


Challenges of **Water Stress** and **Climate Change** in the **Himalayan River Basins**

COLLABORATIVE DIALOGUE PROCESS



Kathmandu, 6-7 August 2009

**Experts Call for Himalayan Sub-Regional Cooperation
to Promote Water Security and Peace in Asia**


Strategic Foresight Group



Strategic Foresight Group had organized the first inter-national workshop on **Challenges of Water Stress and Climate Change in the Himalayan River Basins** at Hotel Dwarika's, Kathmandu, Nepal, on August 6-7, 2009. It was a component of the collaborative dialogue process launched under the auspices of the Asian Security Initiative of John D and Catherine T MacArthur Foundation. The World Bank and International Union for the Conservation of Nature, Nepal, cooperated with the Strategic Foresight Group in convening the workshop, which was attended by leading experts on water and climate change from Bangladesh, India, China, Nepal and the World Bank, including former Ministers of Water Resources.

SFG is grateful to The John D. and Catherine T. MacArthur Foundation for their support to host the workshop.

In addition, SFG appreciates intellectual and practical cooperation extended by the World Bank and the International Union for the Conservation of Nature.



The participants overwhelmingly emphasized the need to promote Himalayan Sub-regional Cooperation to ensure water security and a climate of peace and progress. There is no alternative to cooperation in view of the retreat of glaciers, resulting decline in river flows in parts of the four countries and flooding in other parts, tectonic changes in the Himalayan region, sedimentation, threat to food security and the risk of increase in inequity.

The experts expressed serious concern for paucity of climate data in mountain regions, as the present emphasis is on national averages which tend to be influenced by the situation in the plains. There is a risk of economic collapse of several mountain communities. The experts were alarmed that engineering and climate modeling techniques, knowledge of clouds and fog are either outdated or inadequate.

The experts urged to overcome the present tendency to resist the sharing of scientific and technical data in a context where national solutions are not feasible. Several experts recommended the use of local tradition to preserve livelihood, action research, treatment of the eco-system as a whole involving all stakeholders, and the use of instruments of international cooperation such as the UN Biodiversity Convention and the Ramsar Convention.

In brief, participants recommended building blocks of regional cooperation beginning with water dialogues, data sharing, and awareness building in affected communities, slowly enhancing it to the level of collaborative river basin management. Strategic Foresight Group announced in response that it would continue with the collaborative dialogue process and convene the second workshop in early 2010.

Opening Session



An opening dinner was hosted by the World Bank, where Ms Ilmas Futehally, Executive Director of Strategic Foresight Group and Dr Claudia Sadoff of the World Bank, addressed the participants.

Ms Ilmas Futehally said in her welcome address: “We are meeting at a time of significant challenges to all countries in our region. According to various scientific reports, in 50 years time, within half a century from now, Himalayan glaciers will have receded significantly, fish stocks in the world will have vanished and cultivatable land would have largely depleted, especially in developing countries.

As a result, the world in 2050 will be a world without the gifts of nature that we are used to enjoying. This is not just a question of environmental degradation. This is also a question of the erosion of political and security concepts that we are familiar with. Already, many water deficit but financially rich countries are purchasing millions of acres of agricultural land in other countries, under the protection of their own security. Thus, sovereignty is no longer what we have traditionally understood.

Countries sharing basins of rivers flowing across boundaries are negotiating new forms of cooperation which must involve compromise of traditional concepts of security, or risk confrontation. Refugees, pirates and criminals have grown in parts of the world directly on account of food and water scarcity. If these trends continue, the world in 2050 will be a world with excessive supply of chaos and serious deficit of sustainability. These dangers are most evident in our own region.

We will hear from our colleagues from China of the condition of the Yellow Rivers, melting of permafrost, disappearance of lakes, and the need to divert the Yangtze River by artificial means. We will hear from our colleagues from



India the risk to the future of the Ganges, compounded by the risk to the future of the Yamuna, and the rivers flowing from Nepal. We will hear from our colleagues from Nepal and Bangladesh how the surplus of water in statistics can still mean risks of deficit in real life.

When we face these very similar problems, we have two options. The easy option is to protect our national interests disregarding the concern and interests of others in the region, and exposing the region to the possible dangers created by men or nature in the next half century. Our difficult option is to engage in very honest discourse, rise above the short term fears and build a shared collaborative and sustainable future in the long term. Our discussion tomorrow will help policy communities to decide whether to take the easy option or the difficult one.”



A view of the roundtable

Dr Claudia Sadoff of The World Bank, said in her opening address: “The countries in the Himalayan sub-region account for 40% of the world’s population. The rivers in the region are extreme in terms of population density, sedimentation and variability. Each river is in

effect many rivers in one; each is an ecosystem in itself. Hence, issues related to the Himalayan rivers are complicated. These are difficult rivers to understand, manage and talk about. They are shared rivers, which increases complications. There has been a lot of talk recently about how these rivers are under threat. Glaciers are disappearing, rivers are running dry; rivers are overdrawn and polluted. These rivers are extremely variable in terms of floods and droughts. They are even more threatened due to climate change. The World Bank has identified climate change hot-spots. One is over the Himalayas.

There is a nexus of water and climate change. Climate change increases extreme weather events; also changes ways in which water is used. Water would be the primary medium through which climate change will impact us. Water security has increasing importance today. World Bank defines it as a combination of increased productivity and diminished destructivity of water.

The scarcity and variability of water is important. Historically, water-scarce societies have managed to develop systems to overcome water scarcity. Water variability is a bigger drag on growth than water scarcity. This variability will increase with climate change. This region is highly vulnerable due to high population density, poverty and dependence on rainfall. Water security is particularly challenging to achieve due to weak institutions, infrastructure and fragmented information.

Climate change raises the stakes in trans-boundary cooperation. Risks of river systems rise with climate change. So, the value of cooperation rises. The costs and benefits of basin-wide information system and a system-wide



infrastructure management will become greater. This makes climate change a driver in either direction between conflict and cooperation. Policy makers will have to be ensure that climate change moves towards cooperation instead of conflict. Water and climate change are central to growth.

The World Bank would like to promote a South Asia Water Initiative. This operates on three levels across South Asia through the Abu Dhabi Dialogue.



*Mr. Shrikant Menjoge,
Mr. Tanhidul Anwar Khan,
Major General Muniruzzaman*

It provides a space for dialogue and an opportunity for common solutions sought for common problems. This initiative operates on trans-boundary systems. There are very few knowledge-based systems. The World Bank is financing some such systems. The South Asia Water Initiative also supports governments for cross-border cooperation. But World Bank efforts are not enough. There is lots of work still to be done. The South Asia Water Initiative is a knowledge-based space where challenges can be addressed in a rational way. It is focused on understanding the level of challenge; figuring out the options available; information sharing; and coming up with rational, mutually beneficial ideas

for bettering river basins. Bringing together information and space is what creates such dialogues.”

Session I



Long Term Assessment of **Water Security** with Particular Focus on **Rivers Originating in the Himalayas**



Session I in progress

The first session was chaired by Mr. Sompal. He talked about underground water storage and how India needs to increase its investment in water resources.

Dr. Xiaohong Chen said that global warming in the Himalayan region has been more than the world average; extreme weather events have become more frequent and weather patterns

are becoming more unpredictable. The ecological and social consequences of climate change will be determined by the rate and magnitude of temperature rise, along with changes in water availability. The maximum impact would be felt by rivers that are dependent for their flow on glaciers and snow-melt. The changes in the hydrologic regimes and increased precipitation variability will also have economic consequences for the countries in the region. The increasing shortage of water and the rising incidence of diseases like malaria will make it difficult for these countries to attain their goals towards poverty and health. Dr. Chen said that agricultural lands, investments in civil infrastructure and in hydropower generation will be increasingly impacted by flooding, landslides and/or increased sedimentation.

Dr. Chandan Mahanta emphasized the tertiary impacts of climate change on health, agriculture, increase in microbes, among other factors. The lack of information on the impacts of climate change is a big problem. Since we haven't succeeded in emissions reduction till now, the only other option in front of us is adaptability in the race against climate change. Information sharing between nations is necessary since the peak discharges of rivers are going to increase considerably in the future. There is no permanent solution to impact of climate change on rivers since the rivers in this region change daily; the only answer is adaptability. Due to global warming, colder areas would gradually become warmer and hence, would become more cultivable. The need of the hour is to develop crops that use less water, and which are heat, pest and disease resistant. The crop planting distribution should also change



with warmer temperatures. There should be a collective South Asian initiative to address climate change, global warming and mitigation. Since water, food and energy security are linked, there is need for developing a mechanism to share risks equitably and address all issues. While climate change adaptation is most important, the incremental cost of adaptation can be a huge burden for developing nations; so, an inter-country action plan is needed.

Dr. Sushil Kumar Gupta emphasized the need for the evolution of a culture of water conservation. Development related activities are also accelerating climate change, along with emissions. Today, the Himalayan region is facing water stress. The need for mitigation strategies like conserving water reserves and making society more water efficient. For this, the emphasis must start from the local scale as the government can only act as a stimulant.



*Mr. Sompal with Mr. Zhang Shuang,
Mr. Shrikant Menjoge &
Dr. S. K. Gupta*

Mr. Tauhidul Anwar Khan focused on the water situation in Bangladesh where during monsoon season, rivers like the Ganges and Brahmaputra bring in huge flow of water and during the dry season, there is hardly any rainfall. The importance of food and water security to a country like Bangladesh is vital. Adaptation is the wisest option to climate change, but countries like Bangladesh need understanding from their neighbors

and upper riparian nations. Cooperative management of water resources is required. There is a need to create a mechanism for collaborative management of rivers and the need for an environment of trust and confidence.

Mr. Kanak Mani Dixit said that this region's rivers are facing problems even without considering the impacts of climate change. Experts of individual river basins should sit together and discuss without nationalistic posturing or populism. Cross-border discussions could not proceed without the countries resolving internal issues related to water. Currently upper riparian states and provinces are exploiting rivers for their own demands, and ignoring the lower riparian states. There are 'populist demands' for dams in Himalayas where the issues of flooding, inundation and seismic activity still have to be discussed before the construction can go head. The viability of high dam projects will be severely impacted when river flows are reduced due to climate change. Plans and projects based on populism or poor science would have to be debunked and questioned in the end.

During the discussion, with regards to India and Bangladesh water relations, the importance of greater intergovernmental dialogue was emphasized, while participants appreciated that academics and civil society actors were engaged in various dialogue processes. Similarly, there was discussion on Yarlong Tsangpo River and the speculation about its possible diversion. In this context as well, the importance of promoting understanding between all stakeholders through dialogue was emphasized. Overall, the participants strongly recommended dialogue at various levels and sharing of important information between countries in the Himalayan region.

Session II



Impact of **Climate Change** on **Glaciers, Precipitation and Water Flows**



Session II in progress

The second session was chaired by Mr. Dipak Gyawali. He said that on the issue of trans-boundary water resources, there is cooperation between nations at academic levels, but not at the government level. The data collected with public money should be made public. He praised the strong local government structures in China that encourage payment for ecosystem services. China's policy has changed to that of being more internationally responsible and hence, the neighbors would have to engage China more actively.

Dr. Xiaoquan Zhang spoke about the impact of climate change on glaciers, precipitation and water flows. By 2050, the glacial area in western China will decrease by 27.2%, and between 2002 and 2008, the glacial area in the headwater region of Yangtze River will decrease by 13.5%. The seasonal snow cover will increase with higher variation in precipitation. Due to the impact of global warming on glacial area, the water flows in spring have increased and water flows in the rest of the seasons, especially during summer, have decreased. In the next 50-100 years, water flow in North China will be reduced by 2-10% whereas in South China, it will increase by 24%. Between 2020 and 2030, the water shortage in western China will go up to 20 BCM annually.

Mr. Malik Fida Khan spoke about the impact of climate in Bangladesh. Since the national mean temperature in Bangladesh had risen by 0.3°C over the past 40 years, there had been a subsequent increase in precipitation. The frequency of 'mega floods' has been increasing in the past decades, leading to the percentage of flooded area increasing over the years. Since the impacts of climate change are still uncertain and huge informational gaps exist at regional and national levels, it is essential to fill these gaps. 'Climate proofing' water resources which means building more resilience to climate



change in order to maintain and expand South Asia's growth is needed. Building resilience would involve the 4 pillars of regional knowledge base: - policy and governance; leveling and enhancement of skills; and investment for adaptation. The knowledge base could be developed through the creation of a 'Regional Climate Change Information Network' or RCCIN that would promote national and regional initiatives for research and data sharing among institutions. This RCCIN would establish a cooperative framework among scientific communities and institutions to advance a regional agenda aimed at increasing knowledge and best practices; it would also strive for wider application of satellite-based integrated weather forecasting and monitoring of snow-melt and a regional early warning system for natural disasters.



Dr. Xiaohong Chen makes a presentation

Dr. Zheng Yen spoke about the need for innovation and adaptation in view of the impact of climate change on the water situation. Cooperation between governments, institutions and people is necessary. She cited the example of China that is making institutional innovation in eco-conservation. Presently, payments for eco-services

have been practiced at provincial level and local level through subsidies transfer and other market approaches. China is now playing a responsible role in global negotiations. For example, in the UNFCCC, China has helped countries get 'adaptation funding'.

Prof. Jayanta Bandyopadhyay focused on the need for strengthening the process of modeling in the study of climate change since country-level models do not study the trends on a regional basis and not enough attention is paid to micro-level changes taking place in precipitation patterns. The rapid retreat of Himalayan glaciers and predictions made by models indicate that the next few decades will see increase in frequency of spring floods in rivers fed by Himalayan snow and ice-melt. The decline in winter precipitation both in the mountains and in the plains will lead to serious water stress, while enhanced summer precipitation would need an eco-hydrological response. Regional politics would have to be reworked according to hydrological changes. The dearth of baseline data and the uncertainty for Himalayan waters impedes the taking of sound steps for adaptation. The data already available in South Asia is not being made available to academic institutes for information sharing. Engineering projects on the Himalayan Rivers were thought of more than 50 years ago, and designs made then were according to a knowledge base that was narrow and not ecological; hence, it has little validity today. A cooperative and open approach to Himalayan Rivers, starting with new fundamentals has become imperative.



During the discussion it was mentioned that much of the policy and protocol on the issue of climate change never percolates down to the grassroots-level, where millions of people take everyday decisions. Climate change is already resulting in migration of people in Nepal. Frequent flooding, droughts and landslides have displaced millions of people who have had to look for alternate sources of employment. This has fuelled a lot of anger and a sense of alienation. It was agreed upon that in order to improve water efficiency in agriculture; water conservation has to be encouraged. Climate change

models need a lot more ground level data in order to become more practical; it is essential to 'ground-truth' models. There is a lack of data and information in this region; also, whatever data is available is not being shared fully. The importance of permafrost melting was underlined in relation to glaciers melting. It was generally thought that the policymakers should go for a bottom-up approach.



*Mr. Dipak Gyawali and Mr. Sompal,
former Water Ministers of
Nepal and India*

Session III



Conservation and Efficiency in Water Management



Session III in progress

The third session was chaired by Mr. Zhang Shuang. He talked about how China has paid for its development through environmental damage. The Yellow River is already a dead river. Hence, a solution to revive the river has been thought of in terms of transfer of water from the Yangtze River to the Yellow River.

Prof. Jinxia Wang said that measures to increase agricultural water use efficiently should include adopting water saving technologies, reforming water management, establishing water rights system to reallocate water among sectors and regions, and reforming water pricing. The different water saving technologies includes traditional, household-based and community-based ones. The incentive system that the basin has in place to encourages water saving. By increasing irrigation efficiency, water can be allocated from agriculture to industry in order to fulfill industry's growing water demand. The use of water pricing can be used as an important tool in water conservation.

Dr Bishnu Bhandari said that if water wars happen, they would be worse than the ones the world has seen for land and oil, since these would pit communities and families against each other. If water is not managed properly, it would be a disastrous situation. Water stress is a dynamic interaction of climate change with population increase, lifestyle change, variable uses. Water resources are being threatened by pollution, overuse, sedimentation and encroachment. It is important to manage the water resource carefully; it is essential that all stakeholders and different ecosystems be considered. It is important to have action-oriented research for immediate solutions to problems of climate change. Local wisdom, information and knowledge must be packaged and disseminated. The UN Convention on Biodiversity could provide a framework for consultations on trans-boundary Rivers. Also, the maintaining the ecological characteristics of wetlands, as described by the Ramsar Convention, is important.



Mr. Ashok Jaitly said that the impact of climate change is being felt not just in terms of water availability, but also in terms of how we manage the resource. Water cannot continue to be treated as a given since it has become an economic entity. In South Asia, public utilities had failed to provide water to the poor man for drinking, as well as irrigation. Since water is not restricted by boundaries of nations, cooperation and collaboration over trans-boundary water resources comes in perspective; it will not be possible for any country to manage either their economy or their society without some collaborative system to manage that water. Researchers and scientists can look at the social costs of not cooperating with each other over the water issue.

During discussion, it was agreed that water conservation should be promoted as cultural renaissance and it should be pursued through all means, legal and social. It was said that since irrigation uses the maximum water in South Asian countries, it was essential to make it efficient through the use of various technologies like raised bed cultivation, drip irrigation system, zero tillage etc.

Session IV



Mutual Learning and Trans-boundary Collaboration



Session IV in progress

The fourth session was chaired by Major General A N M Muniruzzaman. He was of the opinion that trans-boundary collaboration over the issue of shared waters was critical since water was scarce in most areas. Though scarce water resources posed a huge threat in form of potential conflicts, there were immense possibilities of cooperation as well.

Prof. Shaofeng Jia said that in view of the uncertainty of the impact of climate change, information exchange is of immense importance. For the Himalayan region, the greater evil is the increased frequency of flooding since the precipitation during monsoons will increase as a result of climate change. This region faces water stress on account of lack of proper water management. There is a need to include energy or hydropower in water regimes since it would be an antidote, to a large extent, to carbon emissions that cause climate change. He denied that China was planning to divert waters from the Yarlong Tsangpo to North China. The importance of comprehensive thinking and on the development of a mechanism for cooperation on the issue of water was stressed. Thorough research, regular meetings at different levels, and mutual benefit would be required to build trust among the various parties that should include China as well. In the long run, an international basin commission may be created to facilitate trans-boundary collaboration on the issue of shared rivers.

Mr. Ganesh Pangare said that for trans-boundary collaboration, it is essential to find opportunities for collaboration; to make sure that every side had equal share of the pie; to harmonize short-term and long-term plans for development; to engage in cross-border research, monitoring and exchange of data; and to coordinate across different interest groups, sectors and levels. The development of institutional mechanisms for honest facilitation between



different sides is critical for forward movement. Climate change is adding more challenges to the already-complex trans-boundary water governance. Multi-stakeholder dialogues can become a tool for trans-boundary water governance and climate change adaptation so that water governance issues can be addressed and discussed at local, national, bilateral and multilateral levels. The example of Mekong Region Water Dialogues in which the stakeholders include the government, the civil society, businesses and research institutes can be studied. In order to build trust, it is essential to understand the security concerns of the countries involved.



Dr. Malik Fida Khan makes a presentation

Mr. Som Nath Poudel informed the panel that though bilateral talks and efforts were on between Nepal, India and Bangladesh, nothing multilateral had been done so far on shared rivers. On the question of water diversion in Tibet, he emphasized that there was not enough water to divert without harming the interests of the stakeholders. A risk-analysis needs to be done before any projects are undertaken on shared rivers. The need to share information between various riparian nations is crucial; in the absence of open information sharing, no developments can be made in the field of trans-boundary water governance. Trans-

boundary collaboration is a must and that the countries should be open to sharing benefits, as well as the costs associated with it.

Mr. Ajaya Dixit discussed the need for training of water professionals with an expanded horizon of knowledge to include, along with technical know-how, holistic knowledge about ecosystems, gender among other things. There is a need to cross gender boundaries in the water sector and to undertake collaborative research across boundaries of communities and nations, in order to find out how communities respond to climate change. The findings from such research need to be shared at various platforms, so that policy-makers can learn from this process.

Mr. Malik Fida Khan spoke about how countries like Bangladesh can suffer due to lack of cooperation between riparian states. Shared waters basically provide an opportunity to share benefits. Though there is trust among the scientific communities, politically, there is a lack of trust between nations. It is important to emphasize environmental flow of rivers in bilateral treaties over shared rivers. Organizations based on river basins need to be created.

During the discussion, it was agreed that there was no alternative to cooperation in the Himalayan region with regards to trans-boundary water management; the first thing to be done would be to get the national governments to agree to the free-flow of information and flood-related data. Since flooding was a common issue in the rivers of the region, 'flood risk management' could



become a window of opportunity for cooperation. Also, technology could also be exchanged, especially satellite-based technology, rainfall models and early warning systems; this could be an opportunity for cooperation with the upper riparian nation.

It was also suggested that the dependence on government for developing dialogue between multiple stakeholders must be reduced; instead, efforts should be made to share information among the academic and scientific communities, and research institutes through joint projects. These should be used to convince policy-makers of the need for sharing information. It was also suggested to create a platform of data on South Asia water situation that would be accessible by everyone. An institution based on the lines of the Mekong River Commission was also suggested in the Himalayan region.

Programme



Day 1 (Thursday, 6 August 2009)

- Arrival of participants during the day
- Lunch hosted by SFG for participants who have already arrived

Evening

- 6.00 - 6.45 pm Reception
- 6.45 - 7.30 pm Opening Session
- Introduction by Ms Ilmas Futehally, Executive Director of Strategic Foresight Group
 - Address by Dr Claudia Sadoff of the World Bank
 - Introduction by participants
- 7.30 - 9.00 pm Dinner hosted by the World Bank

Day 2 (Friday, August 2009)

- 9.15 - 11.30 am **Session I: Long Term Assessment of Water Security with Particular Focus on Rivers Originating in the Himalayas**
Chaired and introduced by Mr Sompal, India
- Mr Tauhidul Anwar Khan, Bangladesh
 - Dr Xiaohong Chen, China
 - Dr Chandan Mahanta, India
 - Dr Sushil Kumar Gupta, India
 - Mr Kanak Mani Dixit, Nepal
 - Discussion
- 11.30 - 11.45 am Coffee Break
- 11.45 - 1.45 pm **Session II: Impact of Climate Change on Glaciers, Precipitation, and Water Flows**
Chaired and introduced by Mr Dipak Gyawali, Nepal
- Mr Malik Fida A Khan, Bangladesh
 - Dr Xiaoquan Zhang, China
 - Prof Jayanta Bandyopadhyay, India
 - Dr Zheng Yan, China
 - Discussion
- 1.45 - 2.45 pm Lunch
- 2.45 - 4.30 pm **Session III: Conservation and Efficiency in Water Management**
Chaired and introduced by Mr Zhang Shuang, China
- Prof Jinxia Wang, China
 - Mr Ashok Jaitly, India
 - Dr Bishnu Bhandari, Nepal
 - Discussion
- 4.30 - 4.45 pm Coffee Break
- 4.45 - 6.30 pm **Session IV: Mutual Learning and Trans-boundary Collaboration**
Chaired and introduced by Major General A N M Muniruzzaman, Bangladesh
- Dr Shaofeng Jia, China
 - Mr Ganesh Pangare, India
 - Mr Som Nath Poudel, Nepal
 - Mr Ajaya Dixit, Nepal
 - Discussion
- 6.30 - 6.40 pm Concluding Session
- Ms Ilmas Futehally, Strategic Foresight Group
- 7.15 pm Dinner

Participants



Host

- Ms Ilmas Futehally, Executive Director, Strategic Foresight Group, India
- Mr Shrikant Menjoge, Senior Advisor, Strategic Foresight Group, India

Bangladesh

1. Maj Gen A N M Muniruzzaman, President, Bangladesh Institute for Peace and Security Studies
2. Mr Tauhidul Anwar Khan, Secretary General, Bangladesh Water Partnership
3. Mr Malik Fida A Khan, Head, Climate Change Study Division, Center for Environmental and Geographic Information Services

China

1. Mr Zhang Shuang, Director, The Nature Conservancy, China Program
2. Dr Zheng Yan, Associate Research Fellow, Research Centre for Sustainable Development
3. Dr Xiaohong Chen, Director, Department of Water Resources and Environment, Sun Yat-Sen University
4. Prof Jinxia Wang, Associate Professor, Center for Chinese Agricultural Policy, Chinese Academy of Sciences
5. Dr Shaofeng Jia, Professor, Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences
6. Mr Ma Jian, Manager of Conservation and Climate Project, The Nature Conservancy China Program
7. Dr Xiaoquan Zhang, Senior Climate Change Scientist, The Nature Conservancy China Program

India

1. Mr Sompal, former Minister of Agriculture and Water Resources of India
2. Prof Jayanta Bandyopadhyay, Professor, Centre for Development and Environmental Policy, IIM Calcutta
3. Mr Ashok Jaitly, Distinguished Fellow and Director, Water Resources Division, The Energy and Resources Institute
4. Dr Chandan Mahanta, Head, Department of Environment, IIT-Guwahati
5. Dr Sushil Kumar Gupta, Visiting Scientist, Physical Research Laboratory
6. Mr Ganesh Pangare, Regional Coordinator, Water and Wetlands Program, International Union for the Conservation of Nature, Asia Regional Office

Nepal

1. Mr Dipak Gyawali, former Minister for Water Resources, Member Nepal Academy of Science and Technology, Member Board of Directors, Nepal Water Conservation Foundation
2. Mr Som Nath Poudel, Former Executive Secretary, Water and Energy Commission Secretariat and General Secretary, Jalsrot Vikas Sansthan
3. Mr Kanak Mani Dixit, Editor, Himal
4. Mr Ajaya Dixi, Nepal Water Conservation Foundation
5. Dr Bishnu Bhandari, Chief Technical Advisor, International Union for the Conservation of Nature
6. Mr Jay Pal Shrestha, Regional Environmental Affairs Specialist, U.S. Embassy
7. Dr Madhav Karki, Deputy Director General Programmes, International Centre for Integrated Mountain Development (ICIMOD)
8. Dr Mandira Shtestha, Water Resources Specialist, Water and Hazards, International Centre for Integrated Mountain Development (ICIMOD)

World Bank

1. Dr Claudia Sadoff, Lead Economist, South Asia Unit
2. Mr Shyam Ranjitkar, Sr. Irrigation Engineer, South Asia Sustainable Development Unit

Rapporteur

- Ms Sahiba Trivedi, Research Analyst, Strategic Foresight Group