

ICIMOD Proceedings 2018/7



Knowledge Forum

# Climate Resilient Development in Himalayan and Downstream Regions

ICIMOD

FOR MOUNTAINS AND PEOPLE



# About ICIMOD

The International Centre for Integrated Mountain Development (ICIMOD) is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush Himalaya (HKH) – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – based in Kathmandu, Nepal. Globalization and climate change have an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream and downstream issues. ICIMOD supports regional transboundary programmes through partnerships with regional partner institutions, facilitates the exchange of experiences, and serves as a regional knowledge hub. We strengthen networking among regional and global centres of excellence. Overall, we are working to develop economically and environmentally-sound mountain ecosystems to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now and in the future.



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ICIMOD Proceedings 2018/7

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## **Climate Resilient Development in Himalayan and Downstream Regions**

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*Jointly Organized by*

Ministry of Agriculture and Farmers Welfare (MoA&FW), Government of India

International Centre for Integrated Mountain Development (ICIMOD) and

Institute of Economic Growth (IEG)

International Centre for Integrated Mountain Development, Kathmandu, Nepal

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## Acronyms and Abbreviations

BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
CACP	Commission for Agricultural Costs and Prices
CIMMYT	International Maize and Wheat Improvement Center
CSISA	Cereal Systems Initiative for South Asia
DFAT	Australian Government's Department of Foreign Affairs and Trade
GCF	Green Climate Fund
HICAP	South Asia and Himalayan Climate Change Adaptation
HKH	Hindu Kush Himalaya
ICIMOD	International Centre for Integrated Mountain Development
ICRIER	Indian Council for Research on International Economic Relations
IEG	Institute of Economic Growth
IRADe	Integrated Research and Action for Development, India
ITC	Indian Tobacco Company
LPG	Liquefied Petroleum Gas
MAP	Medicinal and Aromatic Plants
MDGs	Millennium Development Goals
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Scheme Act
MOAFW	Ministry of Agriculture and Farmers Welfare
NARC	Nepal Agriculture Research Council
NPC	National Planning Commission
NREGA	National Rural Employment Guarantee Act
ORF	Observer Researcher Foundation
PKSF	Palli Karma-Sahayak Foundation
SAARC	South Asian Association for Regional Cooperation



# Executive Summary

Countries in the Hindu Kush Himalaya (HKH) have made advances in socioeconomic development in recent years, but the challenge remains to ensure food and nutrition security, end hunger and poverty, and provide access to safe water and clean energy to a burgeoning population. Leaders in the region have committed to inclusive growth and climate resilient development as part of the Sustainable Development Goals (SDGs) and Agenda 2030. Achieving these goals requires a multifaceted approach including integrated solutions; efficient and sustainable use of land, water, energy and ecosystems; strengthening upstream-downstream linkages; and increased regional and sub-regional coordination and connectivity.

In response to these concerns, the International Centre for Integrated Mountain Development (ICIMOD) with the Government of India's Ministry of Agriculture and Farmers Welfare (MoAFW) and the Institute of Economic Growth (IEG) conducted a "Knowledge Forum on Climate Resilient Development in the Himalayan and Downstream Regions" on 16–17 June 2016 in New Delhi, India. As a multisector platform, the event brought practitioners, senior government officials, policy makers, experts, researchers and development workers together to deliberate on issues common to the HKH. Participants from Himalayan and downstream countries, including Bangladesh, China, India and Nepal discussed ideas and solutions to ensure food, water and energy security and how to promote climate resilient development. Through six themes, the conference delved into challenges, opportunities and integrated solutions linking science and policy for inclusive growth and climate resilient development.

A main output of the forum was that policy makers, researchers and development practitioners came to a shared vision and understanding of issues linked to climate resilient development in the Himalaya and downstream regions. This has strengthened a network of diverse stakeholders, encouraging regular and increased interactions in the future. The forum also generated new insights, solutions, and courses of action at the regional level for inclusive growth and resilient development.

Long-term water, energy and food security requires sustainable coordination among upstream and downstream countries, development of nexus knowledge, and conservation of ecosystem services.

There are solutions to many common challenges and transboundary cooperation should be strengthened in the management of the region's shared natural resources. Collaboration is also essential to ensure that the benefits of improved resource management are shared between upstream and downstream communities and that appropriate incentive mechanisms are put in place.

One significant message was that policies and mechanisms are institutionalized and should ultimately benefit HKH populations. Eventually, the information, data, and knowledge would have to be implemented on the ground with pilot initiatives designed for scaling up to upstream mountain and downstream lowland communities.

Regional cooperation in water-energy-food security is important for enhancing resource use efficiency and ensuring climate resilient development.

The two-day forum was a good learning process that drew from past shortcomings to move on to new and innovative solutions. There is now a conscious effort among countries not to work in isolation in the areas of research and knowledge generation. Such forums can sustain this culture to share knowledge and ideas to further develop HKH as a climate-resilient region. This evolving learning curve with a regional approach is a milestone for the HKH.

## Conference Themes

1. Food-water-energy nexus and connectivity
2. Improving agricultural productivity and livelihoods
3. Climate change and upstream-downstream linkage of river basins
4. Innovation for climate resilient development
5. Agricultural development: emerging challenges and opportunities
6. Coherent and coordinated policies for comprehensive development





# Chapter 1 : Introduction

Climate change is widely discussed around the globe as a main factor putting pressure on natural resources with direct bearing on people and livelihoods. Spreading awareness about the adverse impacts of climate change and the need to develop a climate resilient world is vital. The degradation of soil, water, and other natural resources combined with a dramatic population increase, globalized production processes, changing consumption patterns, and environmental degradation is an increasingly serious matter. The Hindu Kush Himalaya (HKH) holds a crucial key for resilience, which is hydropower energy potential and rich cultural, biological, and agricultural diversity. The extended ecosystem is closely interconnected, as are upstream and downstream regions. Activities in the mountains impact the plains and vice versa. Decisions made in capital cities have implication for rural areas throughout the region.

Efforts to highlight climate change in the global agenda have helped generate new knowledge to guide the development of effective adaptation strategies in the region over the years. This knowledge is critical to achieving the 2030 Agenda for Sustainable Development. Countries across the region face common challenges such as unmet agriculture demand. The projected food grain demand in the region is likely to exceed 476 million tonnes by 2025, which raises serious concerns in the face of rapid urbanization and shrinking agricultural lands against the background of climate change. More innovative and integrated solutions are needed to address interlinked challenges related to food, water and energy security. Solutions can be achieved through appropriate policies and institutional mechanisms in all HKH nations. Sector-specific research, as well as integrated research that incorporates factors such as growth, inclusiveness, and sustainability are imperative. Such outputs will enhance policy-makers' awareness of issues and how to integrate them into national policies.

## Messages

- Countries in the HKH will struggle to address the challenges of climate change alone. The impacts on natural resources are transboundary in nature and countries therefore need to collaborate on research, advocacy, solutions, policy actions and implementation.
- Interdependencies between upstream and downstream needs to be better understood to establish synergies between the mountains and lowlands.
- Researchers need to collaborate to generate knowledge and better understand linkages.
- Development of sustainable and climate resilient plans need to incorporate economic, social and environmental aspects.
- Substantial changes are needed in production, consumption and behavioural attitudes in water use, irrigation, agriculture and food consumption.
- The river basin approach should be promoted to manage disasters and water resources.
- Appropriate and equitable benefit sharing mechanisms should be established so mountain communities become stakeholders in the development process.
- There should be people-centred policies to help communities own, use and scale up initiatives. Gender and social equity should be a significant aspect of every initiative.
- Unsustainable use of resources especially in mountain areas, can lead to irreversible damage in both upstream and downstream reaches.
- Focused efforts are needed to reduce social, regional, and gender inequalities.
- Policy strategies, technological and institutional innovations, and multistakeholder engagements between scientists, policy makers and development practitioners are critical to promote, sustainable climate resilient development.
- Policy and technological interventions must be flexible enough to suit local conditions and requirements.



## The Knowledge Forum

Climate change is exacerbating energy, water, and food securities in the region. The food-water-energy nexus and upstream-downstream linkages are indispensable for the HKH region, where many transboundary rivers originate in the Himalaya and drain through South Asian plains, producing food and energy for millions of people. Food-water-energy security and conservation of ecosystem services are therefore linked across the Himalayan basins, and related problems may be addressed at the regional level. Yet, farmers have limited access to water for irrigation and suffer recurrent floods and droughts, while power shortages cripple economic activities. Despite being endowed with immense water resources that support highly fertile basins, the region still suffers from water, food and energy shortages.

In response to these concerns, the International Centre for Integrated Mountain Development (ICIMOD), with the Government of India's Ministry of Agriculture and Farmers Welfare (MOAFW) and the Institute of Economic Growth (IEG), conducted a "Knowledge Forum on Climate Resilient Development in the Himalayan and Downstream Regions" on 16–17 June 2016 in New Delhi, India.

# Chapter 2: Inaugural Session

The inaugural session set the context for the knowledge forum to focus on the issues and challenges faced by Himalayan and downstream communities to identify options and mechanisms for integrated solutions, resource use efficiency, upstream-downstream linkages, regional and sub-regional cooperation for inclusive growth, and climate resilient development.

## Messages from the Speakers

### Manoj Panda, Director, IEG, India

- The need of the hour is a two-pronged approach to research. That is, an intensive sector-specific research agenda incorporating the issues of growth, inclusiveness, and sustainability. This is particularly important in the Himalayan and downstream regions.
- Policy makers are interested to learn how to better integrate these issues into policies.
- The effect of climate change on agriculture is multidimensional and not uniform across the region. For example, the impact of climate change is more pronounced in low income areas. Thus, there is a need to analyse the impact on farmers and develop coping and adaptation strategies for them.

### David Molden, Director General, ICIMOD

- International dialogues around climate change talk about maintaining the average global temperature increase to under 2° Celsius, yet the average temperature increase in the mountains could be nearly twice that because of temperature amplification.
- Mountain areas are in the forefront of immediate impacts of climate change and are more vulnerable. Globalization and environmental degradation are additional challenges in the region. Thus, climate resilient development strategies are crucial.
- There are over 210 million people in the mountain areas and 1.3 billion people in the downstream region in ten river basins. An additional three to four billion people are dependent on the food produced in these river basins. Thus, it is critical to manage the mountain and downstream regions for climate resilience and food security.

## Speakers

**Manoj Panda**, Director, IEG, India

**David Molden**, Director General, ICIMOD

**Harinder Sidhu**, Australian High Commissioner, India

**Qazi Kholiquzzaman Ahmed**, Chairman, Palli Karma-Sahayak Foundation (PKSF), Bangladesh

**Yuba Raj Khatriwada**, Vice-Chairperson, National Planning Commission, Government of Nepal

**P.C. Bodh** on behalf of **S.K. Pattanayak**, Secretary, Ministry of Agriculture and Farmers Welfare, Government of India



### **Harinder Sidhu, Australian High Commissioner, India**

- The UN's Sustainable Development Goals (SDG) and 2030 Agenda came into force in January 2016. Climate change is recognized as a serious global threat and SDG 13 commits its global partners to urgent action to combat it.
- In South Asia, urgent action is needed to safeguard food, water, and energy resources. Which are threatened by climate change. In the HKH region, these threats are further aggravated by rapid population growth and the need for additional resources.
- Farmers in the region are facing one of the worst droughts in a generation. Creative solutions are now more important than ever to resolve the environmental and climate issues here.

### **Qazi Kholiquzzaman Ahmed, Chairman, PKSF, Bangladesh**

- International negotiations on climate change are complicated but we have all the resources, technological and financial, to work across the globe to combat climate change.
- South Asian and Eastern Himalayan countries have been working together and agree on climate change issues. While important agreements such as the Thimphu Statement, the Dhaka Declaration, and the South Asian Association for Regional Cooperation Declaration have been agreed to, most remain on paper and are yet to be implemented.
- Inclusive development is not adequate. Equitable development is required. A recent study on women in climate change adaptation projects in Bangladesh demonstrated that women had less access to resources and participated less than men, although women and children are generally more affected by the adverse impacts of climate change.



### **Yuba Raj Khatiwada, Vice-Chairperson, NPC, Government of Nepal**

- Climate change is a global issue, but it has to be tackled at the national and regional levels. No government can address it alone and it must be mainstreamed in national plans and budgets.
- In the preparation of the SDG post-2015 Agenda, the discussion of marine resources overshadowed that of mountain resources. The mountain agenda on how to develop the region as a sustainable source of ecosystem services needs to be discussed and we need to develop our own targets and mechanisms to address climate change.
- In Nepal, periodic plans are audited for climate change impacts and projects with negative impacts on climate change have been significantly reduced. This is the second year of implementation and we invite institutions to evaluate whether it is providing the desired outputs and outcomes to help mitigate and adapt to climate change.
- Policies put forth by regional institutions such as SAARC and The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) need to be implemented.

### **P.C. Bodh on behalf of S.K. Pattanayak, Secretary, MoAFW, Government of India**

- This forum is a good opportunity to discuss the interdependence of plains and mountain ecosystems.
- Research and knowledge sharing here could help address some issues already highlighted by the delegates.
- One challenge we have is how to maximize agricultural productivity while addressing long-term sustainability.



# Chapter 3: Policy Talk 1

## Food-Water-Energy Nexus and Regional Connectivity

Demand for food, water, and energy is growing rapidly in the Himalayas and downstream regions. Although Himalayan countries have made progress in food production, poor sectoral coordination and institutional fragmentation have led to an unsustainable use of water, energy, and other resources. This has increased the risk of unstable long-term food, water, and energy security in the region and poses a critical challenge to achieving the SDGs.

The policy talk focused on:

- Improving our understanding of current knowledge related to food, water and energy security in the Himalayas and downstream areas, and their linkages, synergies and trade-offs

**Topic:** Identifying options and mechanisms to improve intersectoral and interregional coordination and coherence to minimize trade-offs

**Chair:** Rajat Kathuria, Director, ICRIER, India

The food-water-energy nexus is underexplored in South Asia. Policy and implementation often occur in silos. Given that the majority of the population is dependent on agriculture, it is important that the nexus is well understood. Access to energy is not complete; for example, only 70% of the population in India have access to energy. But there is progress. For example, an initiative to replace biomass with liquefied petroleum gas (LPG) as an energy source for cooking is expected to improve women's health in rural areas. Health and poverty need to be included in the policy discussion, as a single health problem in a rural family can condemn them to poverty for generations. Thus, it is important to analyse issues in relation to each other rather than separately.

### Chair

**Rajat Kathuria**, Director, Indian Council for Research on International Economic Relations (ICRIER), India

### Speakers

**Golam Rasul**, Theme Leader, Livelihoods, ICIMOD

**Jyoti Kirit Parikh**, Executive Director, Integrated Research and Action for Development, India (IRADe)

**Sabnam Shivakoti**, Joint Secretary, Ministry of Agriculture, Government of Nepal

**Dipak Gyawali**, Chair, Nepal Water Conservation Foundation, Former Minister of Water resources

**Ashok Gulati**, ICRIER, India



## Golam Rasul, Theme Leader, Livelihoods, ICIMOD

- Food and nutrition security are major challenges. South Asia has 3% of the world's agricultural land but 25% of the world's population. While there is demand to increase production, availability of arable land is decreasing. Fertilizer demand is also increasing by 4.5% per annum.
- Energy demand is increasing at the rate of about 5% in Bangladesh, India and Pakistan but there are still large populations that do not have access to energy. Energy shortages impede economic growth. Studies have shown that the GDP for India and Pakistan could be increased by a further 1–2% if energy access can be increased.
- Landlocked mountain countries of the HKH such as Nepal and Bhutan, and north-eastern states of India suffer from connectivity issues and bear higher transportation costs than the coastal countries, posing major constraints on economic development.
- Regional cooperation is critical to managing transboundary water, disasters and energy production. For example, in the Ganges and Brahmaputra basins, most water flows through in a period of 70 to 80 days. Storing this water to meet everyone's needs during the dry season requires regional cooperation.

### Policy Recommendations

- An integrated approach is needed to address the already growing gap between supply and demand of food, energy, and water. Policies must take into consideration the impact that production in one sector has on related sectors and focus on a complementary and integrated approach. For example, sustainable agriculture practices with watershed management can reduce the demand for irrigation water and energy for fertilizer production.
- Regional cooperation is needed to manage the rich ecosystem services of the Himalayan and downstream regions. The transboundary nature of river basin production of food and energy provides an opportunity to efficiently manage competing resources. Development of waterways in the transboundary river helps to connect landlocked mountainous countries.

## Jyoti Kirit Parikh, Executive Director, IRADe, India

- Hill region agriculture is different from agriculture in the plains and has its own set of challenges. Due to climate change, production is affected by weeds and insect infestation moving from lower to higher altitudes, and cloud bursts, landslides, and floods. A decrease in production of non-timber forest products and medicinal and aromatic plants (MAP) has also been observed. There is increased dependency in rainfall and a decrease in irrigated land. Other biophysical changes such as drying up of water sources, have been noted, resulting in women spending more time collecting water.
- Certain strategies and policies can be applied to ensure that people and their livelihoods can adapt to changes in climate and economic conditions. For example, improved technologies can be adapted to hill region topography such as drip irrigation to use water and energy more efficiently.
- Other economic activities such as tourism are also expected to move to higher altitudes but the physical infrastructure for tourism needs to be put in place. The food, water and energy nexus in a changed climate is a challenge that can be best understood and addressed by policy makers, decision-makers, and agricultural planners by taking into account the local microeconomic conditions.

### Policy Recommendations

- Climate change will negatively impact agriculture and local economies unless strategies are implemented to account for different dimensions, expected impacts, and the needs of local communities; otherwise it will be difficult for them to adapt.
- Appropriate technology and inputs such as drip irrigation and improved pesticides should be adopted. Farmers need capacity building to transition from high-elevation to low-elevation crops.
- The economic opportunities for agriculture and tourism in higher elevations will require infrastructure development.

## **Sabnam Shivakoti, Joint Secretary, MoAD, Government of Nepal**

- Policy is pushing Nepal to become self-sufficient, especially in cereal production, through expansion of spring season rice and the use of improved varieties, production practices, and irrigation expansion. In contrast, in the plains there has been an increasing trend of converting paddy fields into fish ponds as they are more productive. Whether this trend has implications for self-sufficiency in cereals is being debated by policy makers and practitioners.
- In the irrigation sector, water user associations are often the legal entities involved in the operation and management of irrigation systems. It has been observed, however, that there is limited coordination among these associations and agricultural extension agents. The public agriculture extension system, which often works with farmer groups and cooperatives, is now trying to mobilize these water user associations for technology transfer. At the institutional level, the Ministry of Agriculture is working with the Department of Irrigation under the Ministry of Water Resources.
- As the majority of farmers in Nepal are small landholders, the government is engaged in various programmes for climate change resilience. These include local adaptation plans, agrobiodiversity conservation programmes, and insurance schemes. However, as insurance schemes are production based rather than weather or information based, farmers are less attracted to invest in these schemes. Accessible weather information for farmers and insurance providers is therefore necessary.

### **Policy Recommendations**

- Agricultural institutions at the local and central levels should work with relevant institutions such as the Department of Irrigation to increase the efficiency and effectiveness of government programmes and policies.
- For efficient use of resources, whether it is land, water, or energy, policy makers and decision-makers must take into consideration the impact of policies in other sectors.
- Regional connectivity for agricultural production, nutrition security, energy production, and water management is an important discussion for a forum such as this.





## Dipak Gyawali, Chair, NWCF, Nepal

- Nexus and SDGs are new ways of thinking about development, but there are some dangers. Government institutions and bureaucracies are not designed to meet multiple indicators of success. SDGs have 169 indicators, which government institutions may not be able to address without committing significant resources to monitor them.
- Progress in dealing with these challenges stems from innovations and creativity at the local level. An example of this is how local groups, civil society, NGOs, and religious and youth groups are working on reconstruction and rehabilitation efforts more effectively than in the government. However, such innovation and action are not scalable to the national level.
- The nexus approach has shown that we need to go back to interdisciplinary thinking for sustainable development. The Department of Irrigation in Nepal, at one point, managed water springs as part of its purview, but no longer does. Engineering approaches alone will not be adequate to meet the demands of communities living in the hills, where springs are the major source of water.

### Policy Recommendations

- Development should take into account societal and environmental values as defined at the local level and these should be embraced by central governments and regional agendas.
- Sectoral approaches to development should give way to interdisciplinary approaches at the local, national and regional levels in policy and institutional mechanisms.

## Ashok Gulati, ICRIER, India

- Climate change will have two major impacts in South Asia. First, the rapid melting of glaciers will cause more floods, and second, the intensity and frequency of droughts will increase. Food production will be affected by both.
- Innovative policy incentives could be devised to save energy, for example, cash incentives equivalent to 200 kilowatt hours/hectare for saving 300 kilowatt hours/hectare in energy consumption. It is more resource efficient to manage demand than supply.
- In the eastern parts of India, energy is scarce and 80% of the rural economy is dependent on diesel, which costs INR 12 per kilowatt hour. Incentive mechanisms could be developed that would allow energy-scarce areas to produce their own energy through solar panels and then supply energy to the grid, which would account for the negative externalities of thermal power plants. This could give incentives directly to the farmers and increase productive use of groundwater where it is in surplus.

### Policy Recommendations

- Develop incentive mechanisms to encourage the use of resources where they are abundant and reduce consumption in resource-scarce areas.
- Innovation in technologies like drip irrigation and SRI, along with smaller projects, can be cost effective in benefiting farmers. Researchers should focus more on piloting new technologies as well as on new policy mechanisms.

# Chapter 4: Technical Session I

## Improving Agricultural Productivity and Livelihoods

The majority of people in the Himalayan and downstream regions live in rural areas and depend heavily on agriculture for their livelihoods and wellbeing. Improving agricultural productivity and enhancing sustainability is critical to improving the livelihoods of rural people and promoting inclusive growth. Growth and dynamism in agriculture have recently slowed due to both climate and non-climate factors. This session focused on innovative ideas and options that promote agricultural productivity and livelihood enhancement in changing climatic socioeconomic conditions.

**Chair: Brij Mohan Singh Rathore,**  
Chief Policy Advisor, ICIMOD

The earlier session demonstrated that several countries in the HKH have achieved food security. The current focus of countries is to achieve nutrition security too.

The session also noted the need for integration in the policy regime between food, water and energy but we also need to add forests in mountain ecosystems. The call for coherent and harmonious policies is evident and there are many examples where communities have demonstrated how this can be achieved, for example in the Arunachal Pradesh (Apatani Plateau), a sustainable ecosystem is being managed.

**Shiv Kumar, Divisional Chief Executive, Agriculture Business Division, ITC Limited, India**

- There are two fundamental questions. The first is what to grow sustainably, which has to be filtered through ecological, climate resilience and economic lenses. Ecological considerations such as deciding which crops to grow require fewer natural resources. There is also a need to consider which crops can withstand climate change impacts such as drought resistant or water tolerant species. The second question is how to access markets, not just infrastructure-based markets but information-based markets such as weather forecasts, market prices, farm extension knowledge markets, input markets (credit, insurance, seeds, fertilizers) and output markets.

### Chair

**Brij Mohan Singh Rathore**, Chief Policy Advisor, ICIMOD

### Presenters

**Shiv Kumar**, Divisional Chief Executive, Agriculture Business Division, ITC Limited, India

**Kalyan Das**, OKD Institute of Social Change and Development, Guwahati, India

**Dennis Wichelns**, Senior Research Fellow, Stockholm Environment Institute, Thailand

**Alwin Keil**, Senior Fellow, International Maize and Wheat Improvement Centre, CIMMYT, India



- A reciprocal trade mechanism between ecological hills and plains regions which benefits both will be more sustainable than each region producing what they prefer to consume. For example, sea buckthorn or buckwheat which are high-value crops grown in the mountains, could be considered as a way to increase livelihood options and climate resilience.

### **Kalyan Das, OKD Institute of Social Change and Development, Guwahati, India**

- Generally, the three major reasons for sand depositions are high flow conditions, breach of embankments, and upstream land use practices such as shifting agriculture, extraction of boulders and deforestation.
- Farmers' motivation to invest in areas with degraded soil fertility is very low, and efforts are limited to using seeds that are more suitable for cultivation in areas with low organic matter. Farmers are also trying to use seeds with shorter growth periods.
- Two major policy discussions are recommended: how to change upstream land use practices to reduce high sedimentation in downstream areas and how effective the embankments are in ensuring livelihood options for farmers in floodplain areas.

### **Dennis Wichelns, Senior Research Fellow, Stockholm Environment Institute, Thailand**

- Rice is generally cultivated in flood areas under anaerobic conditions, where anaerobic bacteria generate methane gas. Twenty percent of human generated methane comes from agriculture, the majority from rice cultivation and livestock. Methane is much more potent than carbon dioxide in terms of global warming.
- Changes in water management and crop choice will help farmers adapt to climate change by reducing irrigation water requirements and diversifying cropping patterns. Rice plants have also been known to be more resistant to drought and water logging when grown in aerobic conditions.
- Growing rice in aerobic conditions reduces methane production and arsenic uptake. It can also adapt to climate change conditions of increased droughts and flooding. However, farmers face challenges in practicing aerobic cultivation. This is an issue that requires further discussion.

### **Alwin Keil, Senior Fellow, International Maize and Wheat Improvement Center, CIMMYT, India**

- Demand for cereal crops in South Asia is increasing but most arable land is already under intensive cultivation. Sustainable cultivation is the only way to increase production. Additional challenges such as climate change impacts of rising temperature, drought, extreme weather events, water shortages, energy costs, population growth, depleted soil nutrients and infestations of disease and insects are already being experienced in this region.
- Bihar is a net importer of wheat and has low wheat yields in the Indo-Gangetic Plains. Zero tillage improves yields, saves diesel costs, increases water efficiency and allows for early sowing. In the zero tillage method, seeds and fertilizer are placed in the soil at the same time, which helps retain soil moisture. Early sowing can help avoid heat stress during the critical grain-filling period, which has been known to reduce yields by up to 50%.
- Data from random sampling of 1,000 wheat farmers in Bihar showed that yield gains using zero tillage were 498 kg/ha (19%) more than that from conventional farming and increased household income by 6%.

### **Remarks by the Chair**

In this session, we talked about what we are growing, how we are growing them, and what problems we encounter in the process. Then we talked about the solutions and options. This was a unique session and each issue was discussed in depth. In addition to technical issues, we realized there is a policy paradox. Policy makers should look to transformative approaches to shifting cultivation, which has inherent characteristics in a given situation. Intersectoral approaches and the science-policy-practice interface is crucial to improve the situation.

# Chapter 5: Technical Session

## Climate Change and Upstream Downstream Linkage of River Basins

Sustainable development of water resources in Himalayan river basins is critical for long-term sustainable economic development of downstream areas and reflects a stronger upstream-downstream linkage. Despite the immense benefit, upstream-downstream cooperation has remained less than optimal even though it is critical for climate resilient development. This session focused on scientific evidence of climate change impact in Himalayan river basins and also discussed mechanisms for strengthening upstream-downstream linkages to minimize the damage of water related disasters and optimize the collaborative development of water resources.

**Chair:** **Dipak Gyawali**, Chair, NWCF, Government of Nepal

Many rivers originating in the Himalaya flow through South Asian plains and produce food and energy for millions of inhabitants. Food-water-energy security, therefore, is linked across the basins, so related problems need to be considered at a regional level. Farmers have limited access to water for irrigation and suffer recurrent floods and droughts while power shortages limit economic activities. The changing climate will make matters more challenging.

This session addressed how emerging scientific evidence of upstream-downstream climate change impacts in Himalayan basins can help optimize collaborative development of water resource and minimize the damage of water related disasters.

### Chair

**Dipak Gyawali**, Chair, Nepal Water Conservation Foundation, Former Minister of Water Resources, Government of Nepal

### Speakers

**A. B. Shrestha**, Regional Programme Manager, River Basins, ICIMOD

**D.K. Mishra**, Member of an Expert Advisory Group to the Ministry of Water Resources (to advise on water resources, river development and Ganga rejuvenation India)

**Srikant Baldi**, Additional Chief Secretary, Government of Himachal Pradesh, India

**Navarun Varma**, Energy and Resource Institute, New Delhi, India

**Anamika Barua**, Executive Director, SaciWATERS, India





### **Arun Bhakta Shrestha, Regional Programme Manager, River Basins, ICIMOD**

- Climate change and variability are important components of upstream-downstream linkages. Temperatures are expected to increase by 1–2 °C in the HKH region, which will have a profound impact on glacier melting. Glacier cover is expected to be reduced 20-50% by 2050.
- These changes will impact land use and land cover. Land use change can impact the hydrological regime in terms of changes in evapotranspiration and infiltration. Land use change has direct links with erosion and landslides (upstream) and sedimentation (downstream), which in the long-run results in shifting river channels causing flooding.
- To improve the situation, governance has a role to play and linkages need to be better understood. Scaling up the information is also important.

### **D.K. Mishra, Member, Expert Advisory Group to the Ministry of Water Resources River Development and Ganga Rejuvenation, India**

- Upstream-downstream is a relative term. The upstream-downstream dynamics differ in each country. There can be six "upstream-downstream" linkages within the same river.
- We always talk about the problem of water deficiency but not about surplus water. A water surplus in one village can be used to counter water deficiency in neighbouring villages.
- There is a lack of dialogue among the stakeholders. Mainstreaming of flood control as a policy measure requires the incorporation of people's needs. There is a lack of effort from the government in terms of responsibilities and accountability.

### **Srikant Baldi, Additional Chief Secretary, Government of Himachal Pradesh, India**

- Himachal Pradesh in India is a good model for sustainable economic development. The state has progressed tremendously since 1971 and offers a replicable model to other similar areas. Himachal Pradesh is ahead on most socioeconomic indicators in comparison to the rest of India. In 1971, Himachal's per capita income was 20% below the national average; it is currently 20% higher than the national average. The poverty ratio in Himachal is only 8.5%.



- To deal with climate change, Himachal Pradesh has given emphasis to balancing industrial and hydropower development (clean energy); plastic bags have been completely banned since 2009; there is a ban on coal and firewood burning; green forest accounting has started; and there is a massive increase in afforestation.
- Himachal applied river basin approaches and integrated watershed management. Fifteen percent of water flow is maintained while generating hydropower.

### **Navarun Varma, TERI, New Delhi, India**

- Several persistent problems can be seen in downstream areas such as increased riverbed levels, increased water levels during floods, and reduced flow during dry seasons. There is permanent loss of agricultural land due to erosion and deposition of siltation.
- Transdisciplinary team building is the entry point to facilitate dialogue to deal with upstream-downstream issues across boundaries. Information plays a central role in bringing teams together for negotiation.
- Fundamental to initiating social learning processes are capacity building of stakeholders, the role of social capital, the linking of science and policy, and a transdisciplinary approach. Track 3 diplomacy (through NGOs, civil society, academia) to resolve upstream-downstream issues at higher scales is also recommended.

### **Anamika Barua, Executive Director, SasiWATERs, India**

- For better cooperation we have to move from Track 3 (NGOs, civil society, academia), to Track 2 (bureaucrats and influential academicians) and Track 1 (politicians).
- In most transboundary river basins, conflicts came after the signing of treaties – for example, the treaties between Nepal and India and the treaties between India and Bangladesh – as asymmetrical treaties lead to conflicts. All treaties are not about cooperation.
- The bottleneck transboundary river basin management comes from bilateral agreements, asymmetrical treaties or no treaty, mistrust, hydro-hegemony, lack of sharing data and information, and lack of vertical and horizontal linkages.
- There is a need to move from confrontation to cooperation and from monologue to dialogue to address the challenges in transboundary basins. Dialogue is essential for effective negotiation and cooperation which should incorporate the voices of all stakeholders. There is a need to build capacity among politicians, bureaucrats and the scientific community. This can be achieved through institutional mapping of all the riparian countries, conducting a multistakeholder workshop and moving from Track 3 to Track 1.

# Chapter 6: Technical Session

## Innovation for Climate Resilient Development

This session focused on identifying innovative ideas, technologies, good practices and solutions for inclusive growth and climate resilient development in changing climate conditions and socioeconomic changes.

**Chair:** **R.B. Sinha**, Joint Secretary, MoAFW,  
Government of India

India has been witnessing extreme weather events with increasing frequency in the past few years. The last two years have been bad for India from the agricultural point of view. We have witnessed two consecutive droughts. Due to sustained efforts with our states and farmers, the loss of production in agriculture has not been as bad as it could have been. The country is trying to cope with climate change taking place.

Himalayan regions are vulnerable. A massive disaster struck Uttarakhand where thousands of people lost their lives. We have to take steps based on science to overcome challenges with cooperation from everyone. This workshop organized by ICIMOD is very timely.

**Shahriar M. Wahid**, Programme Coordinator,  
Koshi Basin Programme, ICIMOD

### Knowledge and Capacity Development

- In the framework we use at ICIMOD, we have identified five elements of knowledge and capacity development. First, we need an assessment that all sectors and all countries can trust. We must create a strong enabling environment for policy support. We must be able to facilitate cooperation among sectors, countries and states. We must be able to show what the knowledge implications are for livelihood strategies. We must be able to develop capacity and empower communities.

### Chair

**R.B. Sinha**, Joint Secretary, Ministry of Agriculture and Farmers  
Welfare, Government of India

### Presenters

**Shahriar M Wahid**, Programme Coordinator, Koshi Basin  
Programme, ICIMOD

**Nand Kishor Agrawal**, Programme Coordinator, Himalayan  
Climate Change Adaptation Programme, ICIMOD

**Chanda Gurung Goodrich**, Senior Gender Specialist, ICIMOD

**Lydia Powell**, Head, Observer Research Foundation (ORF), India

**Zhang Yili**, Chinese Academy of Sciences, China







## River Basin Management

- River basin management is not about water-based socioeconomic development but instead concerns improved water resource management.
- Water resources can be managed to meet the demands of socioeconomic development in river basins. This entails generating knowledge and developing capacity at multiple levels.
- We need to understand the potential of the Koshi River Basin. There are tools and methods to model redistributions of water and what kind of distribution of income and benefits can be accrued.
- On local water management, there is a need for catchment level planning. For example, in Nepal, local water resources are typically managed by using the village as the basic unit. This is good, but we have observed that village planning does not take catchments into account. We need tools to negotiate allocations between multiple villages at the catchment level.
- KBP has worked in three districts in Nepal where we have tried to apply knowledge at the catchment level to formulate water use master plans. So far, it has worked very well. We would like to see this mainstreamed in policy.
- Springs are an immense resource with tremendous impact on local livelihoods. They have been neglected for a long time. We found that the culture of conservation that existed for generations is slowly diminishing as springs dry up. We need to come up with institutional structures and a culture of conservation.
- More attention should be given to payment for watershed services. We have taken a step forward to negotiate processes whereby downstream communities are able to pay for services from upstream communities. Dhankuta Municipality in eastern Nepal is an example where there are 27,000 households facing problems with water for domestic supply. We identified watershed areas from our research. The next step was to determine the willingness to pay for the services of upstream communities where the water flow originates. This is a long process of negotiation. The communities have more or less agreed they would pay a certain amount on top of taxes for conservation of the watershed. That payment will be transferred to water user groups upstream.
- We should also empower communities to monitor floods. We have observed that women tend to be more responsible when it comes to responding to disasters but they often lack training.
- We need to contextualize capacity development. We did a lot of research on capacity development of communities. Generic guidelines to engage with communities do not always work. For example, in training community members how to respond to disasters, we found that different groups in the communities are not educated to the same level. The generic guidelines suggest training them for three weeks. But that does not work for everyone, as some groups need more training.
- Hydropower developers and operators have the tendency to consider each development individually but it does not work that way. The impact is significant with individual developments. Depending on size, one development has implications on many others, so they all need to be looked at together. We have been fortunate to

collaborate with Nepal to come up with Hydropower Environment Impact Assessment guidelines (HP-EIA), in which we bring in the notion of strategic environmental assessment and cumulative environmental impacts built into the EIA procedures.

- Communication is very important. We need to make it easily understandable. Papers, journals and reports are good, but we need to ensure that we are talking to the right people in the right language.

### Policy Recommendations

- We need to develop water infrastructures at the local level, develop capacity as agents of change and share the benefits of ecosystem services. At the same time, we need to work and monitor at river basin scale, as well as manage disasters, develop large infrastructure, and address gender issues at that scale.
- Develop tools and methods to model what redistributions of water that what kind of distribution of income and benefits can be accrued as a result.
- When we talk about payment for ecosystem services, there are good examples we can introduce that can contribute to long-term watershed conservation. For local water management there is a need for catchment level planning. This is a negotiation and allocation process between villages for which we need appropriate tools and knowledge.
- We need to contextualize capacity development.
- We should empower communities to monitor floods.

### Nand Kishor Agrawal, Programme Coordinator, HICAP, ICIMOD

- Building resilience along with infrastructure, investment, and financial commitment are needed at regional and international levels. The fundamental focus must on agriculture and the poorest communities, especially marginal farmers and smallholder landowners and women, particularly in the context of the mountains.
- We need to advocate for more upstream downstream linkages. Mountains are often perceived as tourist destinations. Others see them as a source of water, but they do not see the link between the mountains and the downstream plains. Whatever happens in the mountains affects people in the cities, whether it is Karachi in Pakistan or Delhi or Mumbai in India. Hundreds of thousands are migrating to Delhi from villages affected by droughts.
- About 77% of Nepal's mountain people are directly dependent on agriculture. Their income level is so low that 58% of their cash is spent on food. We need to address this at scale.
- ICIMOD is making simple, replicable, and affordable government-supported small-scale interventions to change lives. We are developing resilience in three areas: climate resilience, socioeconomic resilience, and future resilience. Within each category, we have identified interventions for farmers to take forward.
- We need to enhance the resilience of farming systems. For example, in Nepal we reintroduced a simple indigenous technology called jholmol that only a few people were practicing as most opted for chemical fertilizers. Jholmol uses cattle urine and local plant products, and is fermented for a month to become a high-quality fertilizer and insecticide. This is increasingly being replaced by chemical fertilizers. We targeted 100 farmers and thousands have now implemented jholmol. There is now community ownership of this initiative.
- We need to simplify technology and information systems. A lot of people use mobile phones. Even if it is small scale, everyone should have access to an information system.

### Policy Recommendations

- Advocate for more and upstream downstream linkages. Mountains are often perceived as tourist destinations, but we need to clearly communicate the vital linkage of mountains to downstream areas and how those links relate to water resource management.



- There is a need to enhance the resilience of farming systems with simple, cost-effective technologies.
- Information systems should be enhanced by using existing technologies.
- We need simple, sensible and low-cost solutions which can be adopted by everyone, leading to large-scale adoption. We can probably build dams, roads, and infrastructure that produce some resilience at a scale that we want. Overall, the focus must be on people-friendly solutions.

### Chanda Gurung Goodrich, Senior Gender Specialist, ICIMOD

- Inclusive innovation is required for resilient development and includes social and economic change. When we talk about innovation for resilient development, it has to be inclusive and equitable so people can cope with climate and socioeconomic changes. Innovation must achieve a higher level of equity and justice, especially for the marginalized sections of society.
- Innovation is a process through which social and economic value is extracted from knowledge by developing, implementing, and generating ideas that improve and introduce new products and strategies. Processes and services can be used to help marginalized people cope with climate change.
- We need to focus on the beneficiaries of innovation. Questions such as these are crucial: What is the process? Who is involved? Who are the main targeted communities?
- Inclusive innovation looks at society, which is not homogenous. Society keeps changing and is shaped by external and internal factors. It is within this complex context that innovation takes place.
- Innovation must be people-centred and not just technologically-oriented or market-centred, or it does not work. Local realities must be taken into consideration when interventions are made. These were the lessons from ICIMOD's Koshi Basin Initiative in the pilot study areas.
- If innovations enhance local capacities to manage local resources in people's day-to-day lives, then there is a greater chance for positive economic and social development.
- Inclusive innovation should be considered because it leads toward equity and justice, which do not come automatically. There must also be parallel programmes and initiatives.
- Technological, social, and institutional development should be integrated from the beginning of any initiative to empower women.
- Capacity building programmes should involve more women and marginalized people, and help them learn decision-making skills and take on leadership roles. This was the case with the Koshi Basin Initiative in some villages, which produced good results; for example, the supply of clean drinking water was increased. Women were empowered as they learned about leadership, marketing, and management.
- Market skills and institutional development need to be scaled out. For example, ICIMOD and local partners organized cash crop training on vegetable farming, provided seeds, taught bookkeeping and helped participants enhance institutional development by helping women form groups.
- It is important to take local realities into consideration. For instance, in Nepal's Kavre District, ICIMOD's springs and ponds initiative resulted in increased participation of local agencies and their collaboration with communities. During water shortages, the villagers worked together to find new sources through collective efforts of all the agencies involved.
- A community-led ownership approach can, potentially, bring about quick impacts at the local level. In Kavre District, Nepal, the revival of springs and ponds was community-led and the community is now taking responsibility for local water management by rehabilitating ponds and recharging springs. As a result, there has been a lot of positive impact. There is enough water for irrigation and women's drudgery has been reduced. Their vegetation has also improved and locals are able to sell cash crops in the market. What we learned was that if innovation enhances local knowledge that is acceptable to local people, there is a better chance to bring about positive impacts and sustainable development.



## Policy recommendations

- Inclusive and equitable development strategies and approaches are needed so that people can cope with climate and socioeconomic changes.
- Local realities have to be taken into serious consideration when innovative interventions are made.
- Policies should be oriented towards promoting community ownership to lead local development efforts.
- Market skills and institutional development need to be scaled up so that empowerment marginalized and the women helps build both social and financial skills and capacities.
- Strategies are needed to introduce innovative programmes that enhance local capacities to manage local resources day-to-day, which means a better chance of communities bringing about economic and social development.

## Lydia Powell, ORF, India

- The first dichotomy is the difference between the science of water and technology. Science is about developing an understanding, whereas technology is about control. We should keep the dichotomy between science and technology in mind when helping local people manage the environment.
- The second dichotomy is that the poor and indigenous are seen as a problem for the local environment, while the opposite view is that indigenous people are the solution. I would like to draw lessons from the Sundarban project. In the Sundarban, markets are at extreme downstream areas which the state views as agents of ecological degradation while, in fact, the indigenous people living in the Sundarban are natural conservators. The state sees the Sundarban as a reserve forest or national park and the people who live in or around the Sundarban are viewed as intruders.
- The third dichotomy is between local and global environmental protection. For instance, building dams in the Himalayan ecosystem. One particular example is the Narmada dam where there have been movements against the dam and there have been conflicts for many years between environmentalists and the private sector and the state which was constructing the dam. Finally, in 2000, the issue was taken to the Supreme Court, which ruled that the global environment was being prioritized over the local environment. The Court said that hydropower projects are environmentally benign and reduce carbon emissions, therefore building the dam was permitted.



This means the local environment was not prioritized. The verdict also said that building the dam would help the poor as it would increase irrigation opportunities.

- The last dichotomy concerns time. It is the rich who will immediately benefit from environmental protection. The poor are told the benefits will come later. Attention should be paid to this dichotomy.

#### **Policy recommendations**

- To address these dichotomies, we need to balance the extremes. People who are asked to live life differently than what we call modern life will have to be compensated.
- Ecosystem services should be evaluated, quantified and valued and some of those values should be transferred to the people who are actually facing that challenge.

#### **Zhang Yili, CAS, China**

- There is a relationship between climate and land use. The Koshi basin on the Nepal side is an example where the land cover pattern is dominated by agricultural expansion.
- There is degradation of grassland and forests. This phenomenon has further affected wildlife. The grasslands have decreased over 20 years due to human activities, turning these grasslands into farmland. Temperature rise has affected the grasslands, turning these lands barren.
- The value of ecosystems has decreased and local wildlife habitats have been lost by over 11%.
- Another major problem in the Himalaya is the scarcity of water and drying up of springs, causing out-migration. This has caused labour shortages and this issue needs serious attention.
- The indigenous people are affected and although they are trying hard to cope with climate change impacts, they need training for adaptation activities.
- Climate change is impacting grassland and land use in transboundary protected areas, habitats, ecologies and environments.

#### **Policy recommendations**

- There has been counter-use of land management in protected areas. We can change certain areas first in the Koshi basin and second in the Narayani basin.
- The role of capacity building, networking, training, data sharing and knowledge management are crucial.
- There is a need for strong partnerships at the regional level through ICIMOD.

#### **Remarks from the Chair**

In India, we have taken many steps for climate resilience but what concerns India and other parts of the world is the loss of biodiversity. For example, in the remote Kalahandi District of Orissa, there used to be 38 varieties of rice but now there are hardly six or seven varieties which they sow when there is hardly any rain. If we want to sustain biodiversity, local resilience and local practices need to be revived in India. These practices need to be revisited, slightly modified and implemented at the grassroots level. On the water issue, we are facing crisis everywhere. In India, we are looking at water in a holistic manner. We are going to have irrigation plans for all districts across the country in which total water budgeting is going to be done.

Economic forces are driving the market. Crop alignment is the need of the hour. We have a list of crops that should not be grown for any particular district. The government has recently launched a farm insurance system as a safety net for farmers across the country. Until now, the coverage under any insurance scheme was not more than 20%. We want to increase it to at least 50% within the next two years. The fact remains that unless we manage our natural resources sustainably, agriculture will not be sustainable.

# Chapter 7: Policy Talk

## Agricultural Development: Emerging Challenges and Opportunities

Agriculture is the main livelihood option in the Himalayan river basins. In this session, policy makers and researchers exchange ideas to address challenges and opportunities so the agriculture sector will be more competitive and can grow more nutritious food in a sustainable manner to achieve the SDG goal of ensuring food and nutrition for all.

**Chair:** **Vijay Paul Sharma**, Chairman, CACP, Government of India

The session focused on the role of agricultural development to meet the SDGs. SDG 2 talks about ending hunger, and providing food security and nutrition to help eliminate poverty. All these issues are centred on agricultural and rural development. The agricultural sector in India has been in a serious crisis for the last several years. Agriculture has become unpredictable because of climate change. Sometimes we confuse climate change with weather variability. The latter is more important in terms of how we adapt and mitigate. We have many programmes looking at climate resilience, agriculture, technology and institutions. We need to also look at the positive side. This session will explore opportunities and challenges. As for opportunity, this whole region is like a market in terms of population and rising incomes. There is diversification of income taking place so how do we encourage farmers to respond to these market changes. As for challenges, we have many of issues related to technology and institutional weaknesses, then we talk about moving to hybrid agriculture and postharvest management infrastructure. How then do we strengthen infrastructure, what should be the role of the public and private sectors, and how do we promote partnerships?

### Chair

**Vijay Paul Sharma**, Chairman, Commission for Agricultural Costs and Prices (CACP), Government of India

### Presenters

**Golam Rasul**, Theme leader, Livelihoods, ICIMOD

**Nilabja Ghosh**, Associate Professor, Institute of Economic Growth, Delhi, India

**Bashu Dev Lohanee**, Deputy Director General, Department of Irrigation, Nepal

**M.J.H. Jabed**, Director, Agriculture and Rural Development, South Asian Association for Regional Cooperation (SAARC) Secretariat

**Parmod Kumar**, Professor, Agriculture Development and Rural Transformation centre, Institute for Social and Economic Change, Bangalore, India





We will also talk about incentive structures. If agriculture is not profitable for farmers, we cannot do anything in that sector. How do we make it profitable for farmers? It is not only about pricing policy, we need to look at technology and improving yields and cost of cultivation. These are the four pillars in terms of technology: institutions, infrastructure, incentives, and trade policy. Regional cooperation is important in terms of food security and we can bring in that perspective on how we cooperate for technology, institutional strengthening and other parameters. There are many things we can learn from each other and the purpose of this forum is to interact and see what other countries are doing and if we can also adopt or adapt some of those initiatives.

### Golam Rasul, Theme leader, Livelihoods, ICIMOD

- SDG Goal 2 talks about ending hunger, achieving food security and improving nutritional status. SDG 3 is about how to ensure healthy lives and promote wellbeing for all. To achieve these goals, big investments will be needed in agriculture to provide nutritious food to society. The structural changes in investment and multilateral agreements which started in the 1980s, are declining now as are investments in agriculture.
- Government expenditures from 1971 to 2007 in agriculture have declined steadily in countries like China, India, Pakistan, and Bangladesh. In China, it is higher but if we look at Pakistan, it has the lowest investment in agriculture and this has impacted the sector heavily. In India, the 23% GDP from agriculture has now fallen to 6–7%.
- The major challenges emerging today are about raising and sustaining agricultural growth. Since the 1970s and 1980s, the agricultural growth rate in South Asia was high, about 4–5%. Now that rate has declined in all countries in the region.
- Economic viability and profitability are big issues. Our farmers are facing serious problems due to competition from cheaper products from other regions. Even fruits, nuts and other vegetables are being imported from other regions of Asia.
- While promoting the Green Revolution, our focus was on a few crops like rice and wheat. We need high-value products but agriculture is not diversified enough. We are still heavily dependent on cereal crops.
- Out-migration is high in countries like India, Pakistan, and Nepal leading to unplanned urbanization and feminization of agriculture. Agriculture has become less profitable and less prestigious. Depopulation is more in the hilly and mountain regions. Horticulture practices need to be improved.
- In the mountain areas especially, there is an emerging issue of traditional agriculturists switching to cash crops. Horticulture in Himachal Pradesh is a good example but for horticulture, you need good marketing and processing facilities, which have not been developed equally.
- Mountains bear more of the burden of climate change as agriculture is mostly rainfed and there are small irrigation systems. Now, water stress is growing as the water sources are drying up and affecting irrigation systems across the HKH.
- The other major challenges are reducing postharvest losses, protecting biodiversity, human-wildlife conflict, and degradation of agricultural resources.
- We have moved from the challenge of hunger to dietary challenges and on to nutrition debates. Stunting, wasting and malnutrition remain high, mostly in mountainous regions.
- Agricultural ecosystems not only produce crops and fruits, but also generate agricultural services and have adverse consequences. There is a direct link between the upstream mountains with the downstream plains.





## Policy recommendations

- More investment in agriculture is needed.
- Promote high-value products and diversification of agriculture.
- Develop good marketing and processing facilities.
- Increase agricultural resources since higher subsidized areas have higher depletion of groundwater.
- For a good agricultural system downstream, there is a need for better management of watersheds in the upstream areas.

## Nilabja Ghosh, Associate Professor, IEG, Delhi, India

- India is diverse and all regions have their own pace for development. We need to focus on each region individually, especially in the least developed areas.
- Bihar's development is critical to India's growth. Almost half of Bihar's population live in the Koshi basin, a transboundary river shared by China, India and Nepal. Koshi is known for causing floods and has low urbanization, low GDP growth, high population density and is highly farm-dependent.
- The yields of rice and wheat are low. Much land is leased out and there is a poor recording system which makes it difficult to get information.
- A study in 16 districts in the Koshi basin examined the major drivers of agricultural decision-making and productivity. The study showed that the Bihar area is less developed in many ways. The region is highly vulnerable to flooding, river erosion, sedimentation, impact of upstream river movements, faulty policies, and economic challenges.
- As regards the food situation, farmers sell and buy food from Public Distribution Systems (PDS) and markets. PDS is a lifeline because due to frequent floods, farmers are reluctant to grow rice. This creates space for commercial farming of maize.
- Improved supply of electricity and roads could help create better markets. There is a need for technological support to process maize and there is scope for building a maize industry. This could create local incomes based on non-farm occupations and reduce migration. Maize areas have been increasing in the last few years and rice areas are going down.
- Regional cooperation is extremely important.
- Comprehensive water management is needed given that the region is water rich compared to other regions. We can use technology to help use water resources more effectively.
- There is a challenge of high dependency among the landless.





### Policy recommendations

- Improve farmland recording systems and agriculture information systems.
- Strategies are needed for improved public distribution systems.
- Ensure a good supply of electricity and road infrastructure to create better markets for agricultural products.
- Regional cooperation should be enhanced for upstream-downstream linkages.
- Water management plans should be comprehensive to make the best use of the region's rich water resources.

### Bashu Dev Lohanee, Deputy Director General, DoI, Nepal

- Upstream and downstream regions both use natural resources and only wise use can lead to sustainability. Irrigation has to be used for all cultivable lands but is not readily available across Nepal.
- Nepal has several government policies. The irrigation policy was recently revised to assure good irrigation facilities for farmers through technologies and basin transfers. Surplus basin water has to be transferred to deficit areas and the process needs to be inclusive. In the Department of Irrigation, there are units formed for gender quality and social inclusion. The policy also emphasizes involving women farmers in water users' associations.
- The Irrigation Act has been drafted and is with Parliament for approval. It has an agricultural development strategy to provide irrigation facilities in all cultivable lands.
- Climate change has affected agriculture and part of the solution is protection of downstream areas through embankment and other measures.
- A focus on adaptation by changing farmer habits is needed. For instance, farmer-managed irrigation systems in Nepal are using large areas, which is not necessary. For every hectare, farmers use six litres of water per second. We need to change farmer habits to reduce this to one litre per second per hectare. This can be done through capacity building and management of resources and through training and pilot demonstrations.
- The Government of Nepal is implementing a programme that will help coordination between the agriculture and irrigation sectors. Integrated crop and water management programmes are being implemented in some pilot areas so that farmer-centred programmes can be conducted in the field. Irrigation and agricultural technicians can teach farmers together – one about minimum use of irrigation and the other about agricultural inputs to maximize production in areas with limited water. The Nepal Agriculture Research Council is a third party and will research new varieties to increase agricultural productivity and feed more people.
- Consider transforming surface irrigation to piped systems. Drip and sprinkler irrigation will conserve water, decrease soil loss and increase farm efficiencies. Through this system, in one season farmers can cultivate rice and in other seasons produce cash crops like vegetables using greenhouse farming. Similarly, downstream for consumptive use we will provide groundwater through solar and electric pumping once the pilot is conclusive.
- The best lesson is if we start small, we can achieve more.
- Nepal is heading towards federalism and we need to plan irrigation for a federal set up.

## Policy recommendations

- Irrigation development is crucial to improve access to all agricultural areas.
- Adaptation policy should focus on behavioural change of farmers and provide technical knowledge on the use of irrigation.
- Scale out integrated and water management programmes to implement farmer-centred activities on the ground.
- Irrigation plans need to have a federal structure as Nepal prepares for federalism in its rebuilding process.

## M.J.H. Javed, Agriculture and Rural Development, SAARC Secretariat

- Agriculture in the SAARC region is challenging but also presents opportunities. The importance of agriculture for South Asia is not critical in terms of GDP where it accounts for one-fifth of the region's GDP. We cannot just assess the importance of agriculture on livelihoods in the region but have to take into consideration the proportion of the labour force.
- South Asia is basically rural. In Nepal, 86% population live in rural areas and in Pakistan 66%. In most countries, people have small land holdings. There is less tendency to shift labour from agriculture to non-agricultural activities or industrial sectors. If we talk about social justice and inclusion, we have to talk about livelihoods for 50% of the people. The agricultural labour force cannot be shifted elsewhere. If we cannot increase the labour wage, that would be an injustice. To attain the SDGs, we have to be a good performer in agriculture.
- The major challenges in SAARC countries are significant deterioration of natural resources leading to stagnating crops and declining profitability (terms of trade are not profitable), lack of diversity within agriculture and excessive dependence on rainfed agriculture.
- Agricultural growth in South Asia vis-à-vis economic growth is very low. Between 2001-2010, the economic growth was just 7.6% and agricultural growth was less than half that. The reasons are resource fatigue, weak public-private linkages in the agricultural sector, policy mismatches and harsh competitive environments for agricultural trade, lack of access to technology and limited public sector involvement in agriculture.
- Poor farmers have little access to frontier technologies, which are important to look into. The seed market is not well regulated and farmers do not have high-quality seeds at fair prices at times of need. State interventions for innovative solutions in marketing is a lot to expect.
- SAARC leaders have been cooperating in agriculture since the early 1980s, as seen by the SAARC declarations. In 1988, the SAARC agricultural centre was the earliest regional centre to be formed under the SAARC mechanism to promote regional knowledge and capacity building in agricultural science. This still exists in Bangladesh.
- The opportunity we have today is to build cooperation among SAARC countries. Also, SAARC is keen to engage deeply with international bodies and is currently working towards implementing projects. The agriculture centre is working towards knowledge building and capacity building and is collaborating with international partners.
- SAARC has also set up regional units for the livestock sector in the secretariat in Kathmandu with funding from the EU. Since 2010, experts have been meeting and exchanging knowledge on a regular basis.
- It is a good thing that ICIMOD has engaged SAARC through this forum with the hope of engaging more with partners in future.
- The ultimate goal is to turn frontier and peripheral small landholder farms into commercial farms, but there are serious financial constraints. Credit at affordable rates is difficult to find at peak times.

## Policy recommendations

- Strengthen public-private linkages in the agricultural sector for South Asia to boost trade.
- Strategies are needed to promote access to technology to help poor farmers with limited access to frontier technologies.
- The seed market should be better regulated to help farmers' access high-quality seeds at fair prices.
- State interventions for innovative solutions in marketing is crucial.



- It is important to promote regional knowledge and capacity building in agricultural science. Build cooperation through SAARC, which is engaged deeply with international bodies and is currently working towards implementing projects. Its agriculture centre is working towards knowledge building and capacity building and is collaborating with international partners.



- Reduce financial constraints to help transition peripheral, smallholder farms into commercial farms.

### **Pramod Kumar, ISEC, Bangalore, India**

- India's national scheme through the Mahatma Gandhi National Rural Employment Guarantee Scheme Act (MGNREGA) is a huge programme employing by 30% of its members from rural areas.
- MGNREGA conducts activities directly related to agriculture like water conservation, building new water tanks, road construction, afforestation and irrigation works.
- Under MGNREGA, wage rates have increased by 30–40% as a result of people coming back to rural areas and thus out-migration has been reduced.
- Wage rates for both males and females has increased. Wage differences exist in other sectors but not under MGNREGA.
- States like Kerala and Orissa have higher wage rates compared to other Indian states.
- Since MGNREGA was established, the wages for sowing, ploughing, and harvesting have increased. Real wages have increased but only for unskilled workers. No improvement of wages among skilled workers has been noted as MGNREGA employs only unskilled workers.
- MGNREGA activities are in conflict with farmers and agriculture as it directly limits yield and farmers' welfare, resulting in lower production. Efficiency aspects are compromised. Most activities under the scheme were for irrigation, but the negative impact is through increase in real wages. The impacts are so high that farmer owners find it uneconomical to work in the agricultural sector because the wages have increased at rapid rates, especially in Kerala and Punjab.
- If MGNREGA continues to pay for work in agriculture and pays labourers at market rates, this will generate surpluses within villages, which could be used for village development, investment in education, and for public capital to build rural infrastructure.

### **Policy recommendations**

- Crops need to be diversified and not be as cereal-dependent as is the case currently.
- Today, the opportunities we have are for increased connectivity and globalization, growing markets for mountainous regions, diversification in patterns of off-farm and non-farm employment, diversification of mountain economies and increasing access to information. Traditional nutritious crops should be promoted and markets for fruits and nuts should be increased. Some new opportunities are ecosystem services and carbon trading. Appropriate policy support is needed to create such opportunities.
- A reliable supply of electricity is crucial and roads should be improved and expanded to help build markets for commercial crops.
- Farmer-centred programmes have to work side-by-side with farmers for more efficient irrigation.

# Chapter 8 Session: The Way Forward

## Coherent Policy Making for Integrated Solutions

Inclusive growth and climate resilient development will require appropriate policies and institutional mechanisms to create conditions for innovative ideas and integrated solutions for intersectoral coordination, increased regional and subregional collaboration and sustainable use and management of resources. The aim of this session was to identify appropriate policy and institutional options, incentive structures, regulatory mechanisms to foster science-policy-practice interactions, and to promote actions and strengthen cooperation among diverse actors including government, the private sector, NGOs, civil society and research organizations.

**Moderator: Eklabya Sharma,**  
Deputy Director General, ICIMOD

The following discussions were anticipated.

- Good governance of mountains is for climate resilient development.
- Mountain states could share knowledge and resources so governance is enhanced.
- Interactions between downstream and mountain regions for disaster risk management in the HKH.
- Find ways to translate research and knowledge into policy, practice and action through collaboration between researchers and policy makers.

### Chair

**Eklabya Sharma**, Deputy Director General, ICIMOD

### Forum summary

**Golam Rasul**, Theme leader, Livelihoods, ICIMOD

### Speakers

**David Molden**, Director General, ICIMOD

**Tishyarakshit Chatterjee**, Director, Indian Institute of Public Administration, Former Secretary, Government of India

**Yuba Raj Khatriwada**, Vice-Chairperson, National Planning Commission, Government of Nepal

**Qazi Kholiquzzaman Ahmad**, Chairman, Palli Karma-Sahayak Foundation (PKSF), Bangladesh

**Ajay Narayan Jha**, Secretary, Ministry of Environment, Forest and Climate Change, India

**Anil K. Sinha**, Vice-Chairman, Bihar State Disaster Management Authority, Government of India

**Manoj Panda**, Director, Institute of Economic Growth

### Valedictory

**Nilabja Ghosh**, Associate Professor, Institute of Economic Growth, India



- Reflect on how policies in the past were framed.
- Challenges and hurdles in policy implementation.
- What are the mountains contributing regionally

### **Forum summary: Golam Rasul, Theme leader, Livelihoods, ICIMOD**

- The impact of climate change is visible particularly in the Himalaya and in downstream areas, affecting many aspects of people's lives such as water, agriculture, food, energy and health.
- Many effects of climate change, especially floods, are transboundary. We need urgent action for climate resilient development. No country can address the challenges alone.
- Collaboration and partnerships in the region between diverse stakeholders upstream and downstream are crucial to facing the challenges.
- While making development sustainable and climate resilient, equal emphasis should be given to economic, social, and environmental aspects.
- Unsustainable use of resources, especially in mountain areas, can lead to irreversible damage both upstream and downstream. Special efforts are needed to reduce social, regional, and gender inequalities.
- Climate resilient development requires substantial changes in our production, consumption, behaviour and attitudes, particularly in agriculture and food consumption, and use of water and resources.
- Upstream-downstream linkages and cross-sectoral integration are critically important.
- Upstream-downstream interdependencies need to be better understood to bring about synergies between upstream and lowlands.
- Sharing research and knowledge generation by scientists from upstream and downstream communities is needed to improve understanding of the linkages between them.
- A river basin approach is needed to manage disasters and water resources to address resilient development.
- Appropriate and equitable benefit sharing mechanisms should be established so mountain people can be part of the development process.
- Degradation of forest lands and forest resources and the impacts on ecosystem are serious concerns.
- Policy strategies, technological and institutional innovations, multistakeholder engagements between scientists, policy makers and development practitioners are critical to promote climate resilient development.
- All these factors should be people-centred. Communities should own, use and scale up their initiatives.
- Conducive policies and institutional support need to be established at a wider scale.
- Policy and technological interventions must be flexible enough to suit local conditions and requirements.
- Institutional mechanisms should be structured in such a way that people adapt appropriate technologies and practices.
- Diversification of livelihood options is needed to reduce pressure on agriculture. Reliance on agriculture only is not helpful in improving livelihoods.
- Optimizing some non-farm sectors like tourism and remittances is equally important. Remittances are normally used for consumption, so some appropriate incentive mechanisms are required to channel some of that money to agriculture and other productive activities.
- Mountains contribute to downstream areas significantly through water, energy, ecosystem services and climate services. These benefits need to be recognized in policy and development processes. Similarly, suitable policies on governance and institutional mechanisms need to be developed to provide incentives and compensate mountain people for their services.

### **David Molden, Director General, ICIMOD**

- There are several mountain paradoxes. First, mountains are resource rich but income poor. Despite huge rivers there is still water scarcity. The region is a source of energy, with great hydropower potential that is yet to be fully tapped. Biodiversity and agricultural diversity are tremendously undervalued. There is an obvious case



for investment in the mountains but investment needs to be sustainable. Benefit sharing plays a role. Positively speaking, countries across the region have success stories to tell. Himachal Pradesh in India is a good example with its green development initiative. Bhutan's hydropower development, biodiversity conservation is another and Nepal's forest conservation and organic agriculture yet another encouraging example.

- Another paradox is that the mountains are different. Solutions in the mountains are not the same ones we apply on the plains. We need to think differently for mountains. Access to water is critical and can be achieved by reviving springs and water harvesting. Mountains have different contexts for water access. Mountain agriculture is not how we feed the world with rice, wheat and maize but we can offer high-value nutritional crops, medicinal herbs and indigenous plant varieties. In mountain areas, there is the challenge of getting products to markets. There is a lot of scope for private sector value chains. The risks are quite high in the mountain areas. These are earthquake zones and there are frequent floods and landslides. These are hazard management challenges and have to be taken into consideration when moving forward. More attention is needed on science, research, and data on the mountains. There is a lot known about mountains but part of the problem is we are not connecting the knowledge.
- A third paradox is that mountain people produce few greenhouse gas emissions but it is the mountains that bear the brunt of climate change. We will see more flood events and droughts in the future. At the same time, there are opportunities in the mountains like carbon storage and REDD+, renewable energy and other climate resilience initiatives. Climate resilient development needs an integrated approach. It is more than climate smart agriculture but also disaster preparedness, institutional engagement, equal representation of women and men and having early warning systems. We need to think holistically.
- Paradox four is about upstream and downstream linkages. The connections are growing tighter and we have to think about these issues together. We will see more hydropower developments. Energy flows more to the plains, so there is one link. There is economic linkage with markets and labour flows. We have yet to sufficiently address the upstream and downstream linkages. The discussions now tend to be either about upstream mountains or downstream plains. The two have to be combined and we should go forward with discussions on these linkages and use the interactions productively.
- A fifth paradox is that decisions made outside the mountains have great impact in mountain areas. Decisions made in Dhaka, Islamabad, Kathmandu, and Delhi have implications on the mountains. Despite the fact we have knowledge of mountain areas, we need to decentralize that knowledge to mountain people. There are decisions made at the central level that will affect them. The important thing is to get the messages out to them and talk to them. This is a main purpose of this meeting: to discuss common issues that link us. Mountains are not featured in the global climate change talks and we need to bring our issues to global forums.





- A sixth paradox is that mountains are a shared resource among countries with common borders. Cooperation for sharing resources will lead to better outcomes. ICIMOD's mission is to help promote such regional cooperation. We have heard about track 1, track 2 and track 3 dialogues. We have the SAARC and BIMSTEC and ICIMOD is also doing something interesting. As a knowledge hub, ICIMOD is using knowledge and science to bring countries together on common issues.
- In the future, we might have a Himalayan Council like the Arctic has the Arctic Council and we can take all these approaches and share our knowledge and cooperate better to face climate change challenges. This is why regional cooperation is so important.

### **Tishyarakshit Chatterjee, Director, IIPA, Former Secretary, Government of India**

- There is a big difference between the central, eastern, and western parts of the Himalaya in terms of variances in temperature, precipitation and biodiversity. We cannot talk about a single solution for governance or managing water and soil resources.
- From a 'victims' point of view, there is yet to be an area-based approach, which also needs a boundary. We can manage water and soil at area-based levels like we can at landscape or subbasin levels. Micro-watersheds are nothing to do with administrative boundaries but with community habitations. Especially in the eastern Himalaya, the historical development of certain communities means cultural and social boundaries coinciding with physical boundaries for micro-watersheds. If that has worked for ages, why do we need a top-down sectoral and departmental silo approach in all our plans? For example, Sikkim carried out comprehensive environmental interventions from 1995 onwards. This shows us both right and wrong ways of doing things. There is some criticism from researchers which bears on these problems. How to bring in community and micro-community boundaries to make planning and implementation possible? Sikkim's plan was based on sectoral interventions and integrated existing welfare schemes with climate adaptation programmes.
- Plans should be brought down to micro-watershed level where communities are made aware of the climate change impact on water and soil and learn about disaster preparedness. For example, they use water harvesting structures without considering earthquake vulnerabilities. However, the community is not aware of where the seismic zones are. It is our responsibility to inform them. The question is what do we do with the plans already prepared? For example, there is no plan in the Tibetan Plateau but communities know exactly what to do as they are extremely traditional about soil and water management. Top-down plans can be brought to local scale through the process of vertical and horizontal integration. This is a major intervention that is highly recommended in the mountains and has a community link rather than being a transboundary organization or authority. The authority should be bottom up, built up by these micro-watershed communities. It should be done at corridor level and not at country level. Select only developed areas with potential for population increase. Different types of integration are needed: integration of disaster risk reduction with climate adaptations, integration of central plans with micro-watershed plans and integration of traditional community management of water and soil with our knowledge of tectonic behaviour, biodiversity changes and husbandry.
- The gender issue in climate change is not given enough importance. There is the need to introduce leadership at the local micro-watershed level. Women bear the biggest labour burden of water practices and any changes to them. For the implementation of climate adaptation plans, women should take the leadership roles. In agriculture, we need to have fallow areas as mountain farmers need to produce more fodder and generate income.
- REDD+ will take a long time before any money starts to flow. Learn from Bhutan, which is selling electricity to the grid. This can be done through micro-projects. Resource mobilization in the hill states is possible as long as the grid can take electricity produced by micro-ventures.
- Our knowledge of mountains has to be communicated. A lot of work has been done but not communicated to mountain people. They need to know about what is being done. It is also important for us to learn about how they have managed their climate historically and how they will manage new developments.

**Yuba Raj Khatiwada, Vice-Chairperson, NPC, Government of Nepal**

- There is much scientific and economic research in the region but there are still grey areas. We need clearer messages for policy makers.
- Change is a dynamic process, which means the past does not explain the future. Any modelling we do based on our past behaviour does not work for the future. Research is a dynamic process and we keep engaging in it.
- We should constantly provide ideas to policy makers that can be applied in national planning processes and address the issue of climate change.
- Policies have different impacts in different situations depending on the sector of the economy. Often policies have conflicting results and may not be complementary. There are always trade-offs. For example, the government provides subsidies in agriculture for fertilizers, fossil-fuelled irrigation systems, pesticides, and hybrid and genetically modified seeds. Then we have policies in the region which adversely impacts the issue of climate change.
- We have still not balanced food security with food production. If we go organic, we might lose productivity temporarily.
- We should try to optimize our policy trade-offs and this is where the role of research will be prominent.
- The distortions in pricing policy and subsidies are not just national but regional and global issues. Why is agriculture so subsidized? Why are we talking about agriculture in that way? Particularly, when it comes to crossborder issues, it is important because you cannot protect your agriculture from cheaply produced goods from across the border and we have to follow the same unsustainable way of producing more with unsustainable inputs provided to agriculture. That is the situation in Nepal.
- Our microeconomic policies are distorted in terms of pricing and resource allocations from government in terms of fiscal transfers from central budgets to provincial and local governments. Financial instruments like bank credit allocations and subsidizing agriculture are not sustainable. Financial policies are also distorting the housing industry, which itself is not sustainable. There are several initiatives which are detrimental at the grassroots level. There is a need for linkages between grassroots initiatives and macroeconomic policies.



- Development partners are undertaking different initiatives at the local level much to the surprise of both central and local governments. That can undermine initiatives and ownership of development processes within central and local government bodies. Development partners could take the government into their confidence and engage with governments and local stakeholders to the maximum possible extent to ensure that initiatives are nationally and locally driven.
- We have to protect community-led grassroots initiatives which have been successful in water use and spring revival. We should keep up the momentum and will succeed eventually. In some cases, solid community-led management may still be the way forward. There is no alternative to engaging communities in the development process. We need to build that capacity.
- We need to better disseminate our research findings to local communities.
- On the question of policy, how do we mainstream all this in our national planning process? There are planning processes at the central, provincial, and local levels. The question is, are we making the provincial governments as aware as the central government of all these processes? That is an important issue. Local priorities often differ from national priorities because they have not been exposed to global commitments. Provincial and local governments may not know what agreements we have made globally. Perhaps they do not know how much CO<sub>2</sub> we have to cut in the coming decades or what temperature range we have to maintain. These things we have to disseminate at the provincial and local levels. Our job is to see that federal policies are transmitted to local and provincial governments. Nepal is transitioning into a federal system, we need to empower the provincial and local governments so these global agendas also become their agenda.
- For the hill and mountain economies, which are a major part of our country, life is getting better in terms of communications. For example, mobile phone technology has made many things accessible. In terms of market information, financial information, and financial services, we can improve the information system with better infrastructure.
- Many initiatives could be done with a market-based approach but without distorting the market and not overusing our natural resources.
- Climate smart villages have cattle but not much land. There are people with land but no cattle. All the jholmol and manure they produce has no market. There is no equilibrium in the households. They have farm fields, rice and livestock but you need a market which can promote trade. There are many tradable goods that could be promoted in a more environmentally friendly way. This is one opportunity that we should be working on.
- We are rich in resources but not income. But are we rich in resources really? Nepal is said to be water rich but there is still water scarcity in places and at different times of the year. That means we need to make water available in such a way that resources do not go untapped because we do not have infrastructure or markets, finance and technology. ICIMOD is doing this on a pilot basis. At the same time, other regional initiatives like SAARC have to be made more effective and there will be bilateral issues. Without addressing bilateral issues related to floods, tropical diseases cannot be addressed.
- Along with regional initiatives, we need bilateral initiatives.

### **Qazi Kholiquzzaman Ahmad, Chairman, PKSF, Bangladesh**

- The eastern Himalayan region has seen economic growth, yet poverty and disparity has increased. One question we have to address and cannot avoid is how to make the fruits of development available to all. In addressing that question we need to look to the capacities and skills of people at the bottom level of our societies.
- We need to pay attention to those who are left behind or who are not able to participate in the development process, otherwise sustainable development will be difficult. This paradox is the result of poor policy implementation.
- How can we move forward? One thing that has not been much discussed is the upstream downstream linkages. We thought we understood that, but that does not seem to be true as I found out during the last two days of discussions. The linkages are there in water and environment but are also economic in the form of actions in one country affecting another, so how can we combine our efforts through regional cooperation?



- Southeast Asia has done well through cooperation. South Asia has better prospects of developing faster than Southeast Asia.
- There was little cooperation during the late 1980s but now we are talking to each other. We were not even permitted to do joint research with other countries besides Nepal. In 1988 and 1990, India and Bangladesh were not ready to allow independent research. The governments were not willing to listen. Nepal was an exception. It took at least two years to even start a joint research project. There has been a lot of progress since. But on the ground, where action is needed, there is a lot of work to do. One is integration, which is a difficult process, even if we broadly speak of environment, and economic and social development. These three aspects have been recognized as essential for sustainable development and with people at the centre. We should start from there.
- There is a good example in Bangladesh where we are trying to integrate these elements. We have a programme called Enrich. People are the centre of our work, which has social, economic, and education dimensions.
- We need a lot of research on upstream and downstream linkages. The SDGs suggest that if we want to implement better programmes we need a data revolution.
- If we want to adapt, we need baseline data that helps compare and indicate where to go from here.
- Poverty is multidimensional and that should be taken into account so that SDGs can be implemented. On adaptation, we need to be able to adapt to and measure what we have achieved so far, so we need to focus on data generation and ICIMOD can coordinate among countries for that data initiative. It cannot be achieved overnight but we can make a good start.
- Policy and institutional coherence: We have policies but we do not have institutions to implement them. We have institutions but no adequate policies to be implemented by those institutions.
- There are lot of policies in Bangladesh, environmental, agricultural, and coastal, but there is no institutional mechanism to implement them in a coherent manner or to monitor and coordinate effectively.
- The final point is food and nutrition security where production is highly emphasized. Production is for national food security and there could be surplus production but the issue is distribution and access. We have to ensure that everyone has access to food – access to markets, and access to self-production. If they do not have that, they need to have employment opportunities. Even if they have money, they need to know the behaviour of the market. Social safety nets are important to ensure food security.
- Nutrition security also depends on how food is prepared. Often, people overcook and kill all the vitamins. It is all about food knowledge.
- India has a food security act, which is lacking in Bangladesh, but we have a social movement. There was a food and nutrition security conference in Dhaka in March 2016.



- Research and academic support to these processes are important for food security.
- The mountains were neglected in the Paris Agreement, the Paris Summit and other negotiations. The Arctic Council is a good idea and I support the Himalayan Council. That is a kind of social movement. In the meantime, we can try the Green Climate Fund (GCF). Money is flowing into the fund but dispersing very slowly. Not even 10% of the USD 2.5 billion allocated has been dispersed. The bureaucratic process is quite slow.
- We do not have to depend on international resources or the international community to attain sustainable development. Instead, we should generate our own resources. India is strong enough and Bangladesh is no longer dependent on external development activities like education and health. We are members of World Bank and the ADB and we should consult them at the technical level.
- For upstream and downstream linkages, we have a framework for social movements like the Himalayan Circle on how we can better cooperate for sustainable development: upstream, downstream and in the middle.

### Ajay Narayan Jha, Secretary, MoEF&CC, India

- This forum has generated stimulating ideas. In the HKH, we know it is important for all countries to share mountain-based ecosystem services and resources. Huge populations depend on the entire ecosystem.
- I spent much of my life in Manipur, Eastern India. A strange paradox there is that a lot of turbulence happened in this region, particularly in the Himalayan areas, there has been turbulence in the form of civil disturbance.
- Challenges remain and will continue for many years. The bigger challenge is for the people in those areas. In Uttarakhand, the upper reaches of the state are largely abandoned as people have come down to the lowlands seeking livelihoods. This is exacerbated when there are forest fires.
- Mountain villagers in pursuit of a livelihood find better opportunities downstream. This is a major problem in India and happens in Nepal and other countries.
- The Government of India has made many interventions but the issue of integration remains. How do we bring them all together to benefit the community at large? Institutions like ICIMOD can play a role by doing research and conducting pilot projects through which we can learn and scale up. That is what we need at the moment.
- A transformational change in the last year was in context of states which form part of the Himalayan region.
  - a. Mountain states which have good forest cover were acknowledged by the 14th Finance Commission Award.
  - b. Mountain states are allocating significant funds for the generation of natural resources.
- Between 2010–2015 on average, the annual flows to the states which comprise the Himalayan region was in the range of INR 600–700 crores on account of forest cover. This is expected to go up to INR 25,000 crores in annual flows in the next period. We are not short of resources but the question is how to integrate them and involve communities to make sure the opportunities they see elsewhere are available in their own localities and



so prevent migration. Unless you prevent out-migration, I do not see a great future for large parts of these areas in terms of saving biodiversity and ecosystems. We have to retain the people there as owners to preserve and sustain these ecosystems.

- What we look forward to in our policies and endeavours will be to work further in establishing reliable and verifiable data management that provides a baseline for what we have to do and where to go.
- We look forward to doing a lot of work in climate modelling and development of better early warning systems, which is one of the main factors in the scale of disasters that hit these places.
- Climate resilient technologies are needed for climate resilient development. These are the three areas we need to work on and we seek collaboration from ICIMOD in this regard. We have our own agencies who collaborate with ICIMOD. We will be looking forward to more collaboration in this period.
- Also, we look forward to the three ICIMOD regional programmes on transboundary landscape initiatives. One has had a degree of success, the Kanchenjunga Transboundary Landscape initiative in Bhutan, Nepal and India and is now up for acceptance by UNESCO as a world heritage site. Two are in the pipeline, the Kailash Sacred Landscape in India, China and Nepal and the H1-Life initiative known as Brahmaputra Salween Biodiversity Conservation Landscape across China, India and Myanmar. These broadly cover the Himalayan countries and we hope to get recognition as world heritage sites for all three.
- The Himalayan Circle would give us a focal point and around which we could build a multilateral consensus and enlarge the scope of what we do. It would be a rallying point for negotiations and dialogues because there are small groups which operate in the international arena that make a critical difference on several agreements and initiatives. It is a very good idea and we should try to find common meeting ground to negotiate our case.

### Anil K. Sinha, Vice-Chairman, BSDMA, Government of India

- There are clear indications of climate change in the weather variations taking place. In 2008, the Koshi embankment breach in Nepal displaced more than 70,000 people and over 4 million from dozens of districts in Bihar.
- One recurrent issue in the discussions is the people-centric approach in the local context, local traditional knowledge, and women-friendly equipment.
- The ICIMOD leaflet is effective in presenting gender in water management and can be replicated in India and Bangladesh where there is a similar imbalance in women's work burden, the impacts and repercussions and their institutional involvement. This is a good reference document.
- I will speak but not from a climatologist's point of view. I have over 40 years of service as a civil servant from block, to district to state and international level and now back to state level. I have seen a lot and it has been tremendous to go back to that level. What does this all mean to local communities? There have been many declarations and framework, documents drafted.
- We have been talking about community participation from the days of disaster relief to disaster management and now disaster risk reduction.
- The global initiative started from 1989 to 1990 and into the international decade for disaster risk reduction and then the first world conference at Yokohama and then a second conference in Kobe. One common thread is that well-intentioned statements about community involvement are at the centre of these discussions, yet there are gaps in implementation and practice.
- The mystery of climate change is that dozens of departments are involved in developing state-level action and these people are mostly generalists like us. Their exposure to knowledge on climate change is through news provided via TV or newspapers. Our system does not take care to build a scientific knowledge base.
- Globally, a lot of data is available but HKH suffers from data deficiency. We may be data deficient but we are not knowledge deficient. Documentation of local knowledge exists but is not disseminated or assimilated. While many are involved in state action planning, the soul of the document is unclear. In 2015, we came up with a primer on climate change and I was told that we did more in Hindi and less in English. These are the humble efforts we want to see.

- ICIMOD's flyer highlights flood forecasting and promotes transboundary cooperation for a real-time flood information system. Reaching out to the communities is essential.
- Good things are happening in Bihar and policies are reaching the ground level, but are we reaching out in a holistic level to the communities? This will not happen unless we change the mindset at the state and national level.
- The solution lies in strengthening communities and public mechanisms. At the panchayats, women are responding to the challenges. In a small effort between 2015 and 2016, we raised awareness among 25,000 government officials and 50,000 private school children about disaster risk reduction and planted trees at every school.
- We usually do not talk about schools and children's participation or involve them in development and environment activities. This is a disconnect. We could reach 20 million children. Each educated child can reach at least five other children. Knowledge forums and products mobilize networks. Telecom reform starts from the bottom up. Everyone owns a mobile phone and technology like this should be central to our work. We must find simple and modest ways to cooperate. Does it really need to happen at a national government level? Perhaps that has not worked but people-to-people development is easier said than done. For upstream-downstream linkages between people in Nepal and downstream countries, we have no idea how that will be practical. The broad picture is positive but I do not know how it will work in practice.
- We have been talking about development and we had wonderful presentations but ultimately development should be such that it protects people from disasters and does not become a disaster itself.
- The answer lies in working with the people, finding out how to make that happen and finding answers within those communities.
- Message to take home: how to make global and regional frameworks work on the ground? Formal science is lacking but traditional knowledge systems are rich, so how do we mainstream that in our policy system? It is important to engage youth at the school level.

### Manoj Panda, Director, IEG, India

- We are often asked what policy impacts we are making. Have we had a policy impact on the government? My response is, how can a researcher make a policy impact? We produce certain inputs based on our knowledge and discuss at seminars like this and we share our research findings, analyse data and write reports. We are not action oriented. ICIMOD at least does pilot studies and advocates for scaling up but we do not do that.



- The way to find if research institutes have made policy impacts is to find the people in the institute involved in government policy making, whether they are members of a government commission or part of a government policy making working group. These are some ways that indicate we have made an impact.
- When we talk about an integrated approach, issues of social and gender equity and climate resilient development are important.
- Social science research has made some big impacts. We were talking about rice trade and how it is fluctuating. In this context of integrating growth and resource use, when India accelerated growth prior to the global financial crisis, most of the acceleration was due to expansion in trade and capital flows from opening up the economy. Trade plays a big role. The question is, are we putting sufficient emphasis on regional trade? The trade between SAARC countries needs to improve so each country can benefit.
- The question is whether our trade basket is climate resilient? In the context of CO<sub>2</sub>, there were studies analyzing import and export baskets of various countries. How much CO<sub>2</sub> is embedded in the import-export trade basket? We can do similar studies for other resources in an environmentally friendly way. Different countries have different advantages: some have more water and can export water-intensive products and so on.
- Price distortions and subsidies. As economists, we support subsidies. If you talk to non-economists, you get a different view. We need a dialogue among social scientists to understand each other's position. Only then the government will feel comfortable to take up policy on climate resilience issues.
- Subsidies are seen as social security. In India, we have a fertiliser subsidy, food subsidy and several other hidden subsidies. Why a subsidy is needed can be justified when a group of people who are not part of the mainstream economy need a resource or service. Fifteen to twenty percent of the population might need those subsidies. If you want to provide INR 5,000 to each household regardless of economic status, it would cost only 1% of the total GDP. We can reorient some of those subsidies from price distorting types to income provision types. This would be using resources more efficiently.
- IEG has been working on climate resilience. One recent study focused on how the poor respond to heatwaves. Will they lose employment days by staying home, or have they found some innovative ways to cope with the heat?
- Mangroves have an important impact on mitigating the adverse effects of cyclones.
- One success story was how the Supreme Court of India formed a committee and their recommendations led to the establishment of an afforestation committee. That is a direct policy impact. This is similar in the context of equity and gender sensitivity.
- If we talk of emerging issues, we have to focus on problems in urban areas and also on regional inequalities.
- The previous government adopted two major policies through the National Rural Employment Guarantee Act (NREGA).
- India is talking of demographic dividends and we cannot realize those unless we employ the young generation in a productive way. It is crucial for the government to intervene in the employment sector for urban youth.
- Some distribution and equity policies we have adopted need a reorientation. We need to reduce some subsidies and provide subsidies in the form of employment.
- Most sectors that are expanding are not employment intensive. Even industries which used to be labour intensive are becoming more capital intensive.
- Researchers will be studying these issues in detail and we hope to interact with governments in various forums. We hope we can offer insights to help with research-policy linkages.
- There are inequalities in the region. Trade is not happening as it is supposed to. Employment for youth is not progressing, even in India.





#### **Moderator's remarks: Eklabya Sharma, Deputy Director General, ICIMOD**

- The important thing to understand is that policy is for people and how it can be implemented to that end.
- While we think regionally, we need to act locally. We think of HKH and have data for the region but work on the ground.
- Formal and informal knowledge is important in this process.
- The differential capacities of the eight countries we work in have to be at different levels: local, country and regional, in terms of building capacities.
- Regional cooperation has to be community-to-community, farmer-to-farmer, and between countries and in-country.
- Humanitarian relief is needed and we need to work on how to use international protocols to make that happen.
- It is crucial that a good programme be financially sustainable and not donor dependent.

#### **Valedictory: Nilabja Ghosh, Associate Professor, IEG, India**

The last two days have been a wonderful learning process. We have been doing research in isolation in the past. In recent years, we have gone one step further and coordinated projects where we do all-India level research. Somebody takes a lead in coordination and designs the samples and we get rich information from different parts of the country. Today, we have achieved another milestone by taking a regional approach. We can understand the kind of linkages there are. Isolated research does not give us the big picture so it is important we coordinate with one another within country and within the region. A forum such as this one should be organized frequently.

# Annexes

## Annex I: Conference Agenda

### **16 June, 2016 (Thursday)**

Arrival and registration (09:30–10:00)

### **Inaugural and Welcome Session (10:00–11:30)**

Himalayan countries made remarkable progress in socio-economic development in recent years. Challenges, however, persist in ensuring food and nutritional security, ending hunger and poverty, and providing access to safe water and clean energy to the burgeoning population. Poverty, unemployment, food insecurity, and poor health are widespread in this region. Leaders in the region have committed to end poverty and hunger, ensure food and water security, provide clean energy, mitigate the impacts of climate change, and promote inclusive growth and climate resilient development as part of the Sustainable Development Goals and Agenda 2030. Achieving these goals requires integrated solutions, the efficient and sustainable use of land, water, energy and ecosystems, the strengthening of upstream-downstream linkages, and increased regional and sub-regional coordination and communication.

The inaugural session will set context and orient the Knowledge Forum to focus on the key issues and challenges faced by Himalayan and downstream communities as well as identify options and mechanisms for integrated solutions, resource use efficiency, upstream-downstream linkages, regional and sub-regional cooperation for inclusive growth and climate resilient development.

- *David Molden*, Director General, ICIMOD  
– Welcome and background of Knowledge Forum
- *Manoj Panda*, Director, IEG  
– Remarks on role of research
- *S.K. Pattanayak*, Secretary, Ministry of Agriculture and Farmers Welfare, Government of India  
– Remarks on role of government
- *Harinder Sidhu*, Australian High Commissioner, India  
– Remarks on Sustainable Development Investment Portfolio approach in South Asia
- *Ajay Narayan Jha*, Secretary, Ministry of Environment, Forest and Climate Change, Government of India (TBC)
- *Shashi Shekhar*, Secretary, Ministry of Water Resources, Government of India
- *Suresh Prabhu*, Honourable Minister, Ministry of Railways, Government of India (TBC)  
– Inaugural address
- *Nilabja Ghosh*, Associate Professor, IEG, India- Vote of thanks

11:30–12:00 High Tea

### **Policy Talk: Food-Water-Energy Nexus and Connectivity (12:00-13:30)**

Demand for food, water and energy is growing rapidly in the Himalaya and downstream regions. Although Himalayan countries made progress in food production, poor sectoral coordination and institutional fragmentation have triggered an unsustainable use of water, energy and other resources. This has increased the risk of long-term sustainability of food, water, and energy security in the region, as well as posing a critical challenge to achieving

the Sustainable Development Goals (SDGs). The SDGs of zero poverty (SDG1), ending hunger and food insecurity (SDG2), ensuring water security (SDG6), access to modern energy (SDG7), sustainable economic growth (SDG8), sustainable production and consumption (SDG12), and conservation, protection and sustainable use of marine and terrestrial resources and ecosystems (SDG 14 and 15) are directly and indirectly linked to food, water, and energy security. In this context, this policy talk will focus on:

- Improving the understanding of the current state of knowledge related to food, water, and energy security in the Himalaya and downstream, their interlinkages, synergies and trade-offs;
- Identifying options and mechanisms to improve inter-sectoral and inter-regional coordination and coherence to minimize inter sectoral trade-offs and maximize synergies.

**Ashok Gulati**, Professor, Indian Council for Research on International Economic Relations (ICRIER)

- *Golam Rasul*, Theme Leader, Livelihoods, ICIMOD – Setting the context
- *Sabnam Shivakoti*, Joint Secretary, Ministry of Agriculture, Government of Nepal
- *Dipak Gyawali*, Chair, Nepal Water Conservation Foundation, Former Minister of Water Resources, Government of Nepal
- *Jyoti Kirit Parikh*, Executive Director, Integrative Research and Action for Development, India
- *Rajat Katharua*, Director, Indian Council for Research on International Economic Relations (ICRIER), India
- Chairperson's remarks

13:30–14:30 Lunch

### Technical Session 1: **Improving Agricultural Productivity and Livelihoods (14:30-16:00)**

The majority of the people in the Himalayan region and downstream live in rural areas and depend heavily on agriculture for their livelihoods and wellbeing. Improving agricultural productivity and enhancing sustainability is critical improving livelihoods of rural people and promoting inclusive growth. Growth and dynamism in the agriculture has recently slowed due to climatic and non-climatic factors. This session will focus on innovative ideas and options that promote agricultural productivity and livelihood enhancement in changing climatic conditions and socioeconomic changes.

**Chair: Brij Mohan Singh Rathore**, Chief Policy Advisor, ICIMOD

- *S. Siva Kumar*, Divisional Chief Executive, Agriculture Business Division, ITC Limited, India
- *Kalyan Das*, OKD Institute of Social Change and Development, Guwahati, India
- *Aditi Mukherji*, Theme Leader, Air and Water, ICIMOD
- *Dennis Wichelns*, Senior Research Fellow, Stockholm Environment Institute, Thailand
- *Alwin Keil*, Senior Fellow, International Maize and Wheat Improvement Center (CIMMYT), India
- Chairperson's remarks

16:00–16:30 Tea Break

### Technical Session 2: **Climate Change and Upstream-Downstream Linkage of River Basins (16:30–18:00)**

Himalayan and downstream countries are challenged in ensuring food, water and energy security in the face of increasing uncertainty in water availability with changing climate change. Farmers have limited access to water for irrigation, recurrent occurrence of floods and droughts and power shortage cripples economic activities and thwarts industrial growth.

Sustainable development of water resources in Himalayan river basins is critical for long-term sustainable economic development of down streams areas reflects a stronger upstream-downstream linkage. Despite the huge benefit, upstream-downstream cooperation has remained sub-optimal, though it is critical for climate resilient development

at river basins. This session will bring scientific evidences of climate change impact in the Himalayan river basins and suggest mechanisms for strengthening upstream and downstream linkages to minimize the damages of water related disasters and optimize the collaborative development of water resource at Himalayan river basins.

**Chair: Dipak Gyawali**, Chair, Nepal Water Conservation Foundation, Former Minister of Water Resources, Government of Nepal

- Arun B. Shrestha, Regional Programme Manager, River Basins, ICIMOD
- D. K. Mishra, Member of an Expert Advisory Group to the Ministry of Water Resources to advise the Ministry over Water Resources, River Development and Ganga Rejuvenation, India
- Srikant Baldi, Additional Chief Secretary, Government of Himanchal Pradesh, India
- Navarun Varma, The Energy and Resource Institute, New Delhi, India
- Anamika Barua, Executive Director, SaciWATERs, India
- Chairperson's remarks

18:30–19:30 Musical evening

19:30–21:00 Reception Dinner

## 17 June 2016 (Friday)

### Technical Session 3: Innovation for Climate Resilient Development (09:30-11:00)

Inclusive growth and climate resilient development call for innovative ideas, options, technologies and practices. This session will focus on identifying innovative ideas, technologies, good practices and solutions for inclusive growth and climate resilient development in changing climatic condition and socioeconomic changes.

**Chair: R.B. Sinha**, Joint Secretary, Ministry of Agriculture and Farmers Welfare

Shahriar M Wahid, Programme Coordinator, Koshi Basin Programme, ICIMOD

- Nand Kishor Agrawal, Programme Coordinator, Himalayan Climate Change Adaptation Programme, ICIMOD
- Lydia Powell, Head, Observer Research Foundation (ORF)
- Zhang Yili, Chinese Academy of Sciences, China
- Pranita Bhusan Udas, Gender Specialist, ICIMOD
- Chairperson's remarks

11:00–11:30 Tea Break

### Policy Talk: Agricultural Development – Emerging Challenges and Opportunities (11:30-13:00)

Agriculture is the main livelihood options in the Himalayan river basin. In this specific policy talk, the policy makers and researchers exchange their ideas to address the agriculture challenges and opportunities in the Himalayan river basin so that agriculture sector will be more competitive to grow more nutritious food in a sustainable manner to achieve the goal of SDG to ensure food and nutrition for all.

**Chair: Vijay Paul Sharma**, Chairman, Commission for Agricultural Costs and Prices (CACP)

- Golam Rasul, Theme leader Livelihoods, ICIMOD – setting the context
- Nilabja Ghosh, Associate Professor, Institute of Economic Growth, Delhi, India
- Basu Dev Lohani, Deputy Director General, Department of Irrigation, Nepal
- JMH Javed, Director, Director of Agriculture and Rural Development, South Asian Association for Regional Cooperation (SAARC) Secretariat
- Pramod Kumar, Institute of Social and Economic Change, Bangalore, India
- Chairperson's remarks

13:00-14:00 Lunch



## Way Forward: **Coherent and Coordinated Policy for Comprehensive Development** (14:00-16:00)

Inclusive growth and climate resilient development will require to appropriate policy and institutional mechanisms to create conditions for innovative ideas and integrated solutions for inter-sectoral coordination, increased regional and sub-regional collaboration, and sustainable use and management of resources. The aim of this session is to identify appropriate policy and institutional options, incentive structures, and regulatory mechanisms to foster science-policy-practice interactions, and promote actions and strengthen cooperation among diverse actors including government, private sectors, NGOs, civil society and research organizations.

**Moderator:** *Eklabya Sharma*, Deputy Director General, ICIMOD

**Forum summary:** *Golam Rasul*, Theme Leader, Livelihoods, ICIMOD

- *Yuba Raj Khatiwada*, Vice-Chairperson, National Planning Commission, Government of Nepal
- *Anil K. Sinha*, Vice-Chairman, Bihar State Disaster Management Authority, Government of India
- *Qazi Kholiquzzaman Ahmad*, Chairman, Palli Karma-Sahayak Foundation (PKSF), Bangladesh
- *T. Chatterjee*, Director, Indian Institute of Public Administration, Former Secretary, Government of India (TBC)
- *Ajay Narayan Jha*, Secretary, Ministry of Environment, Forest and Climate Change , India (TBC)
- *Ashok Jain*, Adviser, National Institute for Transforming India (NITI Ayog), Government of India (TBC)
- *David Molden*, Director General, ICIMOD
- *Jawhar Sircar*, CEO Prasar Bharti, India (TBC)
- *Manoj Panda*, Director, IEG
- Moderator's remarks

### **Valedictory**

- *Nilabja Ghosh*, Associate Professor, IEG, India

## Annex II: List of Participants

- 1 **Dr Pramod Aggarwal**  
Climate Change, Agriculture and Food Security (CCAFS)
- 2 **Nand Kishor Agrawal**  
ICIMOD, Nepal
- 3 **Qazi Kholiquzzaman Ahmad**  
Chairman  
Palli Karma-Sahayak Foundation (PKSF)  
Bangladesh
- 4 **Shrikant Baldi**  
Additional Chief Secretary, Shimla
- 5 **Dr Anamika Barua**  
SaciWATERs, Hyderabad
- 6 **Dr Seema Bathla**  
Professor  
Jawaharlal Nehru University, Delhi
- 7 **T. K.Chanda**
- 8 **Kanchan Chopra**  
Former Director, Institute of Economic Growth, Delhi
- 9 **Neetu Choudhary**  
ANSISS, Patna
- 10 **Dr Kalyan Das OKD**  
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Guwahati
- 11 **Purnamita Dasgupta**  
Ford Foundation Chair IEG, Delhi
- 12 **Nitin Desai**  
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- 13 **Ranjit Devraj**  
Editor, Scideve.net, Delhi
- 14 **Dr A P Dimri**  
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- 15 **Marco Ferroni**  
Syngenta Foundation, Delhi
- 16 **Gopi Ghosh**
- 17 **Nilabja Ghosh**  
IEG, Delhi
- 18 **Dr Ashok Gulati**  
Infosys Chair Professor for Agriculture  
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- 19 **Srikant Gupta**  
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- 20 **Joydeep Gupta**  
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- 21 **Deepak Gyawail**  
Director, Nepal Water Conservation Foundation  
(NWCF), Kathmandu
- 22 **Harinder Javedkar**  
Minister Environment, GOI, Delhi
- 23 **ShriAjay Narayan Jha**  
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- 24 **ShriAmitabh Kant**  
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- 25 **Rajat Kathuria**  
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- 26 **Alwin Keil**  
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- 27 **Imran Khan**  
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- 28 **Nivedita Khandekar**  
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- 29 **Yuba Raj Khatiwada**  
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- 30 **Dr Pramod Kumar**  
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- 34 **J. V. Meenakshi**  
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- 35 **D. K. Mishra**  
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- 36 **Sylvia Mishra**  
Observer Research Foundation, Delhi
- 37 **Vishwa Mohan**  
Editor  
Times of India, Delhi

- 38 **Dr David Molden**  
Director General  
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- 39 **Dr Aditi Mukherjee**  
Theme Leader, ICIMOD, Nepal
- 40 **M. N. Murty**  
Retired Professor  
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- 73 **Raminder Singh**  
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- 74 **Anil K. Sinha**  
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