civil society groups to come together and build mutual awareness and understanding of the common water resource challenges.

Keynote Speech

Mr Anuj Kumar Bishnoi, I.A.S., Secretary, Ministry of Water Resources, River Development and Ganga Rejuvenation, GOI

Mr Bishnoi in his keynote address said that fresh and clean water is a limited natural resource which plays a vital role in all aspects of lives and livelihoods of people as well as development of national economies. In South Asia, water resources are under severe stress particularly due to huge population, high level of poverty, urbanization and rapid economic growth. South Asia's population is set to top two billion by 2025.

Keynote Address by
Mr. Anuj Kumar Bishnoi, I.A.S.

Focusing on key challenges in the region, Mr Bishnoi said that the basic sanitation and water quality comes first. The pressure on water resources is increasing rapidly and South Asia is facing a serious and growing water quality challenge. According to United Nations Department of Economic and Social Affairs (UNDESA) report, around 80 per cent of the diseases in developing countries are caused by unsafe water and approximately 900 million people in South Asia do not have access to basic sanitation.

Though endowed with vast water resources, the region is also subject to floods and droughts, along with other natural calamities, which is now likely to worsen with the changing climate.

Another challenge is the depletion of groundwater which is one of the serious issues in many parts of South Asian countries. The period from 1975 to 1990 had seen rapid growth in groundwater irrigation in South Asia that has been one of the drivers in agrarian boom in the region. India, Pakistan, Bangladesh and Nepal account for the bulk of world's use of groundwater in agriculture. While providing sustenance to agrarian economy, groundwater development has created chronic problem of depletion as well as quality deterioration of ground water.

Along with hydrological cycle and water resources, the science of climate change is one of the critical challenges in the management of river basins. Improper land use, soil erosion, land degradation, current agricultural practices, eutrophication, degraded ecosystems etc. requires

> Degraded watersheds have become one of the serious future challenges for sustainable development in South Asia. A number of community based watershed management projects have been implemented in the SAARC region. Learning from these project experiences can be drawn to inform both policy makers and the practitioners.

special consideration in the river basin management. The need for enhanced understanding of the impacts of land use and other development activities on water resources remains significant in specific river basins hence integrated land-use and water-resources planning needs proper implementation. Challenges with respect to the availability of scientific data require particular attention in the management of river basin. Considering the critical role of water systems management in poverty alleviation in South Asia; domestic water security, economic use of water, prevention of pollution, promotion of sustainable water use, mitigation of damages from floods and droughts are the critical challenges which require urgent attention for a sustainable framework.

> With the increase in population and improvement in economic status, demands on the available resources are increasing for which we have to constantly strive towards stretching the available water to satisfy the needs of larger population. As a result, there is an urgent need to conserve and utilize the limited availability of water resources in an optimum and efficient manner. The challenges in water systems management is rooted in the common objective of all the countries – poverty alleviation and sustainable development.

The services provided by the water based ecosystems in the region on which the livelihood of a large number of poor people depend, the growing complexity in the social and political dimensions of water access and use, etc. can form the anchor points around which a framework for interdisciplinary research on water systems in South Asia can be prepared.

Address

Mr R. K. Jain, I.A.S., Secretary, National Disaster Management Authority, Government of India

Mr R. K. Jain in his speech said that concerted efforts and investments need to be made to increase water use efficiency, maintain water quality, conserve and augment water. From

Address by **Mr R. K. Jain**, I.A.S

the point of disaster risk reduction and climate change risk, he said that countries and stakeholders can address sustainable water management by adopting disaster risk management approach. He further said that it is important to link efforts on disaster risk reduction, climate change, preservation of bio-diversity and eco-system to be able to address disaster management in a meaningful manner.

Mr Jain concluded that the task ahead involves adoption of multi-secotral, institutional and stakeholders approach with respect to address-

Mr R. K. Jain advocated for adopting people centric early warning systems and investing in institutional strengthening across the cross spectra of water and sanitation and related areas. The resultant benefit would be immensely through mutual information sharing, setting-up of common facilities and augmenting capabilities and capacities within the SAARC member countries towards sustainable water management.

ing challenges of water management and mitigating the impacts of disasters.

Address

Mr I. R. Onta, Chair, GWP SAS

Mr I. R. Onta in his speech said that the topic of the Regional Day Programme of GWP SAS is rather an apt and contemporary subject. Therefore we must take modern science and technology to come to the stipulated cooperation related to water matters in South Asia region in particular. It is important to give adequate attention to emerging climate related issues which are of very high importance. As per United Nations Intergovernmental Panel on Climate Change (IPCC) findings, Bangladesh, India and Nepal are the most vulnerable to climate change among the countries of the world. The South Asia region is facing unprecedented water induced and water related calamities like floods, droughts and landslides almost in each succeeding years. The Jammu and Kashmir floods in India, the Indus basin floods in Pakistan and India, landslides in Nepal and Sri Lanka and droughts in some parts of India, Pakistan and Sri Lanka during 2014 can be attributed to climate change phenomenon.

Address by **Mr I. R. Onta**

Mr Onta said that it is now imperative that the region can share their experiences for the benefit of one and all. He emphasized on; (i) devising Early Warning Systems to forecast in order to respond as quickly as possible; (ii) sharing of data through modern science and technology in order to analyse and synthesize data; (iii) setting- up a South Asia Water Forum to exchange water related experiences and knowledge regularly; and (iv) bringing all stakeholders and important actors to discuss cotemporary water and climate change related issues.

Inaugural Address

Ms Uma Bharti, Honourble Minister of Water Resources, River Development and Ganga Rejuvenation, GOI

Ms Uma Bharti, Honourable Minister of Water Resources, River Development and Ganga Rejuvenation, Government of India was the Chief Guest who inaugurated the event. In her inaugural address, Ms Bharti said that India has always given utmost importance to bi-lateral and multilateral cooperation among the SAARC countries. The Government of India under the dynamic leadership of the Honourable Prime Minister Shri Narendra Modi is determined, to give further boost to this cooperation in the years to come. She further said that at present she will only dwell upon the basic approach that the member countries of the SAARC could adopt in evolving a regional framework for action to deal with the impact of climate change on India's water resources. She stressed that the framework should lay special emphasis on developing resilience and reducing risks. She further said that the focus of such consultations should be on sharing of knowledge on wide range of issues and also on sharing of experiences in various aspects of water management.

She informed that the National Water Mission has been constituted in India which has developed a comprehensive document giving inter alia an Action Plan with time frame for identified strategies. Various organisations/agencies who would implement these plans have been identified and also implementation of most of the plans has been initiated. Ms Bharti further said that other SAARC countries also must prepare their own plans for sustainable water management.

Ms Uma Bharti, Honourble Minister of Water Resources, River Development and Ganga Rejuvenation, GOI

> The region should develop a water-conscious society that treats water as a precious gift of nature and considers its conservation and protection as its sacred duty, other measures to be able to ensure adequate availability of water of desired quality in the years to come. The looming spectra of climate change and its likely adverse impacts on the country's water resources have to be the main theme of our public awareness and educational programmes.

Vote of Thanks

Dr Veena Khanduri, Executive Secretary-cum-Country Coordinator, IWP Focal point

Dr Veena Khanduri, Executive Secretary-cum-Country Coordinator, India Water Partnership (GWP India) extended the vote of thanks to Chief Guest, Ms Uma Bharti, Honourable Minister of Water Resources, River Development and Ganga Rejuvenation, Government of India; dignitaries on the dais; distinguished national and international delegates and the participants for sparing their valuable time to attend the Regional Day programme of GWP SAS. She also thanked SDMC; WAPCOS Ltd., GWP-SAS and APAN for collaborating in organizing this important event during India Water Week-2015.

Vote of Thanks by **Dr Veena Khanduri**

Key Recommendations

- SAARC member states should emphasize on a regional framework which should lay special emphasis on developing resilience and reducing risks;
- An enabling environment may be provided in the form of appropriate policies and legislation;
- There is a need to develop appropriate technologies especially at the grass-root level;
- There should be institutional strengthening for better governance;
- Focus should be made on key challenges in the region on basic sanitation and water quality;
- Challenges of depletion of groundwater in the region needs to be addressed;
- Best practices need to be drawn from SAARC region on community based watershed management projects;
- For better sustainable water management, the Governments, Institutions and Stakeholders should manage both demand and supply issues and invest in measures to improve water governance;
- At country level, strengthen efforts to meet water sector infrastructure requirements including operation and maintenance costs;
- At institutional level, Governments must invest in reinforcing institutional reforms and implementation of existing provisions affecting the performance level for water service delivery;
- Knowledge and skills of the community members need to be harnessed to tap local resources and capacities;
- Investments need to be made on maintaining the water quality and its conservation;
- Emphasis should be made on sharing data through modern science and technology. There is a need to set-up a South Asia Water Forum to exchange water related experiences and knowledge regularly;
- Bringing all stakeholders and important actors is required to discuss contemporary water, climate and water related issues.

Technical Session - 1

Water Resources Management, Disaster Risk Reduction (DRR) and Climate Change Adaptation in South Asia: Key Issues and Challenges in Water Sector Governance with Focus on Policy, Legislation and Institutional Reforms

Technical Session I in progress

The First Technical Session on "Water Resources Management, Disaster Risk Reduction (DRR) and Climate Change Adaptation in South Asia: Key Issues and Challenges in Water Sector Governance with Focus on Policy, Legislation and Institutional Reforms" was chaired by Mr A. B. Pandya, Chairman, Central Water Commission, Government of India and co-chaired by Dr Lam Dorji, Chairman, Bhutan Water Partnership (BhWP).

There were five speakers viz;

i) Dr Ravinder Kaur, Director (Acting), Indian Agricultural Research Institute (IARI) and Project Director, Water Technology Centre, IARI, Government of India;

ii) Dr K. A. Haq, Vice-President, Bangladesh Water Partnership (BWP);

iii) Mr N. V. V. Raghav, Senior Water and Sanitation Expert, World Bank;

iv) Dr Champa Navaratne, Professor, University of Ruhana, Sri Lanka; and

v) Mr Mohammad Sayed Qazi, Head, International Relation Department, Afghanistan National Disaster Management Authority.

1.1 Chairman's Remarks

Mr A. B. Pandya in his remarks said that the topic selected for Technical Session-I is very important with regard to water resources management and disaster risk reduction in South Asia with respect to climate change. He said that the policies, legislations and institutions play a vital role and when disasters occur, the entire mechanisms that are in place have to be operational without any prior notice or very little prior notice. Therefore, the mechanisms need to be established, well-coordinated, put in place and kept ready so that they can act at the right time.

Water related disasters are many and most common but we consider flood as the serious disaster. Similarly there are slow moving disasters like droughts wherein the long term effects are mostly equal and devastating. Flood forecasting is useful to give proper warning to take the ameliorating measures in terms of flood maps in post disaster response. Therefore, it is important to have both post disaster and pre disaster management preparations. He said that in the past there was a certain pattern of floods that was recurring in flood prone areas having annual or some kind

of sub-cycle floods. Therefore, the preparations and mechanisms were established well in advance. Based on the annual cycles, India established flood forecasting systems for Ganges and Indo-gangetic plains. Now the pattern has changed and what we witness is the floods occurring as a result of climate phenomena that may take place at any place and any time which is not expected in the normal circumstances.

Chairman's Remark by **Mr A. B. Pandya**

Mr A. B.Pandya further said that there were two or three such incidents last year. Uttarakhand floods caused devastation simply because the local area was not ready. Similarly the local area where the landslides occurred in Nepal had certain amount of planning. Jammu and Kashmir floods and especially the floods in Jhelum valley in which we receive a rainfall 300 times more than the normal rainfall resulted huge mischief. Therefore, in these areas, the institutions have to respond at a short notice. Apart from that, it is important that the forecasting mechanisms should be such that at a short notice it can provide advance notice of a particular disaster. So that the advisories can be sent to all the concerned especially the down-stream users and down-stream affected parties for timely action. The advance preparation time will help and mitigate the disaster in a larger way and similar is the situation in case of droughts.

Mr A. B. Pandya further said that droughts generally give about six months warning. Therefore, when it is observed that the trend of monsoon is weak then the relevant agencies can take a long term view and project the future yields and compare with the normal demands. Then the shortfall can be identified to take necessary action to cope up with the situation. However, the institutional mechanisms have to be kept in place in order to deliver the responses on time.

> Water management and disaster risk reduction need to be integrated with climate change adaptation and taken seriously. South Asia is a region where there is a common hydro-meteorological environment. The mechanisms which are providing us water all are connected and therefore, it is important to know the rich experiences from each country. Policies, legislations and institutions play a vital role and when disasters occur, the entire mechanisms that are in place have to be operational without any prior notice or very little prior notice.

Concluding his remarks, Mr. Pandya said that it is expected that today's session is going to provide us opportunity to share the experiences from the representatives of the South Asian countries in context of theme of this session.

1.2 Remarks of the Co-Chair

Dr Lam Dorji said that the theme "Risk to Resilience" is a very appropriate topic for the region. Climate change is becoming a very pressing issue for humans to tackle, the risk is high because of the level of uncertainties that

Co-Chairman's Remarks by **Dr. Lam Dorji**

climate change brings. Also people should be able to cope with the impacts.

Dr Dorji encouraged all the countries to get together and find solutions. He said that since morning it has been emphasized by dignitaries and other speakers, that developing resilience in terms of water resources management, is mainly connected with institutional mechanisms. Concluding his remarks, Dr Dorji said that all have to be prepared from household level to the local level, national and international level for water security in view of the threats posed by the climate change.

1.3 Setting the Context

Prof Santosh Kumar, Director, SAARC Disaster Management Centre (SDMC), New Delhi briefed about the role of SAARC member States. He said that South Asia has been struggling on "Too much and too little water". At times people are suffering from floods and sometimes with drought. Outsiders at times get confused that despite of having abundance of water, South Asia suffers from drought therefore there is a problem of water management in the region.

SDMC tried to resolve the problem through multi kind of forums, multi kind of disciplines or through multi-channels. Therefore SDMC joined with IWP, Global Water Partnership (GWP), Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India, WAPCOS Ltd. and APAN to organize this event at India Water Week-2015 who are having similar views about resilience building.

Session by **Prof Santosh Kumar**

Presentations

1.4 Dr Ravinder Kaur, Director (Acting), Indian Agricultural Research Institute (IARI) and Project Director, Water Technology Centre, IARI, GOI

Dr Ravinder Kaur made a presentation on "Drought Monitoring and Management – An Indian Experience". She said that 70 per cent population (900 million) of India depend on agriculture; 68 per cent net sown area (97 M ha) is drought prone; and 50 per cent of drought prone area is severe in nature. India has faced 22 major droughts from 1871 to 2012, out of which 5 were severe droughts. South west monsoon contributes 80 per cent of total rainfall in India during four months i.e. June to September.

She said that the drought in India is recognized with a rainfall deficiency of more than 20 per cent. She defined drought as (i) meteorologically, ± 19 per cent deviation of rainfall from the long-term mean is considered 'normal' in India; (ii) deficiency in the range 20–59 per cent represents 'moderate' drought, and more than 60 per cent is 'severe' drought; (iii) a year is considered to be a drought year when the area is affected by moderate and severe drought, either individually or together, i.e, 20- 40 per cent of the total area of the country and; (iv) when the spatial coverage of drought is more than 40 per cent, it is called as all India severe drought year.

Dr Kaur further described the criteria for declaration of drought by the different States as drought is the State subject in India. However, she said that there is no unified and standard criterion for

Presentation by **Dr Ravinder Kaur**

drought declaration in India. She also mentioned about various models of drought monitoring like; agricultural drought monitoring; meteorological and hydrologic monitoring; monitoring by using composite indices, etc.

Increased production by using water saving technologies

At end of her Presentation, Dr. Kaur shared one of the drought mitigation and adaptation efforts made by IARI in Mewat region which is one of the most backward district of Haryana (India) through (i) Renovation of soil/water conservation structures and community ponds; (ii) Laser leveling; (iii) Laying of underground pipelines; (iv) Sprinkler Rain gun irrigation; and (v) Drip irrigation. The resultant benefits observed in two districts of Mewat region are given in the following table:

District	Water Saving Technologies	Water Saved/ha/ season (Cu. m)	Time Saved per irrigation (hr)	GHG Gas Emission Reduction (Kg CO2 /ha)
Nuh	Laser leveling	578	5-6	100.5
	Sprinkler/Raingun	693	6-7	121
	Underground Pipeline	500	3-4	60
Taoru	Laser leveling	576	5-6	100.5
	Sprinkler/Raingun	693	6-7	111
	Underground Pipeline	432	3-4	60

1.5 Dr K. A. Haq, VP, Bangladesh Water Partnership (BWP)

Dr K. A. Haq made a presentation on "Water Resources Management, Disaster Risk Reduction in Climate Change Adaptation in Bangladesh". He said that Bangladesh is a low laying delta formed in the confluence of three mighty rivers; the Ganges, Brahmaputra and Meghna. These rivers have a combined peak discharge in the flood season of 180,000 m3/sec. (the second highest in the world, after the Amazon). As per the IPCC, Bangladesh is defined as most vulnerable country to climate change. Once in every 4 to 5 years, there is severe flood which inundates around 80 per cent lands of Bangladesh, causing severe damages to the lives and livelihood. Dr Haq said that in Bangladesh, the existing water resource management measures are conventional and fragmented for which a more efficient and sustainable solutions are needed.

Presentation by **Dr K. A. Haq**

He cited the examples of water management issues and challenges in Bangladesh such as (i) too much water in monsoon and occasional flooding; (ii) too little water in dry season and dwindling fresh water resources due to upstream uses; (iii) cyclones, storm surges and salinity intrusion; (iv) overexploitation, salinization and arsenic contamination of groundwater; (v) river erosion and stabilization (vi) water pollution; (vii) climate change etc.

> Dr. Haq concluded his speech stating that disasters will strike and we all have to face it and we have to be resilient to that. The whole region has to unite through united programmes and solve the disasters and crises that would strike in future. He further said that South Asia can face any disaster with the available resources, the technologies and through united and concerted efforts.

He said that the basic challenges in Bangladesh due to climate change are; (i) increase of intensity and duration of natural disasters such as floods, cyclones and storm surges; (ii) increase of droughts due to erratic precipitation; (iii) salinity intrusion due to sea level rise; (iv) inundation due to sea level rise leading towards "climate refugees"; (v) effects on health and livelihood of coastal people ; (vi) effects on bio-diversity, ecology and sundarbans; and (vii) hampered food security and social security.

Dr Haq introduced the management institutions who are involved in disaster risk reduction in Bangladesh and the institutions involved in flood forecasting and warning at global and regional level. He further informed about the disaster management planning framework, policy and governance and disaster risk reduction framework which were developed in Bangladesh.

1.6 Mr N. V. V. Raghav, Senior Water and Sanitation Expert, World Bank

Mr N. V. V. Raghav in his presentation covered groundwater issues; surface water issues; disaster risk vulnerability issues and some of the experiences he gained in the World Bank.

Presentation by **Mr N. V. V. Raghav**

He highlighted that in Indo-gangetic river system, many aquifers are underlying. These aquifers are recharged with monsoonal rains and by leakage from the canals. There is excessive use of surface water in high water table areas. As most groundwater system react slowly to changes which are occurring on the earth's surface,

Mr Raghav said that India is the largest groundwater user in the world with an estimated usage of around 230 cubic kilometres per year which is more than a quarter of the global total. If the current trend continues in the next 20 years, about 60 per cent of our aquifers will become critical. This will have wider implications on social, economic and livelihoods issues.

groundwater acts as an important buffer against the hydrological variability of surface water especially during droughts. Hence conjunctive use of groundwater and surface water can be a key adaptation strategy.

He also highlighted his experience from the World Bank assisted project for the efforts to mitigate risks from natural disasters in the States of Orissa and Andhra Pradesh. He shared that project interventions includes; improving early warning system and communication systems; strengthening capacity of local communities to respond to disasters; and strengthening disaster risk management capacities at Central, State and local levels.

1.7 Dr Champa M Navaratne, Professor, University of Ruhana, Sri Lanka

Dr Champa M. Navaratne made a presentation on "Water Resources Management, Disaster Risk Reduction (DRR) and Climate Change Adaptation in South Asia: Key Issues and Challenges in Water Sector Governance with Focus on Policy, Legislation and Institutional Reforms-Sri Lankan Perspective". She said that the annual rainfall in Sri Lanka varies between less than 1000 mm to over 5000 mm. She also narrated about the history of water resources management in Sri Lanka. She said that concept of Integrated Water Resources Management (IWRM) was part of hydraulic civilization dating back from 6th Century BC and water was treated with respect. There was strong link between temple, tank and the community. However, the water was regulated through edicts issued by the Kings and there was penalty for the non-compliance by the community.

Presentation by **Dr Champa M Navaratne**

Dr Navaratne further briefed about the existing institutional arrangements for water management in Sri Lanka. She also talked about the various water rights like; (i) rights based on land ownership; (ii) appropriative rights (Purana lands); (iii) riparian rights; (iv) decision making rights; and (v) State rights.

On the issue of disaster management in Sri Lanka, she said that w.e.f 1996, National Disaster Management Centre (NDMC) has been undertaking the disaster management activities consisting preparedness, mitigation, response and recovery measures and the Department of Social Services is providing relief assistance while the

Rehabilitation and Reconstruction Department and several other organisations are assisting to displaced persons in the event of civil conflict.

She further added that the challenges in case of disasters in Sri Lanka are; (i) inadequate early warning; (ii) lack of coordination; (iii) non-availability of institutional framework; (iv) lack of communication and information system; (v) non-availability of a District and Divisional contingency plan; (vi) lack of political will; (vii) inadequate risk, vulnerability, damage and capacity assessment; (viii) lack of knowledge and skills of the officials related to response and recovery measures ; (ix) lack of modern technological support; (x) lack of public awareness and perception of the people regarding the disasters; (xi) unplanned settlement, etc.

Presentation by **Mr Mohammad Sayed Qazi**

1.8 Mr Mohammad Sayed Qazi, Head, International Relation Department, Afghanistan National Disaster Management Authority

Mr Mohammad Sayed Qazi started his presentation with a brief about Afghanistan and said that Afghanistan is among the World's 15 least developed countries.

More than 80 per cent of water resources originate in the Hindu Kush Mountains. Seasonal variation has caused extreme snowfall, floods and droughts. Temperature and precipitation is strongly influenced by elevation ranging from 0 mm to 1000 mm per annum.

Afghanistan is rich in water resources mainly due to series of high mountains. These mountain ranges function as a natural storage of water in the form of snow during winter. Based on the hydrological and morphological system, Afghanistan is divided into four main river basins and it shares these rivers with Iran, Pakistan, Kirgizstan, Tajikistan, Turkmenistan and Uzbekistan. Hence regional cooperation on shared water resources is very necessary to ensure sustainable development in the region.

Mr Mohammad Sayed Qazi further said that with respect to disaster risk reduction, people

> Afghanistan is ranked among 15 most vulnerable countries in terms of lowest natural disaster coping capacities. In terms of human development, Afghanistan is ranked 175th out of 187 countries in the United Nations member States. Afghanistan is regularly experiencing floods, earthquakes, avalanches, landslides and droughts.The current priorities of Afghanistan lie in mitigation efforts including better preparedness and responses to floods and droughts.It is therefore a felt need for regional cooperation among the SAARC countries to mitigate the impeding effects of the climate change.

are lacking awareness about climate change, insufficient weather forecast with limited model and personnel trained in high altitude conditions in his country. Communities are presently lacking knowledge on climate change, technical capacity, management capacity and also have limited resources. Therefore informed decision-making and increased public awareness about the climate change needs to be ensured in the country. Floods are the main natural disaster in Afghanistan which aggravates poverty. Hence technical advances in flood forecasting and management offer an opportunity for regional cooperation in disaster management among the SAARC Member States. The current priorities of Afghanistan lie in mitigation efforts including better preparedness and responses to floods and droughts.

Key Recommendations

- Drought management approach should be shifted from fund release mechanism to a focussed mitigation approach;
- No country in isolation can face a disaster therefore pooling of various resources, techniques, research findings need to be brought together;
- Capacity building of South Asia region need to be pooled together (Scientists, Researchers, Resource Persons, etc.);
- There is a need for training and awareness building at the community level on knowledge on climate change and adaptation;
- Allocation of drinking water supplies need to be increased in order to meet the future demand from the surface water;
- Community level management for groundwater needs to be practiced;
- There is need to sensitize the community on water conservation;
- Strengthening of communication and coordination among SAARC member States during disasters is important;
- There is need for capacity building on weather forecasting system within South Asia region;
- There is also a need for regional cooperation in space technology and early warning systems;
- It is essential to address the issue of over utilization of groundwater.

Technical Session - 2

Developing a Joint Framework for Learning and Action for Effective and Sustainable Water Resource Management from a DRR and CCA perspective in the South Asian Region

Technical session II in progress

The Second Technical Session on "Developing a Joint Framework for Learning and Action for Effective and Sustainable Water Resource Management from a Disaster Risk Reduction and Climate Change Adaptation (CCA) perspective in the South Asian Region" was chaired by Dr Amita Prasad, I.A.S., Joint Secretary (Admin and GW), Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India and Co-chaired by Mr Mohammad Sayed Qazi, Head, International Relation Department, Afghanistan National Disaster Management Authority.

There were five speakers namely; (i) Dr V. S. Prakash, Former Director, Karnataka State Natural Disaster Monitoring Centre and former Scientist, Central Ground Water Board, Government of India; (ii) Ms Naseer Faroosha Ali, Senior Programme Manager, National Disaster Management Centre, Maldives; (iii) Dr Partha J Das, Head (Water, Climate and Hazard), Aaranayak; (iv) Mr Gehendra B. Gurung, Programme Leader, DRR South Asia (Practical Action, Kathmandu); and (v) Prof V. K. Goswami, Former Vice-Chancellor, Sangam University and Sunrise University, Alwar (Rajasthan).

2.1 Chairpersons' Remarks

Chair of the session, Dr Amita Prasad, I.A.S., Joint Secretary (Admin and GW), Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India, said

Chair, **Dr. Amita Prasad**

that the theme of today's workshop and deliberations are not limited to water security and water risk management. She said during the morning session it was discussed the type of cooperation that the SAARC Countries can have and she is looking forward to witness the collaboration. Dr Prasad mentioned that the disaster management authorities in most of the countries in South Asia are working on disaster risk management. However, there is need for data sharing and experience sharing between nations as each country has different expertise.

2.2 Remarks by the Co-Chair

Mr Mohammad Sayed Qazi, Head, International Relation Department, Afghanistan National Disaster Management Authority, in his remarks first thanked the Chair for giving the opportunity to set the tone of the Technical Session-II. Speaking about the importance of water as vital natural resources for survival, Mr Mohammad Sayed Qazi emphasized more on the conservation and protection of water through innovative and scientific means.

Co-Chair, **Mr Mohammad Sayed Qazi**

> Flagging the issue of trans-boundary water, he said there are lots of potential and opportunity in the region, if water is used judiciously. It should be used equally as per the international rules and standards for drinking, irrigation, navigation etc. He said that the wastage of water should be closely monitored and all should emphasise on reuse and recycling of water. He concluded his remarks stating that water can be a point of cooperation among neighbouring countries in the region.

2.3 Prof V. K. Goswami, Former Vice-Chancellor, Sangam University and Sunrise University, Alwar (Rajasthan)

Prof. V K Goswami said that disasters cannot be eliminated; therefore, it needs firm determination to face it. Understanding of disasters help to manage it properly, thus optimization of disaster management due to "too much and too little water" is the need of the time. Talking about disasters caused by "too much water" Prof. V K Goswami mentioned about Cyclonic Storms, Tsunami (i.e, water earthquake), floods, river bank erosion. He also said that improper water management of river water channelization and dams also causes huge loss of lives and property in the region. Further elaborating on disasters due to "too much water" he said that rise of sea level due to global warming is also a cause of concern. Coming to the disasters caused by "too little water", he mentioned about droughts, inadequate water harnessing e.g. rain water harvesting, inadequate water conservation, and misuse of water due to un-civic habits like; toilets, shaving, brushings, washing floors, washing cars, gardening flushing system, etc.

Presentation by **Prof V. K. Goswami**

Speaking about the importance of early warning and forecasting system in disaster management, Prof. Goswami mentioned about qualitative and quantitative forecast of natural disasters, qualitative and quantitative forecast of manmade disasters, mitigation and diversion of natural disasters towards unpopulated areas by changing its course under innovative research to control the disasters.

Prof. Goswami also mentioned that SAARC has developed weather forecasting system for the region that needs to be shared with the public at large and also the regional cooperation may be extended to China and Philippines.

2.4 Dr V S Prakash, Former Director, Karnataka State Natural Disaster Monitoring Centre and former Scientist, Central Ground Water Board, GOI

Dr V. S. Prakash made a presentation on "Water Resource Management using: Real time data , information and predictive analytics". Following the discussion from previous sessions on risks and managing the risks he shared the experience of developing a monitoring and forecasting system and addressing the issue at the sub-continent level.

Presentation by **Dr V S Prakash**

Dr Prakash told that response time is very crucial in disaster management which he elaborated by citing the example of recent Delhi Zoo Case where an youth who fell into the animal's enclosure had 10 minutes for the response but the authority didn't act timely and he succumbed to his fate. According to the forecasting of Organisation for Economic Co-operation and Development (OECD), India is projected to be water deficit by 2030 therefore there is a necessity for India to improve skills and technology in water management.

A case study of a monitoring system in Karnataka was presented by him where designing an appropriate preparedness and early warning system has made life simple and safe with customized solutions. He said, Karnataka State Natural Disaster Monitoring Centre (KSNDMC) has set up a General Packet Radio Service (GPRS) enabled telemetric rain gauge and Weather Station Network at Gram Panchayats of Hubli Taluka which together gives a good monitoring system. In which the data collection time to information on near time scale has been reduced drastically. Thus, collecting data, customizing and making it available to end users has become quick and response time has been reduced. Communities at risk are being informed through mobile phones.

Dr Prakash further elaborated the outcomes of the Web Based Data Management System which are given below;

- Near real-time rainfall data; significant reduction in time gap between data generation and information generation;
- Rainfall data on hourly/sub hourly basis;
- Alerts on high intensity/heavy/very heavy rainfall events;
- Accurate and reliable data in building up trust under weather based crop insurance programme;
- Data dissemination in weather forecast model;
- Rainfall forecast and advisories at Gram Panchayat level; and,
- Speedy, dynamic and informed decisions taken at the State Level Weather Watch Committee, State Level Coordination Committee on Crop Insurance and Water Management.

KSNDMC has developed a package consisting of monitoring and forecasting through web enabled data management system that focus on providing advisories (warnings about bad weather conditions) to farmers and inputs to the Weather Based Crop Insurance Programme in Karnataka. The information generation is made possible in less than two minutes as compared to 7.5 man hours earlier. The time taken has been reduced considerably to 255 times.

2.5 Ms Naseer Faroosha Ali, Senior Programme Manager, National Disaster Management Centre, Maldives

Ms Naseer Faroosha Ali gave a presentation on "Water – Too Much or Too Little= Hazard". She started her presentation by giving a brief account of Maldives physiogeography. Maldives has a total land area of 298 sq. km, in 1200 coral islands which is divided into 26 atolls and only 188 are inhabited. The total population is around 400,000 as per the 2014 census. Temperature of Maldives is warm and humid with yearly temperature varying from 27^{0}C to 34^{0}C. The main occupation of Maldivians is tourism, fishing, agriculture and constructions and the country is heavily dependent on imports for survival.

In terms of water resources management in Maldives, there are public awareness and advocacy, provision of water tanks for water scarce regions, flood mitigation projects, emergency water provisions and integration of disaster risk reduction into developmental projects and plans. There are also planned projects on rain water harvesting and projects to maintain a water reserve for emergencies which will be materialized in the near future.

Presentation by **Ms Naseer Faroosha Ali**

While elaborating on disasters in Maldives, Ms Naseer Faroosha Ali highlighted that out of 169 incidences reported in 2014, 158 i.e. 93.4 per cent are water related. Out of 158 incidences, around 111 incidences are related to water scarcity i.e. too little water. This indeed is an irony, where the country being surrounded by water but still faces the acute problem of water scarcity.

2.6 Dr Partha J Das, Head (Water, Climate and Hazard), Aaranayak

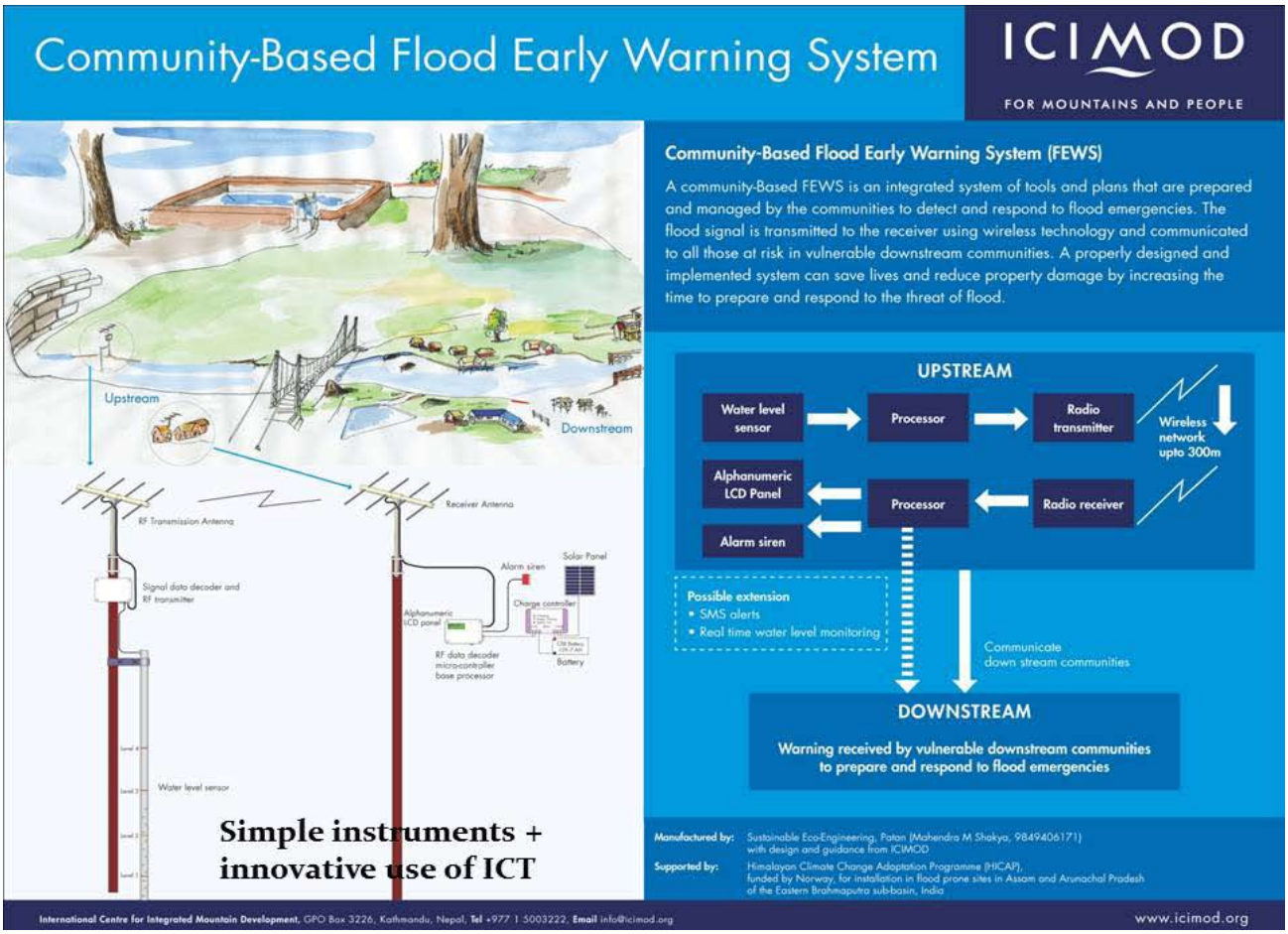
Dr Partha J Das started his presentation with the emphasis on development of joint framework, learning and action for water resource management and disaster risk reduction in the context of climate change. He narrated the story of Brahmaputra basin wherein Lakhimpur and Dhemaji districts are reeling with impacts of climate change in the form of increasing intensity and frequency of water related disasters. The region is in high risk zone and high exposure because most of the people are living on the river bank.

Dr Partha further said that Aaryanak has organised awareness meetings with the communi-

Presentation by **Dr Partha J Das**

ties for enabling people to be proactive during floods. For example; identification of shelter and escape routes and evacuation planning. ICIMOD and Aaryanak have plans to request the State and local government agencies to mainstream these practices into regular disaster and mitigation activities in both the districts.

Highlighting the Aaryanak and International Centre for Integrated Mountain Development (ICIMOD) Community Based Flood Early Warning Systems (CBFEWS) in Lakhimpur and Dhemaji districts of Assam, Dr. Partha J Das explained that through innovative and transformative solutions, around 20,000 people from 40 villages (20 villages in each catchment) in the river catchments were benefitted. Further he said that this system is designed in a way that community can manage and respond to flood emergencies by



using simple innovative use of Information and Communications Technology (ICT) solutions. Elaborating the system he said that water level sensors are placed on the upstream that are connected to a processor and radio transmitter. The flood signal is transmitted to the receiver using wireless technology and communicated to all those at risk in downstream communities. The multi-level information and communication system provides enough time to prepare and respond to the floods. The risk levels are defined by consulting the communities and transmitted in intervals.

The joint framework of early warning system by ICIMOD and Aaryanak has increased alertness in upstream and downstream communities about the flash floods which are replicable to the other areas.

2.7 Mr Gehendra B. Gurung, Programme Leader DRR South Asia (Practical Action, Kathmandu)

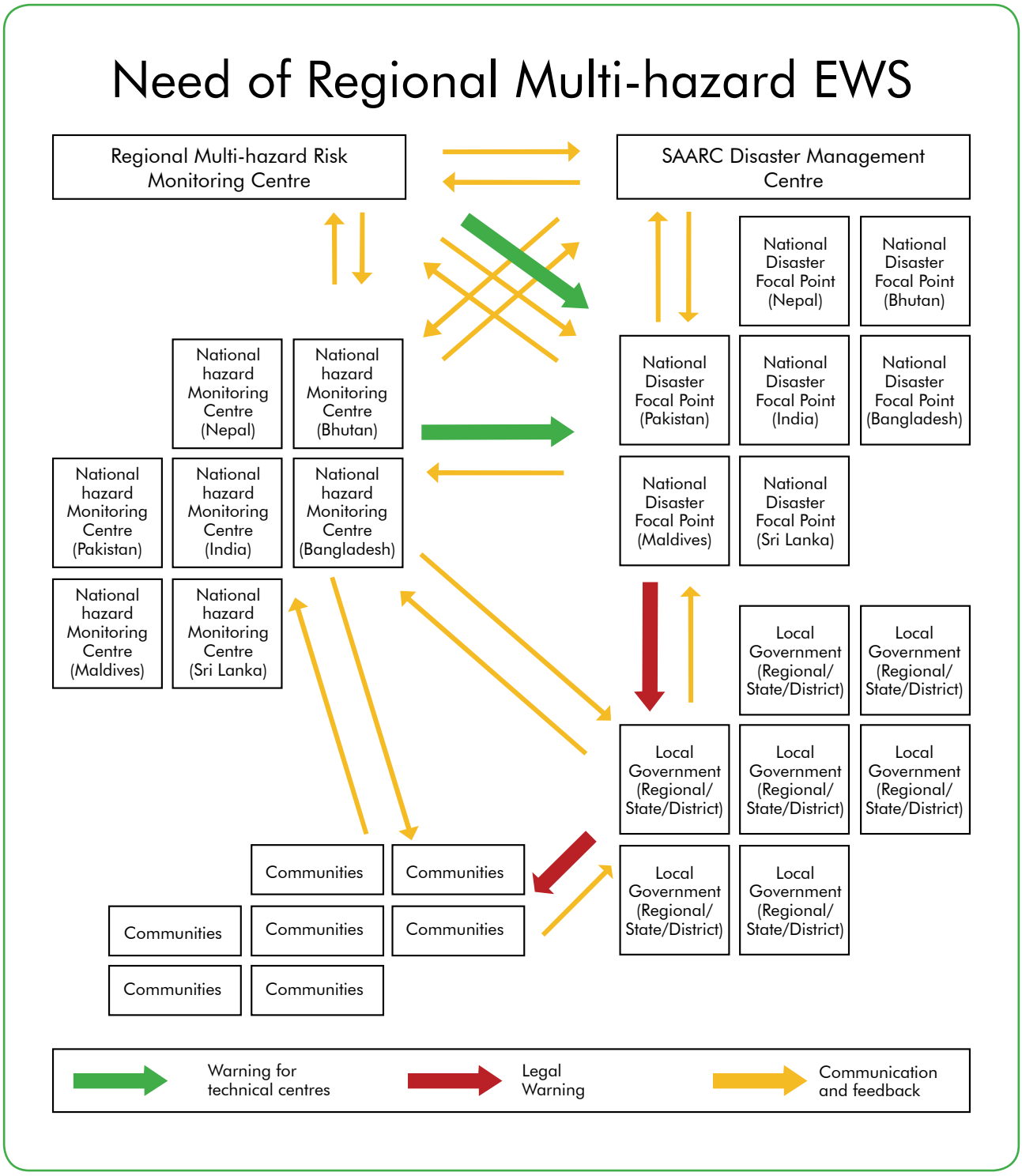
Mr Gehendra B. Gurung made a presentation on "Cross Border Flood Disaster and Role of Cross Border Early Warning System". He said that there were five major catastrophes in 2014 in India, China, Pakistan, Nepal, Vietnam, Philippines and Afghanistan due to floods, flash floods and landslides. He further said the devastating floods which took place in transboundary rivers in Nepal and India i.e. Koshi floods in 2013, Mahakali floods in2013 and Karnali (Ghaghra) floods in2014 have killed millions of people in India and Nepal and inundated huge areas in both the countries.

Mr Gurung said that there is a gap in sharing information on floods for early warning system between the two countries. He elaborated that

Presentation by **Mr Gehendra B. Gurung**

Information sharing and mutually agreed action plans are lacking between Nepal and India with regard to water induced disaster as per JVS/GWP Nepal, 2013. Like-wise, in case of Mahakali Floods in 2013, some warnings were disseminated by the Indian Meteorological Department but still it was not transmitted to the public who were at risk as per ICIMOD, 2013.

Mr Gurung emphasised that regional cooperation in the form of early warning systems, cross-boundary information sharing, and a regional strategy for disaster risk reduction would assist the countries in flood disaster management.



Mr.Gurung said that initiatives have been taken by the two countries (India and Nepal) on early warning information sharing with regard to Karnali (Ghaghra) river to some extent. He concluded his presentation by stating that there is a need for regional multi-hazard early warning information sharing between the SAARC countries.

Key Recommendations

- There is need to recycle the waste water into usable water;
- Need for qualitative and quantitative forecasting of natural disaster and manmade disasters;
- Conduct innovative research to control the disasters by simulation and numerical weather forecasting;
- Mitigate and divert the natural disasters towards unpopulated areas by changing its course;
- Develop micro irrigation development system for water resource management;
- Develop better drought management systems through better monitoring and early warning system at national and regional level;
- Capture and strengthen the data base for accurate forecasting;
- Improving and capturing Spatial Resolution Data Sharing for accurate forecasting;
- Raise public awareness regarding water storing;
- Create water emergency provisions at community level;
- Development of better dissemination process with community and local administration level; and,
- Integrating work for joining to CBFEWS at local level, etc.

Valedictory Session

View of the Valedictory Session

The Valedictory Session was chaired by Dr A. M. Gondane, I.F.S. Joint Secretary, SAARC, Government of India and Co-chaired by Ms Angela Klauschen, GWP Senior Network Officer – China & South Asia. The speakers in the session were; (i) Ms Yi Ying Lee, Associate Coordinator, Asia Pacific Adaptation Network (APAN); (ii) Mr Lal Induruwage, WACREP Manager, GWP SAS; and (iii) Prof Santosh Kumar, Director, SDMC, New Delhi.

3.1 Remarks by Chair

Dr A. M. Gondane, I.F.S., Joint Secretary, SAARC, Government of India, in his remarks appreciated the hard work of GWP SAS, IWP, SDMC, WAPCOS Ltd., APAN and the Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India for organizing this important event during India Water Week-2015.

He said the Ministry of External Affairs, GOI, over the years have not only moved ahead in the fields of water management, disaster management, climate change efforts, but also have consistently taken the whole region and the member States of SAARC along with them. This is because they believe that in a split way we deprive ourselves from the available wisdom and possibili-

Chair, **Dr A. M. Gondane**

ties to combat the impact of disasters and climate change in the near future. He further emphasized the importance of knowledge sharing with South Asian nations. The technology and innovations needs to be harnessed and shared for the benefit of both present and future generations.

The region needs to move together and must have faith to deal with such common issues. The deliberations today have come-up with several recommendations and these will be considered, as the region can only be benefitted from collective wisdom said Dr Gondane.

Ms Angela Klauschen flagged the potential way forward in the region by enumerating few points like; (i) to scale up the cooperation at the multilateral level; (ii) to replicate the tools and mechanisms; (iii) strengthening the capacity and education; (iv) data sharing and exchange of expertise from member countries as well as beyond the region like China and Central Asia; and (iv) opportunities to develop ecosystem based approach for combating climate change impact and natural disasters.

3.2 Remarks by the Co-Chair

Ms Angela Klauschen, GWP Senior Network Officer China and South Asia, Co-chair of the session in her remarks thanked the Chair for giving the floor. She expressed that it is a great day for her because this is the first time she is attending for the India Water Week and honoured to attend the same. She said there has been plethora of initiatives in the region and beyond the region and exist lots of commonalities among member countries on the projects and programmes on climate change related disasters. Also there is significant number of projects and initiatives ongoing on early warning, monitoring, community based involvement and capacity building within the South Asia region.

Co-Chair, **Ms Angela Klauschen**

She also talked about trans-Himalayan dimension of cooperation on water resources and management; where China, Myanmar and Central region cooperation is very crucial for addressing the issues of glacial melting and its impact.

Presentations

3.3 Ms Yi Ying Lee, Associate Coordinator, Asia Pacific Adaptation Network

Ms Ying Lee started her address by briefing about the role of APAN in addressing issues related to climate change and adaptation in the water sector in Asia Pacific region. She further elaborated that APAN is a regional programme

Presentation by **Ms Yi Ying Lee**

for managing and applying adaptation knowledge, and supports governments and other organisations working on adaptation, with special emphasis on the management of knowledge and capacity building. APAN is a part of United Nations Environment Programme's - Global Adaptation Network (GAN) which is a platform for generating and sharing of knowledge on climate change adaptation. It is primarily supported by Ministry of Environment, Japan.

Ms Lee further said that APAN mission is building climate change resilient and sustainable human systems, ecosystems and economies through the mobilization of knowledge, enhanced institutional capacity and informed decision making-processes, and facilitate access to finance and technologies. APAN supports climate change adaptation through the following four core activities;

- Knowledge management which helps policy makers and practitioners and influences global dialogues. The APAN web portal serves as the region's primary knowledge platform and resource repository for climate change adaptation practitioners. Knowledge synthesis is critical to adaptation. APAN is continually developing its knowledge base with updated information on emerging and priority issues in climate change adaptation.
- Asia-Pacific Climate Change Adaptation Forum is a flagship programme of APAN which provides a unique opportunity for a large number of diverse stakeholders to get together to learn the latest adaptation knowledge from each other and to expand their networks.
- Sub-regional and thematic conferences, and targeted training workshops provide learning opportunities for climate change adaptation practitioners to discuss common and cross-cutting environmental issues such as water, food security and others.

She highlighted the flagship programme of Asia-Pacific Climate Change Adaptation Forum that has been organised for last four years, which is the biggest forum on CCA in the region. Over 500 experts and practitioners on climate change from 50 countries attended the fourth forum on CCA which was held in Kuala Lumpur from 13 to 14 October in 2014. In the last forum there was a panel discussion on ability to withstand drought, flood, water supply and sanitation.

She said APAN has three thematic nodes;

- **Water:** GWP SAS
- **Mountains:** ICIMOD
- **Agriculture:** Southeast Asian Regional Centre for Graduate Study and Research in Agriculture (SEARCA)

She concluded her presentation by saying that since 2011, APAN has conducted a total of 41 training workshops, sub-annual conferences, and forums across a number of climate change adaptation areas. The number of developing country government officials who participated in APAN forums since 2011 totals to around 4,000 people. Awareness on CCA was raised among newer stakeholders during these events such as; Members of Parliament in South Asia were trained on framing adaptation strategies in public policy-making processes in Islamabad, Pakistan in December 2013.

At the end of her presentation a special request was made by participants to APAN requesting them to conduct similar workshops in each South Asian country.

3.4 Mr Lal Induruwage, WACREP Manager, GWP SAS

Mr Lal Induruwage in his speech said that together with demographic, economic, environmental, social and technological forces, climate change has developed to a major driver which influences water resources management. Global warming and its associated consequences are being manifested in terms of increased climate variability and extreme weather events such as floods and droughts. These have become more frequent and intense in many regions. Stability in food production depends on how well we adapt to this increasing climate variability and change. South Asia, with 20 per cent of the world's population and 40 per cent of the world's poor, is one of the most food insecure regions in the world.

Presentation by **Mr Lal Induruwage**

Conditions of vegetation and soil moisture are not yet monitored and reliable detection of drought emergence and progression at regional level remains challenging. In this context, the project on "Development of South Asia Drought Monitoring System" was initiated as a join undertaking of International Water Management Institute (IWMI), GWP SAS and the World Meteorological Organization/Global Water Partnership which is called as Integrated Drought Management Programme (IDMP). The key partners are intergovernmental, governmental and non-governmental organizations involved in drought monitoring, prediction, drought-risk reduction and management. The project has two phases namely; Phase I (July 2014 to April 2015) and Phase II (April 2015 to December 2015).

Mr Induruwage mentioned that the primary objective of the project is to develop an innovative approach for monitoring and assessing the drought risk, based on integration of meteorological data, vegetation condition from satellite imagery and targeted collection of ground truth moisture and crop-yield data that supports directly at increased resilience to drought. The project will develop an online drought monitoring system for South Asia-encompassing Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka in the first phase that will be based on spatial composite maps of drought indices updated approximately every week or two – as new remote sensing data becomes available from public sources and processed for the purpose of the project.

Mr Lal said that it has been estimated that of the total 1 billion food insecure people in the world, 30 per cent live in South Asia. The economic damage caused by drought in agriculture is growing whereas effective tools for monitoring drought for designing and implementation of preventive measures, remain limited. Information on the development and the possible drought threat is based solely on meteorological data, which are limited in principle.

Finally, Mr Induruwage briefly informed about the WACREP of GWP SAS. He said that the WACREP was launched during India Water Week-2013 and is presently being implemented in all the six countries of GWP SAS which include; Bangladesh, Bhutan, Nepal, India, Pakistan and Sri Lanka. He further said that more than 40 climate resilience interventions are planned for the first phase – from October 2013 to March 2015, with the financial support of GWP and DFID. On successful completion of first phase, a set of new activities will be taken-up during the second phase.

3.5 Prof Santosh Kumar, Director, SDMC, New Delhi

Prof Santosh Kumar expressed his deep gratitude to Ministry of External Affairs, Government of India for accepting the invitation for the event and supporting all the initiatives. He also thanked Dr A. M. Gondane, Joint Secretary, SAARC for chairing the session despite his busy schedule. He appreciated the thoughts and experiences expressed and shared by the eminent speakers of the session for ensuring water security and climate resilience in the region.

Prof Santosh Kumar said that he is deeply indebted and obliged to the Honourable Minister Water Resources, River Development and Ganga Rejuvenation the senior Secretaries of Government of India and the Chair, GWP SAS for giving their insights and support which is highly commendable to take the SAARC and GWP SAS agenda forward.

Presentation by **Prof Santosh Kumar**

He thanked SAARC Secretariat and Governing Body for approving the programme and partnering with IWP, GWP SAS, WAPCOS Ltd. and APAN for organising this programme.

3.6 Vote of Thanks

Ms Priyanka Dissanayake, Regional Coordinator, GWP SAS, gave the vote of thanks and appreciated the hard work and efforts of IWP(GWP India) GWP SAS, SDMC, New Delhi, Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India, WAPCOS Ltd. and APAN for their collaboration to make this event successful.She mentioned that GWP SAS organized the Regional day side event in India Water Week held in 2013 and this is the second time that GWP SAS organized the regional day side event. Ms Dissanayake ensured that GWP SAS is hoping to organize the Regional day side event in the future India Water Weeks as well.

Vote of thanks by **Ms. Priyanka Dissanayake**

Key Recommendations

- Technology and innovations needs to be harnessed as well as shared for the benefit of present as well as future generations;
- Knowledge sharing with South Asian nations is important in present climate change scenario;
- There is a need for data sharing and exchange of expertise from SAARC member countries as well as beyond the region like China and Central region;
- Develop ecosystem based approach for combating climate change impact and natural disasters;
- There is a need to scale up the cooperation at the multilateral level.

Annexures

Annexure I

INDIA WATER WEEK-2015

Regional Day Program of GWP-South Asia

From Risk to Resilience: South Asia Regional Framework for Sustainable Water Management

January 15, 2015 (Hall No. 2, Pragati Maidan, New Delhi)

0930-1000 hrs	Registration
Inauguration Session	
1000-1005 hrs	Welcome Address by Mr R. K. Gupta, President, IWP and Chairman-cum-Managing Director, WAPCOS Limited
1005-1015 hrs	Bouquet presentation by IWP/GWP and SDMC and Lighting of Lamp
1015-1025 hrs	About the Regional Day Programme by Prof Santosh Kumar, Director, SAARC Disaster Management Centre (SDMC), New Delhi
1025-1035 hrs	Keynote Address by Mr Anuj Kumar Bishnoi, Secretary, Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India
1035-1045 hrs	Address by Mr R. K. Jain, Secretary, National Disaster Management Authority, Government of India
1045-1055 hrs	Address by Mr Iswer Raj Onta, Chair, GWP-South Asia
1055-1110 hrs	Inaugural Address by the Chief Guest, Sushri Uma Bharti, Honourable Minister of Water Resources, River Development and Ganga Rejuvenation, GOI
1110-1115 hrs	Vote of Thanks by Dr Veena Khanduri, Executive Secretary, India Water Partnership
1115-1130 hrs	Tea Break
Technical Sessions	
1130-1230 hrs	**Technical Session 1**: Water Resources Management, Disaster Risk Reduction (DRR) and Climate Change Adaptation in South Asia: Key Issues and Challenges in Water Sector Governance with Focus on Policy, Legislation and Institutional Reforms. **Chair**: Mr A. B. Pandya, Chairman, Central Water Commission, GOI **Co-chair**: Dr Lam Dorji, Chairman, Bhutan Water Partnership **Setting the context**: Prof Santosh Kumar, Director, SAARC **Speakers**: • Dr Ravinder Kaur, Director (Acting), Indian Agricultural Research Institute and Project Director, Water Technology Centre, IARI, Government of India • Dr K. A. Haq, Vice-President, Bangladesh Water Partnership; • Mr N. V. V. Raghav, Senior Water and Sanitation Expert, World Bank; • Dr Champa Navaratne, Professor, University of Ruhana, Sri Lanka;

	• Mr Mohammad Sayed Qazi, Head, International Relation Department, Afghanistan National Disaster Management Authority • Open House Discussions and Questions & Answers
1230-1330 hrs	Lunch Break
1330-1400 hrs	Technical Session-1 Contd.....
1400-1515 hrs	**Technical Session 2**: Developing a Joint Framework for Learning and Action for Effective and Sustainable Water Resource Management from a DRR and CCA perspective in the South Asian Region **Chair**: Dr Amita Prasad, I.A.S., Joint Secretary (Admn. & GW), Ministry of Water Resources, River Development and Ganga Rejuvenation, GOI **Co-chair** : Mr Mohammad Sayed Qazi, Head, International Relation Department, Afghanistan National Disaster Management Authority **Speakers**: • Prof V. K. Goswami, Former Vice-Chancellor, Sangam University and Sunrise University, Alwar (Rajasthan) • Dr V. S. Prakash, Former Director, Karnataka State Natural Disaster Monitoring Centre & former Scientist, Central Ground Water Board, Government of India • Ms Naseer Faroosha Ali, SAARC representative from Maldives • Dr Partha J Das, Head (Water, Climate and Hazard), Aaranayak • Mr Gehendra B. Gurung, Programme Leader DRR South Asia • (Practical Action, Kathmandu)
1515-1530 hrs	Tea Break
1530-1600 hrs	Technical Session 2: Contd...
1530-1545 hrs 1545-1600 h	• Reflections from SAARC member States delegates (Afghanistan. Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan & Sri Lanka) • Open House Discussions and Questions & Answers
1600-1655 hrs	Valedictory Session and Way Forward **Chair** : Dr. A M Gondane, I.F.S., Joint Secretary, SAARC, GOI **Co-chair** : Ms Angela Klauschen, GWP Senior Network Officer, China & South Asia **Speakers**: • Ms Yi Ying Lee, Associate Coordinator, Asia Pacific Adaptation Network (APAN) • Mr Lal Induruwage, WACREP Manager, GWP SAS • Prof Santosh Kumar, Director, SDMC, New Delhi
1655-1700 hrs	Vote of Thanks by Ms Priyanka Dissanayake, Regional Coordinator, GWP-South Asia

Annexure II

Position Paper

on Regional Day- Global Water Partnership, South Asia on

"From Risk to Resilience: South Asia Regional Framework for Sustainable Water Management"

1. Background

Water plays a vital role in all aspects of lives and livelihoods of people as well as development of national economies. With increase in population and development, the pressure on water resources intensifies due to rise in demands in domestic, agriculture and industrial sectors, leading to excessive pressure on environment. Climate variability in recent years has increased the incidences of natural disasters like droughts and floods resulting in disease and deaths along with causing acute social and economic shocks and chronic stresses.

The South-Asian Sub-Continent is home to more than one fifth of the world's population i.e around 1.5 billion people and water forms a part of the cultural, social, economic and political fabric of the lives of these people (World Bank, 2014). South Asia has four major rivers basins, i.e., the Brahmaputra, Indus, Ganges and the Meghna. The Ganges river basin alone is home to some 500 million people. The presence of this enormous population has led to extreme pressure over the water resources. According to UN Water, by 2025, about 1800 million people will be living in countries or regions with absolute water scarcity and two-thirds of population could be under stress conditions[1] and by 2020 around 120 million to 1.2 billion will experience increased water stress in South and South East Asia.

South Asian region is among the most water stressed regions of the world and melting Himalayas pose serious risk to sustainability of water resources of the region. Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka account for more than 21 per cent of the world population, but have only 8.3 per cent of the global water resources[2] .

South Asia is also very vulnerable to climate change and the most visible impacts can be seen in term of melting of glaciers which also affects the precipitation levels. During the period of 1975 to 1999, the Himalayan glacier has retreated more than 850 meters, with a 76 meters loss from 1996 to 1999 alone[3] . Since the water levels in the rivers are determined by the glacial melting and precipitation, climate change has a direct impact on the lives of people who are dependent for food, water and energy and livelihoods from the river networks. This will also exacerbate the challenges of poverty reduction and improving access to safe drinking water, which are two of the Millennium Development Goals.

The intensifying strains on the river basins have visible impacts in terms of diminishing river flows and dropping water tables. Water is a renewable resource, but also a finite one and therefore planning for its sustainable use is not only wise but also essential.

Changing climate, unplanned development, increased water pollution; population growth etc. have not only adversely affected the water sources but have also made the region vulnerable to various hydrological shocks posing huge long term recovery challenges, recent. Due to a variety of complex issues including climate change, depletion of water resources has become a looming crisis in South Asia[4] .

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[1] UN-Water (2006).Coping with Water Scarcity: Strategic issue and priority for system-wide action.
[2] Brahma Chellaney: Water Asia's New Battleground
[3] Naseer Menon, Disasters in South Asia: A regional perspective
[4] Maryam Mastoo, Water Scarcity in South Asia, 2012

The river basins, however, offer significant potential for water resources development and better management of current and evolving climate risks. But it requires policy makers, researchers, advocacy groups, development professionals and civil society groups to come together on one platform and build mutual awareness and understanding of the common water resource challenges. There is a need to distinguish the critical knowledge gaps and issues in science, policy and practice and to address them through collective wisdom collaborative action at the regional level in the South Asia. As also highlighted in the post-2015 framework for Disaster Risk Reduction (Hyogo Framework Action 2) in the SAARC region, one the key focus area is to collaborate and work together as a region to address the various risks through early warning mechanism, regional response mechanism, knowledge management etc.

2. Issues of South-Asian Countries

South-Asia has the world's largest concentration of poor people. The combination of high poverty and high population density along with rapid urbanization makes it extremely difficult for communities to cope with hydrological and climate variability. As per the World Bank Report of 2013, due to the lack of social and economic means to effectively mitigate risks, it is the poor who are more vulnerable to water-related stresses and shocks including flood, drought, water contamination and water-borne diseases[5]. Cooperation and management in water resources could do much to mitigate vulnerabilities through enhanced protection and management of water resources, equitable distributions and timely disaster warnings as well as agricultural forecasts[6]. It could also become a powerful entry point for wider regional integration. Country-wise specific issues have been highlighted as below:

2.1. Afghanistan

- Afghanistan is an agrarian society with 80%[7] of population living in rural areas and directly dependent on natural resources for their livelihood.
- Rainfall is scanty and highly variable.
- About 30%[8] of the country's water resources are currently being used. Water use efficiency and productivity are quite low. Irrigation and rural water supply have deteriorated due to strife, drought and lack of maintenance. Dwindling forest cover has led to floods, soil erosion and reduced water retention in the aquifers.
- Only 15%[9] runoff contributes to groundwater.
- Inadequate coordination among water management policies, institutions, lack of research and development, combined with local issues have exaggerated the problems of water management.

2.2. Bangladesh

- The water resources are dependent on glacial melt. Warming is expected to change the river flows with increased flows and floods in the short term and reduced flows and droughts in the long term.
- The country is located in the terminal floodplain delta of three large rivers (World Bank, 2011). About 20 to 30 percent of the country is flooded every year. This causes serious damage to the infrastructure, crops and overall economy.
- About two-thirds of the land area is less than 5 meters above sea level (APAN, 2012). It is predicted that sea level will rise by 62 cm in 2080 due to climate change, inundat-

[5] https://www.southasiawaterinitiative.org/sites/sawi/files/SAWI%20Report%202009%20to%202013.pdf
[6] Ibid
[7] http://www.afghaneic.net/library/hydrological%20surveys/wor49.pdf
[8] http://www.gwp.org/Global/Activities/South%20Asia/gwp-apan-technical-report-issues-water-agriculture-south-asia.pdf
[9] Ibid.

ing about 4,700 km. increased rainfall and storm surges will inundate more lands. Agriculture contributes to about 30% of the GDP in the coastal areas, which will be affected due to climate change (Khan, 2012).

- River bank erosion is a major problem in rivers such as Brahmaputra/Jamuna and Ganges/Padma. Increased peak discharges due to climate change are predicted to increase the problem (Khan, 2012).
- There are non-climate related phenomena such as over-extraction of groundwater for irrigation that are complimentary to low-lying nature of the land, resulting in salt water intrusion to groundwater. Arsenic contamination of groundwater is a major concern, and over-exploitation is considered as one contributing factor. Although the government is trying to increase the surface water utilization, flat topography and alluvial soils reduce surface water storage options (Khan, 2012).
- Several factors mentioned above make Bangladesh highly vulnerable to floods, droughts and sea level rise. Climate change is expected to make the situation worse. Among the phenomena that affect agriculture include the projected changes of river flows, inundation resulting from inadequate surface drainage, sea level rise, salt water intrusion, and increased occurrence of floods (USAID, 2010).

2.3. Bhutan

- The agricultural land in Bhutan covers only 7.8 percent of the country, which is under increasing competing demand from urbanization. The current level of food production is generally sufficient for an adequate per-capita food consumption level. But the subsistence agriculture intensifies land scarcity issues, and therefore diversification and commercialization of agriculture is needed.
- Bhutan has adopted strong conservation ethics and there is commendable commitment. However, soil erosion, deforestation, and overgrazing are common, especially in densely populated areas. There is a need to involve the communities and private sector in agriculture and natural resources management (World Bank, 2011).
- Climate change can aggravate the issues such as erosion. Already the sediment in rivers affects the output and economic life of the hydropower plants. In addition, melting of glaciers and Glacial Lake Outburst Floods (GLOF) occurrence are increasing, resulting in water-related disasters. Low capacity of river flow regulation (NEC, undated) would increase the adverse impacts.
- Climate change impacts on water resources would adversely affect agriculture as well. Risks include possibility of extinction of traditional crop varieties, loss of soil fertility due to erosion of topsoil and loss of cultivable lands due to flash floods, landslides and loss in crop yields due to hailstorms (APAN, 2012). Bhutan has a huge hydropower potential, but less than 2 percent is developed (NEC, undated). Financial resources and sustainable development with due regard to environment, climate change induced flash floods and sedimentation are the challenges to improve hydropower development.
- Changing lifestyle, increased demand from agriculture, urbanization and water pollution which are common to the region are challenges to Bhutan as well.
- Other challenges include the need to strengthen water-related research and improved col-

laboration among regional experts in all water-related subjects.

2.4. India

- Many river basins in India are predicted to face water-stress conditions due to climate change. The reasons are change in rainfall-runoff patterns and alterations to snow and glacier melt contributions to river flows (APAN, 2012).
- While it is known that climate change would increase the variability of rainfall, temperatures and occurrence of floods and droughts, the spatial variation of such changes are not easily predictable. To address the anticipated water stress, larger water storage is necessary (IWP, 2012).
- Water quality concerns would add to the water stress. IWP (2012) notes that water quality in Ganges river system is particularly badly affected due to high population density, high-intensity agriculture, loss of forest cover and reduced river flows.
- There is a need to improve efficiency of individual irrigation system for optimum use of developed water resources, and to reduce non-beneficial water uses such as evaporation/evapotranspiration of the swampy areas. Improvements to drainage systems in water-logged areas are required as well.
- The contribution of rain-fed area to food security and poverty alleviation is significant (IWP, 2012). About 65 percent of the net cultivated area is rain-fed, and this area contributes to 45 percent of rice production. Therefore, rain-fed agriculture and related livelihoods are more vulnerable to change of rainfall pattern. High-intensity rainfall and floods would increase the risk to high-value and horticultural crops, affecting both national and individual economies (APAN, 2012).
- In addition, rainfall in India is concentrated in less than forty days per year, on average. Less than 30 percent of rainfall is harvested. Therefore, rainwater harvesting is crucial for water and food security and the required technology is available within the country (IWP, 2012).
- There is a need to improve the institutional arrangements in the water sector. It is recommended to internalize the climate change concerns in the current institutional structure with necessary modifications (MWR, 2009).
- Among the other issues related to water management, inequitable allocation of water and deteriorating irrigation infrastructure, it is noted that many states lack the incentive, policy, regulatory, and institutional framework for efficient, sustainable, and equitable allocation of water. The existing infrastructure has rapidly deteriorated as operations and maintenance are given lower priority (World Bank, 2011).

2.5. Maldives

- Global warming could lead to an average sea level rise and especially low-elevation small island states such as Maldives. The potential impacts include coastal flooding, increased storm damage, and contamination of fresh water by salt water. Given that most islands in Maldives have less than a two-meter average elevation, even a moderate rise in sea level could submerge many islands in the longer term (World Bank, 2011).
- One of the severest and most damaging effects of improper resource management is soil erosion which, on atolls, depletes an

already scarce resource. Soil erosion occurs to a large extent on the islands' shorelines and in areas of agricultural activity (Zuhair, undated).

- The agricultural systems in the Maldives consist of a mixture of traditional and new practices. One of the problems is to find an agricultural system that is both productive and sustainable (UNESCAP). For example, at present, the majority of agricultural activities in Maldives rely on sunken wells and manual watering for crop irrigation. That procedure prevents over-exploitation of water resources.
- The decline in land productivity in the Maldives is the result of overuse of soil resources and reliance on external inputs, which reduce the productivity. Over-cropping with limited crop rotation or fallow periods has resulted in depletion of soil organic matter and nutrients on some islands.
- Although not a serious problem yet, the islands have a potential to be affected by water-logging and build-up of salinity. Pollution and intrusion of salt water is an emerging problem due to population increase, agricultural and industrial activities. The low level of organic matter in the soils is conducive for leaching of pesticides and fertilizers into the groundwater.

2.6. Nepal

- The observed changes in climate, especially rainfall, are similar to the other parts of the sub-region. They include increased frequency of extreme rainfall events, overall decrease in annual rainfall in arid and semi-arid regions, decreasing snow cover and groundwater levels, drying-up of springs, delayed or unreliable rainfall pattern, these are some of the observations (Sharma, 2010). The river flows that are dependent on glacial melt are expected to change, with increased flows and floods in the short-term and reduced flows and droughts in the long-term.
- Climate change is expected to increase the risk of Glacial Lake Outburst Floods (GLOF). As expected, such variations in climate have resulted in increased occurrences of flood, drought, and landslide. Such events will contribute to loss of soil fertility and cultivable lands, and would result in a decrease in crop yields and agricultural productivity, affecting traditional crop varieties as well.
- Drying up of sources, decreased surface and groundwater flows and pollution have negative effects on meeting domestic water supply needs of the increasing population. Such changes to water availability have contributed to additional burden on women and children to fetch water for domestic needs, collection of firewood and fodder. Similarly, the demand for water from the allied sectors such as hydropower, industry, drinking water and sanitation is increasing, resulting in completion for water.
- Poorly-managed watersheds increase the stress and decrease sustainability of water resources.
- Improvements in climate and weather-related data management and efficient information flow at national as well as regional levels is required (Sharma, 2010).
- There is a need for stronger incorporation of climate change impacts and adaptation measures to the national policies and planning process (NAPA). The commitment in translating water resources policy into investment, planning and prioritization at the national, regional and local level is inadequate.

There is also a need for water regulations to implement the water policies.

- Full irrigation potential has not been achieved in Nepal. Less than 40 percent of cultivable land is irrigated and the annual value is only 17 percent. The potential is estimated at about 67 percent. Institutional problems and inadequate resources for operations and maintenance affect achieving the potential (World Bank, 2011). Landslides, soil erosion and flash floods may further deteriorate the irrigation infrastructure.

2.7. Pakistan

- Monsoonal rainfall and Indus river flow which depend on glacier melt are the main water sources for Pakistan. These sources are predicted to be adversely affected by climate change, and in combination with increased evaporation due to increased temperatures, water stress in Pakistan is likely to increase (APAN, 2012).
- Projected recession of Hindu Kush-Karakoram-Himalayan (HKK) glaciers due to global warming and carbon soot deposits from various pollution sources, threatens water flows into the Indus River System (IRS). This results in increased siltation of major dams caused by more frequent and intense floods (APAN, 2012).
- The capacity of the agriculture research and development system has declined. Better technology for rain-fed areas and livestock is needed. Livestock has been the fastest growing sub-sector, and now comprises almost half of the agricultural GDP (World Bank, 2011).
- Pakistan so far has not developed the capacity to fully utilize rain water. Presently it is estimated that not more than 20-25% of rain water is harvested with current practices (Ali, 2012).
- Irrigation plays an important role in rural economies, which can be made more efficient. In addition, some irrigation infrastructure shows signs of degradation. Water distribution within and among irrigation systems is required to be more equitable. Inter-provincial water allocation, storage management and water scheduling are among the water management functions needs improvement.
- Water logging, salinity, pollution and land degradation are becoming significant (World Bank, 2011), and these issues usually aggravate with climate change and affect rural economies.
- Low rainfall, poor drainage, ancient marine deposits, saline groundwater, and evaporation and transpiration combine to soil salinity. The expansion of irrigation and agriculture contributes to accumulation of salt. As the water resources are almost fully exploited, any salt/sediment/water imbalance of the Indus system will severely threaten the food and water security (Ali, 2012).

2.8. Sri Lanka

- Pollution of water bodies is an issue growing in significance. Urban, industrial and agricultural wastes contribute to the problem. Concentration of pollutants increased during the dry periods and climate change is expected to influence pollutant concentration. Over extraction of groundwater, especially for agriculture, depletes the resource and increases the pollutant concentration (Iqbal, 2010 and Imbulana et al, 2010). In addition, farmers of the dry zone are affected by a kidney disease, which is suspected to be caused by Cadmium in water, and such issues also af-

fect the agricultural productivity.

- River flows are already under pressure in some major rivers due to demand from hydropower, irrigation and domestic sectors. The erratic rainfall, increased rainfall intensity, reduced rainfall in upper catchments and extreme climatic events can aggravate the situation (Iqbal, 2010).
- There are considerable changes to the rainfall patterns including the delay of rainfall seasons, affecting timely cultivation and harvesting of crops. There is a need for long-term weather forecasting system with special-attention to agricultural needs (SLWP, 2012).
- Current institutional arrangements for dealing with extreme events are reactive and relief- oriented rather than strategic and enabling, with little provision for inclusion of climate change adaption in the normal, pre-planned, development agenda (SLWP, 2012).
- A substantial investment has been made in water storage reservoirs, which could increase the adaptation capacity to varying river flows. However, deforestation, associated soil erosion and sedimentation reduce the capacity of the reservoirs.
- Climate change-induced disasters, such as floods and droughts, destroy the crops. To recover from such situations, availability of good quality seed in sufficient quantities is important. The current storage capacity of seed and buffer stocks are not sufficient to meet the challenges of climate change, and this affects crops such as rice, maize and cowpea.

3. Synthesis of Regional Issues and Challenges

The South-Asia region is facing water-related environmental problems: shrinking glaciers, soil erosion, water pollution and over-exploitation of groundwater resources in some parts have put pressure on water security in the region. Natural contamination of groundwater with arsenic and fluoride is common throughout Bangladesh, India, Nepal and Pakistan[10] . Reduced agricultural productivity due to the decreasing water availability and natural catastrophe is one of the most worrisome consequences of water stress in the region.

According to APAN report of 2012, the region is close to the threshold limit of 60 percent which is defined as "water scarcity is approaching" situation and not too far from the threshold of 75 percent, above which the sustainable limits of water withdrawal are exceeded[11] . Demand management and water use efficiency is the need of the hour which can be managed through proper planning, good policies and better implementation practices. In this context, Integrated Water Resources Management (IWRM) should be the main principle for planning, development and water management.

Key Challenges and Opportunities

Some of the key challenges in the region are as below:

1. **Impact of Climate Change**: Climate change in South Asia is predicted to amplify current levels of variability, and may fundamentally change most hydrological systems. Climate change has not only introduced the element of uncertainty and unpredictability but it has also amplified the level and scale of hydrological shocks. The recent floods in Nepal and J&K are two such unprecedented disasters in the region which clearly illustrate the nature of unpredictability of the events triggered by climate change. There is a need to collaborate on various scientific researches to not only understand these changing patterns

[10] http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/0,,contentMDK:22022926~pagePK:146736~piPK:146830~theSitePK:223547,00.html

[11] https://www.gwp.org/Global/Activities/South%20Asia/gwp-apan-technical-report-issues-water-agriculture-south-asia.pdf

of climate but also to come up with scientific solutions for preparedness and mitigation of risks posed due to climate change. There is also a need to tap into the vast reserve of indigenous knowledge in the region and to come up with best practices for dealing with climate change and sustainable development.

2. **Regional collaboration for enhancing mechanism for joint planning and monitoring**: There is a need for the region to develop a joint mechanism for sharing information on various trends like glacial melting, precipitation rate, shifts in course of rivers, change in the level of water in the river basins etc. All this information can be provided through one common database for the region, that any governmental agency can use and thus, data dissemination within and across respective governments can be coordinated in a systematic manner.

3. **Regional Action Plan for Disaster risk reduction**: In the 1970–2008 period, floods accounted for half of the total number of events reported, while droughts accounted for 2 per cent, but that affected more than 50 per cent of the total number of the people affected[12]. This recent surge in the number of natural disasters, especially related to "too much and too little water" has generated the need for the SAARC nations to join hands at the regional level and prepare regional disaster management plans, which will include the mechanism for preparedness, response and mitigation of disaster risks at a regional level. One of the ways is through increased cross-border sharing of data on seismic activity, heavy precipitation events, and the location of potential GLOFs, as well as the development and deployment of early warning systems. South Asia Disaster Knowledge Network (SADKN) is one of such initiatives of SDMC, New Delhi that provides platform for sharing knowledge and information among multi stakeholders of the member countries of the SAARC on the multi-disciplinary and multi-sectoral issues of disaster risk assessment, risk prevention, mitigation and preparedness and disaster response, relief, recovery and reconstruction[13] .

4. **Water quality and sanitation**: The pressure on water resources is increasing rapidly and South Asia is facing a serious and growing water quality challenge. Rapid population growth, urbanization and industrialization in the region threaten to limit the freshwater supply. According to UNDESA report, around 80% of the diseases in developing countries are caused by unsafe water[14] and approximately 900 million people in South Asia do not have access to basic sanitation[15] . Arsenic and fluoride contamination itself threatens life of millions of people in the region. Pressures on water quantity and quality interact. Decreasing water quality ultimately can lower effectively available water quantities, as some sources become too degraded for certain uses. Likewise, diminishing water quantities boost the concentration of any pollutants present, eroding water quality. Water quantity and water quality stresses frequently occur together, as demand centers requiring large withdrawals - such as zones of intensive agriculture, urban agglomerations, and industrial concentrations - also generate substantial pollution[16].

5. **Groundwater depletion**: Groundwater depletion is one of the serious issues in many parts of the South Asian region. The period from 1975-1990 had seen rapid growth in groundwater irrigation in South Asia that has been one of the drivers in agrarian boom

[12] Disasters in South Asia-A regional Perspective
[13] http://www.saarc-sadkn.org/about.aspx
[14] http://www.un.org/waterforlifedecade/sanitation.shtml
[15] http://www.gwp.org/gwp-in-action/South-Asia/
[16] FAO, "Indus river basin," p.133; C.J. Vörösmarty et al., "Global threats to human water security and river biodiversity," Nature 467, no.7315 (2010), On-line Supplementary Information, doi:10.1038/nature09440.24 Babel and Wahid, pp.17-18.

in the region. India, Pakistan, Bangladesh and Nepal account for the bulk of world's use of groundwater in agriculture. On one hand groundwater development has provided sustenance to agrarian economy, on the other hand it has created chronic problem of depletion as well as quality deterioration[17]. Currently, three problems afflict groundwater use-overuse, water logging and salinization and pollution due to agricultural, industrial and human activity, which call for collective cooperation among the stakeholders.

6. **River basin management**: Along with hydrological cycle and water resources, the science of climate change is one of the critical challenges in the management of river basins. Improper land use, soil erosion, land degradation, current agricultural practices, eutrophication, degraded ecosystems etc. requires special consideration in the river basin management. The need for enhanced understanding of the impacts of land use and other development activities on water resources remains significant in specific river basins so that integrated land-use and water-resources planning may need to be implemented[18] . Challenges with respect to the availability of scientific data require particular attention in the management of river basin.

7. **Climate Change & dislocation of people**: As per the IPCC Fifth Assessment Report, a rise of 4-5 degree Celsius in the global temperature would result in amplified displaced population due to the various impacts of climate change. The major impacts are related to water would include rise in the sea level, shrinking of water bodies, changes in the precipitation trends resulting both in floods as well as droughts. As per the World Bank data of 2008, South Asia's five coastal countries (Bangladesh, India, the Maldives, Pakistan, and Sri Lanka) account for less than 2 percent of the world's total coastline. The IPCC report estimates that even under its most conservative scenario, sea levels in 2100 will be about 40 centimetres higher than today, which will cause an additional 80 million coastal residents in Asia alone to be flooded. The majority of those flooded will be in South Asia, particularly in Bangladesh and India. The absence of collaborative frameworks and mechanism for addressing such challenges may lead to disastrous consequences.

8. **Watershed management**: Degraded watersheds present serious future challenges for sustainable development in South Asia. A number of community based watershed management projects have been implemented across different countries in the SAARC region: learning from these project experiences can be drawn to inform both policy and practice.

4. Context

India Water Week (IWW) is the National Event for addressing India's water issues and related concerns for development and management. The Ministry of Water Resources since the year 2012 have endeavored to celebrate India Water Week on annual basis. IWW serves as an appropriate forum for national and international level dialogue among a range of critical stakeholders that include policy makers, practitioners, academics, technical experts, social workers and concerned communities and civil society institutions. This offers an opportunity to share and generate innovative ideas and insights, while recognizing the works of significance by individuals and organizations active in the water resource management in the region.

[17] Shah, T.; Scott, C.; Kishore, A.; Sharma, A. 2004.Energy-irrigation nexus in South Asia: Improving groundwater conservation and power sector viability. Second (Revised) Edition.Research Report 70. Colombo, Sri Lanka: International Water Management Institute.
[18] http://www.thegef.org/gef/sites/thegef.org/files/publication/R%20ANA%20Final.pdf

Climate change and it's linkages with water has always been one of the core agendas for India Water Partnership (IWP), both in its work on the ground and also in regional and national level discussions and consultations. During 2012, IWP organized a brainstorming session on **"Draft National Water Policy-2012 in context of Climate Change"** and came up with a set of recommendations for inclusion of climate change in the Draft National Water Policy 2012. During 2013 India Water Week, the regional day of GWP-South Asia focused on the theme of **"Improved Efficiency for Increased Resilience to Climate Change: an Integrated Water Resources Management Perspective"** and a panel discussion on "Empowering South Asian Women for Climate Change Adaptation".

Following its commitment for working towards water and climate change adaptation, India Water Partnership (IWP) in collaboration with Global Water Partnership-South Asia, WAPCOS Ltd., SAARC Disaster Management Centre (SDMC) and Asia Pacific Adaptation Network (APAN) would organize the Regional Day Program of GWP-South Asia during India Water Week-2015. The theme of the event for the year 2015 is **"From Risk to Resilience: South Asia Regional Framework for Sustainable Water Management"**. The Regional Day program seeks to draw upon regional experience, knowledge and case studies to discuss how increasing water efficiency can help create a society that is more resilient to climate change and natural disasters.

The event will start with inaugural and keynote address by senior policy makers such as the Minister and Secretaries from the Government of India flagging current policy developments and challenges in the field of water and disaster management in the South Asian region in general and India in particular.

This will be followed by the two technical sessions and a valedictory session followed by open discussion and the way forward.

Technical Sessions

Technical Session 1: Water Resources Management, Disaster Risk Reduction (DRR) and Climate Change Adaptation in South Asia: Key Issues and Challenges in Water Sector Governance with Focus on Policy, Legislation and Institutional Reforms.

Sub-themes of the Technical Session 1 will include:

- Policy and governance framework and institutional arrangements for water resource management, disaster management and climate change adaptation (CCA) measures
- Water security and sustainable development

Technical Session 2: Developing a Joint Framework for Learning and Action for Effective and Sustainable Water Resource Management from a DRR and CCA perspective in the South Asian Region.

Sub-themes of the Technical Session 2 will include:

- Collaboration for developing joint strategies in DRR and CCA in South Asia
- Knowledge Management for effective planning and management with focus on enhancing early warning system
- Sharing of ideas and innovations among stakeholders

5. Aim and Objectives

The regional event is being organized with an aim to clarify and bring forth critical issues involved in addressing and establishing linkages between water security, climate change and

natural disasters particularly hydro-meteorological disasters.

Specific objectives are:

- To assess and identify key issues and challenges in water management and sustainable development in the context of climate change in South Asia.
- To maximize social, environmental and economic welfare (three pillars of sustainable development) resulting from water management.
- To map out pathways that will help realize the potential of SAARC countries in developing its water resources and draw a regional framework for addressing the issues of water management in the context of climate change and disaster risk reduction .

6. Expected Outcome

This entire event is expected to generate the following two broad outcomes:

- An informed and shared understanding of the key issues and challenges in water resource management in the South Asian region from a DRR and CCA perspective.
- An agreed way forward for regional cooperation among the major stakeholders including governments, civil, society institutions and the scientific community.
- A strategy to address the issues related to "too much and too little" at the regional and sub regional level.

7. Operational Strategy of the Event

- This side event will discuss issues of water management for sustainable development in the context of science, policy and practice at regional level.
- Consortium of national and international delegates and experts in the field of water management will share their views and experience.
- This event will provide a platform for ideas and opinions from various stakeholders for knowledge sharing and mutual benefit.

8. Participants

Government organizations, Policy makers, National and international delegates/experts in the field of water resources, delegates from SAARC nations, NGOs and I-NGOs, CBOs working in the field of water management, Academicians, Researchers etc.

9. Venue

New Delhi, India

10. Organizing Team

India Water Partnership (IWP), GWP-South Asia, SAARC Disaster Management Centre, New Delhi, WAPCOS Ltd. and APAN

New Delhi | January 15, 2015

INDIA WATER WEEK 2015

WATER MANAGEMENT FOR SUSTAINABLE DEVELOPMENT

SOUTH ASIAN REGIONAL FRAMEWORK ON WATER CAN HELP REDUCE RISKS, DEVELOP RESILIENCE: UMA BHARTI

Union Minister of Water Resources, River Development and Ganga Rejuvenation Uma Bharti with representatives of GWP, GWP-South Asia, India Water Partnership, Asia Pacific Adaptation Network and SAARC Member States.

Union Minister of Water Resources, River Development and Ganga Rejuvenation Uma Bharti has stressed on a wider consultative process among SAARC countries that would pave the way for evolving a regional framework for action to deal with impact of climate change on South Asia's water resources.

The focus of the consultations should be on sharing of knowledge on wide range of issues and also on sharing of experiences in various aspects of water management, Bharti said on January 15 while delivering the inaugural address on the regional day programme of GWP-South Asia and SAARC on the topic "From Risk to Resilience: South Asia Regional Framework for Sustainable Water Management" during the ongoing India Water Week 2015.

"I am firmly of the view that unless we develop a water-conscious society that treats water as a precious gift of nature and considers its conservation and protection as its sacred duty, other measures will not be able to ensure adequate availability of water of desired quality in the years to come", said Bharti.

The looming spectre of climate change and its likely adverse impacts on our water resources has to be the main theme of our public awareness and educational programmes. It is only through broad-based consultative process that we can develop resilience against harmful impacts of climate change and minimize risks to our water resources, the Minister added.

"As you may be aware a National Water Mission has been constituted under my Ministry. This Mission has brought out a comprehensive document giving inter alia an Action Plan with time frame for identified strategies. Various organizations/ agencies who will implement these plans have been identified and, I am happy to say, that implementation of most of the plans has already been initiated", said Bharti.

"I am sure other SAARC countries must have also prepared appropriate plans for sustainable water management. With the basic preparatory work completed at country level, it is now necessary to evolve a South Asia Regional framework for which regular consultations among the Countries of the region are necessary.

Continued on page 4

Union Minister of Water Resources Uma Bharti with Secretary, Ministry of Water Resources Anuj Kumar Bishnoi, IWP President and WAPCOS CMD RK Gupta and India Water Partnership executive secretary Dr Veena Khanduri during the regional day programme of GWP-South Asia and SAARC.

It is a matter of great satisfaction that GWP-South Asia, WAPCOS Ltd, India Water Partnership and SAARC Disaster Management Centre, New Delhi have taken a lead to evolve a mechanism for such consultations on a regular basis, said Bharti.

The Minister mentioned some of the aspects that were crucial for reducing risks and developing resilience in water related infrastructure and among the people at large. These are: enabling environment in the form of appropriate policies and legislation; development/introduction of appropriate technologies especially at the grass root level; institutional strengthening for better governance; management aspects with focus on improved efficiency of water delivery systems and in various water uses; social change initiatives to develop a water-oriented society; regulatory mechanism and last but not the least; information management system.

The South Asia Regional framework should lay special emphasis on developing resilience and reducing risks, Bharti added.

Secretary, Ministry of Water Resources Anuj Kumar Bishnoi said in South Asian region, water resources are under stress particularly due to huge population, high level of poverty, urbanization and rapid economic growth. Presently home to almost a quarter of the world's population, South Asia's population is set to top two billion people by 2025.

"Though endowed with vast water resources, the region is also subject to floods and droughts, along with other natural calamities, which is now likely to worsen with changing climate".

The pressure on water resources is increasing rapidly and South Asia is facing a serious and growing water quality challenge, he added.

Bishnoi pointed out that arsenic and Fluoride contamination is also threatening life of millions of people in the region, which was facing another challenge in depletion of groundwater.

"Degraded watersheds present serious future challenges for sustainable development in South Asia. A number of community based watershed management projects have been implemented across different countries in the SAARC region. Learning from these project experiences can be drawn to inform both policy and practice", Bishnoi added.

India Water Partnership President and WAPCOS CMD Dr R K Gupta was of the view that cooperation and management in water resources could do much to mitigate vulnerabilities through enhanced protection and management of water resources, equitable distributions and timely disaster warnings as well as agricultural forecasts in the region. "It could also become a powerful entry point for wider regional integration", he added.

"But, it requires policy makers, researchers, advocacy groups, development professionals and civil society groups to come together on one platform and build mutual awareness and understanding of the common water resource challenges", Gupta added.

There is a need to distinguish the critical knowledge gaps and issues in science, policy and practice and to address them through collective wisdom collaborative action at the regional level in South Asia, said Gupta. As also highlighted in the post-2015 framework for Disaster Risk Reduction (Hyogo Framework Action 2) in the SAARC region, one of the key focus areas is to collaborate and work together as a region to address the various risks through early warning mechanism, regional response mechanism, knowledge management etc, he added.

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