ICIMOD

PROCEEDINGS OF THE

Second policy roundtable on building climate resilience in Gilgit-Baltistan

July 2019
Gilgit, Pakistan

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Abbreviations and acronyms

AKPBS	Aga Khan Planning and Building Services
CBFEWS	Community Based Flood Early Warning System
CKNP	Central Karakoram National Park
CPEC	China-Pakistan Economic Corridor
DFAT	Department for Foreign Affairs and Trade, Australian Government
FWMC	Federal Water Management Cell
GB-DMA	Gilgit-Baltistan Disaster Management Authority
GLOF	Glacial Lake Outburst Floods
GoGB	Government of Gilgit-Baltistan
ICIMOD	International Centre for Integrated Mountain Development
IFAD	The International Fund for Agricultural Development
KIU	Karakoram International University
MNFS&R	Ministry of National Food Security & Research
PARC	Pakistan Agricultural Research Council
PCRWR	Pakistan Council of Research in Water Resources
SDIP	Sustainable Development Investment Portfolio
UIB	Upper Indus Basin
UIBN	Upper Indus Basin Network
UNDP	United Nationas Development Programme
WWF	World Wide Fund for Nature

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Executive summary

The International Centre for Integrated Mountain Development (ICIMOD), in collaboration with the Ministry of National Food Security and Research (MNFS&R) and World Wildlife Fund for Nature (WWF), organized the second high-level policy roundtable on building climate resiliency in Gilgit-Baltistan on 24 July 2019. The event aimed to present piloted interventions and explore possibilities for integrating the learnings into relevant policies in Gilgit-Baltistan. The event was hosted by Karakoram International University and attended by more than 55 participants including members of Gilgit-Baltistan Legislative Assembly, provincial secretaries, heads of public and private sector organizations, academia, media and students. Muhammad Iqbal, Minister of Works, was the chief guest along with the Minster of Forest, Wildlife and Environment and the Minster of Law and Parliamentary Affairs.

During the technical session, all partners including ICIMOD, Pakistan Council of Research in Water Resources (PCRWR), Aga Khan Planning and Building Services (AKPBS) and WWF gave presentations on the piloted interventions, efforts to out-scale and up-scale them, climate-smart agricultural water management technologies and Community Based Flood Early Warning Systems (CBFEWS). Milad Karim of Aga Khan Rural Support Programme highlighted the potential of organic agriculture in Gilgit-Baltistan.

Representatives of project communities held a panel discussion. The gathering also witnessed the ceremony of handover of CBFEWS to Gilgit-Baltistan Disaster Management Authority (GB-DMA) for government ownership and long-term sustainability. The agreement was signed between GB-DMA, AKPBS, WWF-Pakistan and ICIMOD. Similarly, Karakoram International University (KIU) and ICIMOD signed a Letter of Intent for field-based monitoring of debris-covered glaciers and glacial mass balance with associated hazards in the Karakoram, Pakistan.

The key outcomes of this event were wider dissemination, handover of CBFEWS to GB-DMA and agreement between ICIMOD and KIU for collaborative work in the field of cryosphere.

Inaugural session

Host: Abdul Wahid Jasra, Country Representative, ICIMOD

Key messages from the speakers

Attaullah Shah, Vice Chancellor, Karakoram International University

Based on lessons gathered during the second Regional Upper Indus Basin Network (UIBN) Workshop in 2019 at the ICIMOD headquarters in Kathmandu, Nepal, the KIU administration decided to establish a Cryosphere and Climate Research Centre at KIU. Gilgit-Baltistan is significant as it lies at the confluence of three mighty ranges – the greater Himalaya, the Hindu Kush and the Karakoram. The region contains the third biggest ice mass after the poles, and K-2 (the second highest mountain in the world) and the source that supplies water to Pakistan's irrigation system. It is a major tourist attraction and home to peaks above 6000 m located in China, India and Pakistan. The glaciated reserves in these ranges are now melting due to the changing climate; according to the Fifth Assessment Report of the IPCC (2013), the Earth's temperature has increased by 0.85°C in the last three decades. The rapid melting of glaciers has resulted in increased flooding. Since the last policy roundtable there have been two GLOF events in Ishkoman and Shishpar. Based on spatial and temporal analysis it has been found that major glaciers like Batura, Biafo, Yahghil, Jutmau, Passu and Ghulkin have lost mass equivalent to 17 km^2, 8.5 km^2, 1.2 km^2, 6.0 km^2, 3.3 km^2 and 0.50 km^2 respectively. According to ICIMOD (2015), there are about 2500 glacial lakes of various sizes in the Himalaya, Karakoram and Hindu Kush. Out of these, 52 lakes have been identified as potentially dangerous and 32 glacial lakes of GB have been declared highly vulnerable.

Scientists working in the field of climate change have been facing many challenges like the lack of availability of primary data on glacial mass balance, temporal and spatial variations in glacial mass and formation of glacial lakes, awareness, adaptation measures, non-documented indigenous knowledge, non-existence of monitoring and early warning systems as well as multi-hazard risk assessment studies.

In order to address the above challenges, KIU is developing indigenous capacity and promoting collaboration with national and international organizations such as ICIMOD, the UNDP, Chinese Academy of Sciences, National Centre of Excellence in Geology, Institute of Space Technology, and Space and Upper Atmosphere Research Commission. A major step in this approach is the establishment of the Centre for Cryosphere and Climate Studies. The centre has conducted a range of activities such as a risk assessment of Shishpar glacier, a glacier lake inventory of Gilgit-Baltistan and decadal dynamics (1977–2018), a community-based response to GLOFs, an impact assessment of Badswat glacier lake outburst flooding in Ishkoman Valley, an assessment of socioeconomic vulnerability and community based management of glacier lake outburst flood in Yasin Valley, and a preliminary assessment of local agricultural systems within the framework of the carbon credit mechanism in GLOF vulnerable areas.

Rab Nawaz, Senior Director (Biodiversity), WWF-Pakistan

Climate change is evident in Gilgit-Baltistan and local communities are suffering from the impacts of these changes. WWF, with support from ICIMOD and the technical expertise of Pakistan Council of Research in Water Resources, has piloted climate-smart agricultural water management and instrument-based hazard management in Gilgit-Baltistan. Climate-smart agricultural water management interventions include solar powered or hydro ram pump assisted river water lifting to barren areas and distribution of lifted water using highly efficient irrigation technologies. These technologies have been tested and found to be scalable throughout Gilgit-Baltistan. The instrument-based hazard management includes Community Based Flood Early Warning Systems for flash flood, debris flow and GLOF.

Almost 20 years ago, there were pure and clear water streams in Gilgit-Baltistan; now these streams are full of waste due to the influx of tourists who don't care about the environment. We need policy for zero usage of plastic materials in Gilgit-Baltistan and its implementation at the grassroots level. It is very important to gather and document indigenous knowledge to cope with changing climate. We also need to have regional collaboration to combat problems related to climate change.

David Molden, Director General, ICIMOD

ICIMOD was established 36 years ago with the motto "for mountains and people". Pakistan is one of its founding members. Its preliminary objective was to document knowledge about mountains and people in eight countries sharing the Hindu Kush Himalayan region, i.e., Afghanistan, Bangladesh, Bhutan, China, India, Nepal, Myanmar and Pakistan. Its board of governors consists of high-ranking officials from the governments of these countries. ICIMOD's mission is to enable sustainable and resilient mountain development through knowledge and regional cooperation. We work through our partners, primarily government institutions.

Five years ago, an ICIMOD mission travelled to Gilgit-Baltistan with the goal of observing the impacts of climate change on the glaciers and environment. It was a very interesting and rewarding trip. One of the most important aspects of the trip was the interaction with local communities suffering from impacts of climate change. The communities spoke about the changes in the glaciers and impacts they were facing. Based on these interactions and ground observations, ICIMOD thought of working for these communities in addition to carrying out modelling and measurements. This proposal brought together partners like KIU, WWF, PCRWR, PARC, GBDMA and AKPBS to try out some interventions. Together these organizations piloted these interventions. The purpose of the current visit is to witness what is happening on the ground. The ICIMOD team had an excellent meeting with the Chief Secretary which brought up a road map consisting of three things: a) data and knowledge required for planning; b) interventions for adaptation to climate change; and c) glacial lake outburst floods and related disasters.

Recently, ICIMOD released a report, *The Hindu Kush Himalaya Assessment*. This reports tells us: a) the mountains are an important source of livelihood for people in these mountain and downstream areas; b) these mountains are highly vulnerable; and c) the impacts of climate change are evident. There is an urgent need to take action for adaptation and resilience building. ICIMOD is dedicated to working in collaboration with regional countries in the fight against climate change.

Muhammad Tahir Anwar, Director General, Federal Water Management Cell

Although Pakistan is not contributing to carbon dioxide gas emission, it is one of the countries most vulnerable to climate change. The entire country is observing the effects of climate change. In particular, Gilgit-Baltistan is facing issues like flash floods, GLOFs and impacts on agricultural production. Thus it is very important to build climate resiliency in Gilgit-Baltistan. The Ministry of National Food Security and Research (MNFS&R) is working in close coordination with ICIMOD to upscale climate-smart agricultural water management technologies. During the April 2019 visit to Kathmandu, the FWMC was briefed on the interventions being tested in the Upper Hunza. The programme will provide 200 units of high-efficiency solar powered irrigation systems 5–7.5 KW and 50 hydro ram pumps.

Over the last two decades agricultural production has not met envisioned targets. After the 18th amendment of the constitution of Pakistan, this subject has become more complicated. The current federal government has launched an agricultural emergency programme to increase the productivity of the farming sector (to reduce the import burden), promote conservation and efficient utilization of water resources, and for livestock and value chain development. Under the second component, the Federal Water Management Cell has conceived two national projects with input from provincial and federal departments: the second phase of the national water course lining and construction programme, and enhancing the command area development of mini and small dams in arid zones. The first phase of the national water course lining and construction programme was implemented successfully during 2004–2011, in which 0.3 million water courses were constructed and lined. The latter programme will be implemented throughout Pakistan by the federal government including in Gilgit-Baltistan. This programme will provide energy-efficient technologies like the solar and hydro ram pumps. Considering the uniqueness of this area, the Government of Pakistan is working with national and international agencies to declare it an organic farming state. The Government of Pakistan is also negotiating with the Government of China under the China Pakistan Economic Corridor to provide agro-processing units. There is a missing link between farm producers and consumers. This initiative will enable value addition and develop the value chain to provide maximum output to farmers and affordable food to consumers. This policy roundtable paves the way towards solving various issues and bringing prosperity as well as climate resiliency in Gilgit-Baltistan.

SECTION 2 |

Technical sessions

Host: Farid Ahmad, Head, Strategic Planning, Monitoring and Evaluation, ICIMOD

During the first policy roundtable, participants showcased interventions or technologies piloted in Gilgit-Baltistan to develop the climate resiliency of local communities. These can be scaled up and scaled out. There is a need to clarify that scaling up and scaling out are not synonyms. Basically scaling out involves extending an intervention from one area to another by customizing it to the local context, i.e., transfer of technology from farmer to farmer. On the other hand, scaling up happens through policy measures, such as the one that the Federal Water Management Cell (FWMC) is going to take. The second policy roundtable aimed to highlight successful out-scaling and upscaling of our piloted technologies. The technical session covered the piloting, out-scaling and upscaling of interventions. It also discussed a policy of the Gilgit-Baltistan government related to potential organic farming in the region.

Session 1: Presentations

Presentation 1: Joint presentation on piloting, scaling out and scaling up of agricultural water, energy and hazard management interventions in Gilgit-Baltistan

This presentation was composed of three sub-presentations. The following are the key highlights of the sub-presentations:

OVERVIEW OF ICIMOD'S PROGRAMME IN THE UIB
ARUN SHRESTHA, REGIONAL PROGRAMME MANAGER, RIVER BASINS AND CRYOSPHERE, ICIMOD

Key messages:

- The Upper Indus Basin (UIB) covers arid to semi-arid zones where agriculture depends on supply of irrigation water.
- The UIB provides irrigation water to downstream with a major contribution of glacier melt (35%), which is much higher compared to other river basins.
- During the April 2014 visit, the goal of the ICIMOD mission was to observe what was happening to the glaciers, hydrology, etc. in the UIB. The mission visited hydro-meteorological stations.
- The mission had interaction with the local communities and observed a number of issues that were also very important from the point of view of downstream communities.
- The Upper Indus Basin Network (UIBN) originated in Passu in April 2014. This network has now spread region wide and each country sharing the Indus Basin has its own country chapter. In January 2019, the Governance Framework of the UIBN has been endorsed.
- During the interaction with communities, the issues highlighted were: GLOF and flash floods; decreased winter precipitation; down wasting of glaciers, rendering irrigation intakes dysfunctional; shortages of irrigation water supplies; migration of people due to flooding events; energy shortages; deforestation; environmental degradation and damages to irrigation canals. ICIMOD decided to try to address a few of these issues
- To overcome water shortages, agricultural water management technologies were piloted. These include river water lifting through solar pumps and hydro ram pumps and combining these with efficient irrigation for establishing high-value orchards.
- For hazards management, Community Based Flood Early Warning Systems were piloted and community watch groups were trained in glacial monitoring.
- Traditional irrigation canals were rehabilitated by introducing high-density polyethylene pipes.
- Sea buckthorns were planted with the involvement of women groups to reduce river bank erosion.
- All these pilots seek to enhance local livelihood, equal participation of women and men, and resilience to climatic disasters.
- All these pilots are carried out for research purposes, and lessons and experiences gained from these pilots will be shared with relevant stakeholders and successful efforts will be replicated.

SCALING OF CLIMATE-SMART WATER AND ENERGY TECHNOLOGIES FOR LIVELIHOODS
FAIZAN-UL-HASSAN, DIRECTOR, PCRWR

Faizan-ul-Hassan presented the piloting of climate-smart water and energy technologies. He gave separate explanations of irrigation water lifting and irrigation water distribution.

Key messages:

- Irrigation water has been supplied and is benefiting 1000 households in 6 different communities i.e., Podan, Murkhoon, Borit Lake, Azizabad, Hussaini and Khyber
- "Zero energy" river water lifting through a hydro ram pump up to a height of 170 feet from river/ water channels has been piloted in Khyber village.
- Solar powered river water lift up to 100 ft has been pioneered in Passu and Murkhoon villages.
- The lifted water is evenly and efficiently distributed with drip irrigation for high-value orchards, and high-density agriculture is practiced through alley cropping for enhanced water and land productivity.
- Upscaling of hydro ram (50) and solar (200) powered river water lifting and efficient irrigation schemes will soon be carried out under the national programme on small and mini dams in barrenareas of Pakistan; the Gilgit-Baltistan component is funded by the federal government and implemented by the GB Water Management. Authority.
- The PCRWR water quality lab has been upgraded to a Regional Research & Development Centre, which will soon initiate R&D activities in Gilgit-Baltistan. This centre will implement an upcoming project on headwater management to reduce water resources depletion in downstream areas of the Indus River system

SCALING OF EARLY WARNING SYSTEMS
DEEDAR KARIM, GEOLOGIST, AKPBS

Deedar Karim spoke about the piloting of CBFEWS in project areas. He explained the site identification, installation, maintenance and operation processes.

Key messages:

- CBFEWS has been installed for flash floods in Sherqilla, Ghanche Nallah and Shighar, for debris flow in Damas, and for GLOF in Passu after a detailed survey by the technical partner keeping in view the flood history and extent of coverage of anticipated floods.
- The successful dissemination of warning by the Sherqilla CBFEWS was observed on 3 August 2017 at 2:30 AM and in July 2019, which alerted the community members while they were asleep and saved precious human lives and livestock.
- For wider upscaling of CBFEWS in Gilgit-Baltistan, the GB-DMA and ICIMOD's Pakistan office have identified a potential vendor, Burraq Integrated Solution. The GBDMA has now involved the vendor in feasibility studies at Shishpar Glacier. The first indigenized CBFEWS will be installed at Shishpar Glacier and which the CBFEWS will be up-scaled under GLOF-2 project though same vendor.

Presentation 2: Demonstration of water resource management technologies and their up-scaling in Gilgit-Baltistan

Haider Raza, head of WWF, presented on the piloting and scaling out of high-efficiency irrigation systems (HEIS) in Gilgit-Baltistan.

Key messages:

- The piloting of HEIS was carried out by WWF, along with the project, Agricultural, water, energy and hazard management for improved livelihood in the Upper Indus Basin, Pakistan (2015–2020), which was funded by the Department of Foreign Affairs and Trade (DFAT), Government of Australia. ICIMOD was lead programme implementer and WWF lead project implementer. All HEIS related activities were carried out by PCRWR, a project associate of WWF.
  - Under this project, solar powered river lifting cum HEIS demonstration sites were established in Passu and Murkhoon. Both sites have been facing issues of pump as well as emitter choking due to turbid water. WWF, ICIMOD and PCRWR are working together to solve the issue.
  - In Khyber, the hydro ram pump lifts river water from a contour channel and the lifted water is stored in uphill storage tanks and from there distributed for alley cropping under HEIS. This demonstration site is not facing any issue.
  - In Shahabad-Ghulkin, the traditional water conveyance system has been replaced with 600 HDPE, which has reduced water losses and

delivery time; however this is dependent on the sustainability of the source, which might decrease with the movement of Passu Glacier.

- The scaling out of HEIS is being carried out by WWF and its project associates under the UNDP-funded projec, Improvement of Central Karakoram National Park (CKNP) management system as a model for mountain ecosystems in northern Pakistan (2018–2019).
  - Under this project 20 hydro ram pumps have been installed in 12 villages to irrigate 23 hectares, benefiting 297 households.
  - Similarly, 10 solar pump systems have been installed in eight villages to irrigate 205 hectares, benefiting 589 households.
  - For high-value agricultural production, 20 off-seasonal vegetable tunnels have been installed in 18 villages, benefiting 200 households.
  - For HEIS installation, feasibility has been conducted in 10 villages.
- Under both projects, it is learnt that detailed feasibility studies and an engineering design are required to prevent emitters clogging.
- There is a need to formulate a policy for providing irrigation to cultivable wasteland with technologies used in pilot and out-scaled projects.

Presentation 3: Scope of organic farming in Gilgit-Baltistan

Melad ul Karim of AKRSP presented on the potential of organic farming in Gilgit-Baltistan.

Key messages:

- Organic farming is a holistic production management system that promotes and enhances the health of agro-ecosystems, including biodiversity, biological cycles, and soil biological activity. All of this is accomplished by using agronomic, biological and mechanical methods, as opposed to using synthetic materials.
- In the case of Gilgit-Baltistan, the government's agriculture policy and strategy supports organic farming as the region has a pristine environment; organic farming has similarities with traditional farming or local farming; the region has rich agrobiodiversity and an institutional setup required for the promotion of organic farming.
- However, organic farming could not flourish due to lack of awareness, capacity, labour, land fertility, inputs, certification services, low volume produce, R&D and incentives.
- Organic farming can help us promote sustainable utilization of natural resources, build linkages with the regional or global market through CPEC, conserve biodiversity, achieve food security and create employment.
- In spite of the great potential of organic farming in Gilgit-Baltistan, organic farming faces challenges such as growing global competition, climate change and climate variability, higher pest and disease incidence, serious reduction in yields, higher certification costs, and alienation of the new generation from agriculture.
- To kick-start organic farming in Gilgit-Baltistan, there is a need to initiate research and piloting in the virgin valleys and link organic products with tourism.
- For the medium term, there is a need to standardize organic farming practices in the mountains, use clean and virgin soils, bring more investment in agriculture and build market linkages.
- For the long term, there is a need to develop regional collaboration for mountain organic research, development and marketing as well as conversion to organic farming.

Session 2
Discussion with community representatives

The panel discussion was moderated by Ajaz Ali of ICIMOD. He said that the main stakeholders of any piloting, scaling out or policy formulation processes are local communities, and that it is very important to listen to them at each step.

Panellists from project communities included:

- Gohar Aziz, President, Ghulkin Village Organization
- Sitara Ali, President, Women Organization of Ghulkin Village
- Ali Qurban, Chairman, Passu Development Organization
- Muhammad Tahir, Chairman, Shahi Khyber Imamabad Development Organization
- Hajat Baigum, President, Khyber Women Organization

The panel discussion is summarized in the table below:

Panelist	Discussion point	Discussion
Muhammad Tahir	What is your community's experience with regard to technologies piloted by WWF, ICIMOD and its project associates in Khyber Village?	The SKIDO has allotted 300 kanal (equivalent to one-eighth of an acre) of land to Khyber Women Organization to mainstream women into the agricultural sector, especially as an increasing number of men have been migrating out of the village. This land had never been under cultivation due to the lack of irrigation facilities. ICIMOD, WWF and PCRWR piloted a hydro ram pump to lift the contour channel water to an uphill area where women have established an apple orchard using drip irrigation. The drip irrigation technology is very efficient and requires less labour. If there is emitter blockage, they untighten the seal and unclog the emitter and tighten the seal again. It is simple and easy to operate. Women regularly visit the fields and are now growing vegetables using drip irrigation. However, the off-seasonal vegetable tunnel requires modification to resist the high winds that blow in this area.
Ali Qurban	How effective is the solar powered river water lifting cum drip irrigation?	ICIMOD and its consortium of partners piloted solar powered irrigation cum drip irrigation for a high-value apple orchard, which was highly successful at the initial stage. But after a few months, rabbits attacked the orchard and damaged some plants. Similarly supply of water was disrupted due to turbidity in the Shimshal River. The partners are now seeking other alternative sites to solve the issue but it is not solved yet. The technical team of PCRWR has connected the irrigation system with the WASP drinking water supply to save the plants. The confluence of the Shimshal and Khunjrab River has eroded the agro-base that had been developed in Passu. The community has submitted a plea to the government as well as private sector organizations but nothing has been done yet.
Hajat Baigum	How is Khyber Women Organization benefiting from hydro ram cum drip irrigation piloted on their land?	The SKIDO has allocated 300 kanal of barren land to Khyber Women Organization, where ICIMOD and WWF have piloted a hydro ram pump, which is lifting water without any external energy. The lifted water is then distributed with drip irrigation. Now women have established an apple orchard and are growing vegetables under drip irrigation. The greenhouse has failed to cope with the high winds that blow in the area. We request all partners to help us make good use of the greenhouse. Overall the intervention will help increase women's annual income.
Sitara Ali	How do women from Ghulkin work together in the Shahabad area and how are they benefiting from it?	The women organization of Ghulkin was established in 1993 by AKRSP. Now it has 500 members who are dedicated and hardworking. Since 1993 they have been empowered to develop an orchard and cultivate crops. The income is distributed among all group members. Arun Shrestha visited the Shahabad irrigation channel during 2009 and 2014; the channel is affected by climate change. Back in the 1980s AKRSP developed an irrigation water conveyance system, which worked till 2014. Then the glacier moved due to climate change and disconnected the system. ICIMOD, PCRWR and WWF rehabilitated the irrigation system in 2016, which worked great for 18 months. The water supplied was used for the cultivation of seasonal and off-seasonal vegetables. The tunnels could not bear the strong winds. Recently the source has disconnected from the water conveyance system due to the movement of the glacier, and water shortage has become a problem for the community. However, ICIMOD and its consortium have built women's capacity to grow organic vegetables in the fields. Initially the vegetables were sold in the market but now they are using them for household consumption. Shahabad is a future village of the Ghulkin community, which is vulnerable to GLOF and other disasters. 184 household plots have been established in Shahabad. In case of any GLOF activity, the Ghulkin community will have to resettle in Shahabad.
Gohar Aziz	What are the challenges of sustaining the irrigation water supply to Shahabad?	Ghulkin is vulnerable to any GLOF activity of Ghulkin Glacier. Shahabad is a safe area and has been chosen for future resettlement of the Ghulkin community. However the source of water supply to this area is Ghulkin Glacier, which keeps moving. This area has been chosen for the resettlement of the Ghulkin community but due to disrupted water supply, it is hardly inhabited. AKRSP developed an irrigation channel in 1992, which failed after a few years. AKRSP then installed a galvanized iron pipe, which again stopped supplying water in 2014. The community reached out to ICIMOD, which rehabilitated the system again. But Passu Glacier has moved again, causing disruption to the water supply. The Gulkhin Village Organization has submitted an application to the IFAD project to help the community come up with a sustainable solution. The organization hopes that the government will be able to provide a sustainable solution.

SECTION 3 |

Agreement signing session

During the policy roundtable two agreements were signed: a) handover of CBFEWS to Gilgit-Baltistan Disaster Management Authority, and b) Letter of Intent between ICIMOD and KIU for field-based studies on the cryosphere.

1. Handover of Community Based Flood Early Warning Systems to the Gilgit-Baltistan Disaster Management Authority

In order to ensure government ownership and longer-term sustainability of CBFEWS, all five systems located in Passu (for GLOF), Shighar, Ghanche and Sherqilla (for flash flood) and Damas (for debris flow) were handed over to GB-DMA. Farid Ahmad (DG of GB-DMA), David Molden (DG-ICIMOD), Rab Nawaz (Senior Programme Director-WWF) and Deedar Karim (Geologist, AKPBS) signed the agreement.

2. Letter of Intent for field-based monitoring of debris-covered glaciers and glacial mass balance with associated hazards in the Karakoram, Pakistan

In order to strengthen the capacity of the university, Attaullah Shah (VC, KIU) and David Molden (DG, ICIMOD) signed a letter of intent for field-based monitoring of debris-covered glaciers and glacial mass balance with associated hazards in the Karakoram, Pakistan.

SECTION 4 |

Closing session

1. Aurangzeb Khan, Provincial Minister of Law and Parliamentary Affairs, Gilgit-Baltistan

The Government of Gilgit-Baltistan (GoGB) is strongly motivated to ensure food security and environmental sustainability. This is reflected in the Environmental Protection Act it passed. As per this Act, all projects are required to carry out an environmental impact assessment and obtain a No Objection Certificate from environmental agencies before they can commence. Gilgit-Baltistan is vulnerable to any type of disaster, mainly due to intruding pollution from neighbouring countries. The GoGB is trying to strengthen the GB-DMA so it can respond in time to early warnings generated by CBFEWS. The government is grateful to ICIMOD and its consortium for strengthening the GB-DMA in terms of infrastructure for disaster risk reduction. Whatever policy recommendations the forum will make, the GoGB will try to implement them in a timely manner. Government institutions like the Mountain Agriculture Research Centre (MARC), provincial departments and private sector organizations including local and international NGOs have created awareness among local farming communities.

2. Muhammad Iqbal, Provincial Minister, Public Works and Law Department, Gilgit-Baltistan

This is a unique gathering of local, national and international researchers, practitioners and local communities. I wish leaders who tend to underestimate the impacts of climate change would visit Gilgit-Baltistan to witness the suffering of communities due to climate change. Gilgit-Baltistan is home to the largest glaciers after the polar systems and some of the highest peaks in the world. Due to global carbon dioxide pollution, the mountains and glaciers of Gilgit-Baltistan are under threat. Protecting these glaciers is now a global cause. These glaciers attract a lot of domestic and foreign tourists. With a high influx of domestic tourists, solid waste pollution is also increasing at an alarming rate,

which is putting pressure on the country's resources. Today we had the opportunity to learn about new technologies for building the climate resiliency of local communities. It is hoped more such gatherings will be organized in the future. Preventive measures like early warning systems can help save lives, but once disaster strikes, a lot needs to be done for community rehabilitation. The GoGB is ready to implement the policy recommendations of this forum.

3. Concluding remarks and the way forward

All global leaders must visit climate vulnerable areas and witness the suffering of communities. Interventions for building climate resiliency among locals have been piloted and out-scaled. It is hoped that the annual development plans of the GoGB will include efforts for wider up-scaling of these interventions.

There are four key points for the way forward:

1. We should keep working together to address lessons and challenges. We should continue efforts to promote dialogue among researchers, practitioners and policy makers through policy roundtables. A third policy roundtable has been proposed for next year to review the progress.
2. We should prioritize community knowledge and skill sets.
3. We should also keep learning from the work done by local institutions i.e., KIU's work on the cryosphere and climate change as well as AKRSP's work on organic farming potential of Gilgit-Baltistan.
4. We should stay updated on the government's efforts and policy decisions.

4. Vote of thanks: Ghulam Rasul, Regional Programme Manager, MENRIS, ICIMOD

On behalf of the organizers, Ghulam Rasul thanked the chief guests, namely Muhmmad Iqbal, Minister of Public Works and Law; Aurangzeb Khan, Minister of Law and Parliamentary Affairs; and Imran Wakeel, Minister of Forest, Wildlife and Environment for their participation and guidance for future actions. He also thanked the representatives of government and non-government organizations, academia and media for their participation. He expressed his appreciation for KIU's support in organizing the second policy roundtable. At the end, he applauded the efforts of WWF and ICIMOD teams for organizing this successful event.

SECTION 5 |

Annexes

Annex 1: Concept note

The economy of Gilgit-Baltistan depends on agriculture, livestock herding and tourism. However, the region has limited arable land (only 2%) and small landholdings (<0.73 ha) dominated by subsistence-based agriculture, arid landscape, dwindling irrigation water supplies and seasonal shifts due to climate change, labour shortages as result of higher male out-migration (41%), insufficient research and development, government subsidies, and poor market linkages. The arable land spreads along the river banks, out of which 50% land is uncultivated due to lack of access to water. Although the area is highly arid, about 57,000 ha of land has been cultivated through inefficient irrigation systems that rely on meltwater, built over generations. In recent years rapid deglaciation and consequent lowering of glacier surface and water-related hazards have been disrupting vital irrigation infrastructure and reducing water availability for agricultural uses. The traditional irrigation system comprises unlined water conveyance and distribution channels. Furthermore, poor on-farm water management techniques cause water losses and lower yields. Under these circumstances, agricultural production is not sufficient to feed the rapidly growing population.

The province is prone to various types of natural disasters; people are regularly affected by disasters. The most frequent hazards include earthquake, flash flood, glacial outburst flood, riverine floods, heavy snowfall, snow avalanche, landslide, debris flow, rock fall and torrential rain, which put the lives and livelihoods of the inhabitants at risk.

Keeping in view the aforementioned impacts of climate change in the Upper Indus Basin (UIB), ICIMOD together with WWF-Pakistan, and its strong consortium of partners including Pakistan Council of Research in Water Resources (PCRWR), Gilgit-Baltistan Disaster Management Authority (GB-DMA), IMARC of Karakoram International University (KIU) and Aga Khan Agency for Habitat (AKAH), has been implementing a project to build the climate resilience of local communities. This project is supported by the Sustainable Development Investment Portfolio (SDIP) of the Department of Foreign Affairs and Trade (DFAT) of the Australian government.

The project aims to pilot climate-smart water, energy and hazard management technologies and enhance local capacities to improve livelihood and build resilience for dealing with the effects of climate change in the UIB. The pilots are more focused on improving water use and energy efficiency, particularly demonstration of the solar pump or hydro ram pump at the community level, combined with micro irrigation systems. For hazard management, the Community Based Flood Early Warning System (CBFEWS) has been piloted as an approach to enhance the resilience of vulnerable communities in the flood-prone areas.

The piloted interventions are expected to be up-scaled and out-scaled through relevant public and private sector organizations. The learnings can be integrated into government policies and strategies to improve the resilience of the mountain communities. ICIMOD together with AKAH is already supporting the GBDMA in revising the Disaster Risk Management Plan of Gilgit-Baltistan. The project also aims to establish a province-wide network of community-based flood early warning systems after successful pilots and gathering evidence of reduced loss of life and properties.

On 26 June 2018, the Indus Basin Initiative (IBI) of ICIMOD, in partnership with the Pakistan Council of Research in Water Resources (PCRWR), Karakoram International University (KIU), and WWF-Pakistan, organized a high-level policy roundtable to present the successes and learning experiences of the pilot interventions of the IBI project to policymakers. The roundtable's objective was to explore possibilities for up-scaling and out-scaling by integrating the learnings into relevant policies in Gilgit-Baltistan. "Agricultural Water, Energy, and Hazard Management in the Upper Indus Basin for Improved Livelihood and Building Resilience" is a key project under the Indus Basin Initiative. The guests of honour discussed the impacts of climate change on the environment and local communities, and the adaptation measures under the Indus Basin Initiative (IBI) project were showcased. The government of Gilgit-Baltistan praised ICIMOD and its partners for bringing together all the important stakeholders to discuss possibilities for up-scaling and out-scaling. The technical sessions of the workshop included joint presentations by the project partners on the outcomes of pilot initiatives, followed by panel and group discussions. A key outcome of the policy workshop was wider dissemination of IBI project interventions among relevant stakeholders.

A second policy roundtable on Building Climate Resilience in Gilgit-Baltistan is scheduled for 24 July 2019 at KIU, Gilgit. Muhammad Hashim Popalzai, Federal Secretary of the Ministry of National Food Security & Research, Muhammad Tahir Anwar, Director General of the Federal Water Management Cell, David James Molden, Director General of ICIMOD, and heads of partner organizations are expected to join the roundtable. The objective of the session is to present the success and learning experiences of the pilot interventions to policymakers, discuss the out-scaling efforts by relevant stakeholders and explore ways to integrate the learnings into relevant policies in Gilgit-Baltistan.

Annex 2: Agenda

Host: Abdul Wahid Jasra

Time	Description	Remarks
13:00 – 13:30	Arrival of guests	**Venue:** KIU, Gilgit
13:30 – 13:35	Recitation of the Holy Quran	KIU Student
13:35 – 14:20	**Welcome remarks:** • Vice Chancellor, KIU • Director General, WWF-Pakistan, Islamabad **Opening remarks**: • Director General, ICIMOD • Director General, Federal Water Management Cell, MNFS&R	 Attaullah Shah Hammad Naqi Khan David Molden M. Tahir Anwar
14:20 – 15:20	**Piloting, out-scaling and up-scaling of agricultural water, energy and hazard management interventions in Gilgit-Baltistan** • An overview of the programme in Upper Indus • Scaling of technologies and institutional setup by PCRWR • Scaling (local manufacturing) of CBFEWS in GB **Demonstration of high-efficiency irrigation systems in Gilgit-Baltistan** **Scope of organic agriculture in Gilgit-Baltistan while up-scaling agricultural water management interventions through enabling policy**	**Moderator:** Farid Ahmad, ICIMOD Arun Shrestha, ICIMOD Faizan-ul-Hassan, PCRWR Deedar Karim, AKPBS Haider Raza, Head WWF-GB Melad ul Karim, AKRSP
15:20 – 16:00	**Community representatives' panel discussio**n • Gohar Aziz President of Ghulkin village Organization • Sitara Ali, President of Women Organization of Ghulkin village • Ali Qurban, Chairman of Passu Development Organization • Muhammad Tahir, Chairman of Shahi Khyber Imamabad Development Organization (SKIDO) • Hajat Baigum, President of Khyber Women Organization	**Moderator:** Ajaz Ali, ICIMOD
16:00 – 16:20	**Ceremony** • Handover of Community Based Flood Early Warning Systems to Gilgit-Baltistan Disaster Management Authority • Letter of Intent signing between KIU and ICIMOD for field-based monitoring of debris-covered glaciers and glacial mass balance with associated hazards in the Karakoram, Pakistan	
16:0 – 17:00	**Concluding session** • Remarks by Minister of Law and Parliamentary Affairs • Remarks by Minister of Public Works and Law	 Aurangzeb Khan Muhammad Iqbal
17:00 – 17:15	**Way forward** **Vote of thanks**	David Molden, DG-ICIMOD Ghulam Rasul, ICIMOD
17:15 – 17:45	Group photo and high tea	

Annex 3: List of participants

Gilgit-Baltistan Legislative Assembly

1. Imran Wakeel
   Minister of Forest, Wildlife, and Environment

2 Muhammad Iqbal
   Minister of Public Works and Law

3 Aurangzeb Khan
   Minister of Parliamentary Affairs

Federal Water Management Cell

4 Tahir Anwar
   Federal Water Management Cell (FWMC)

Pakistan Council of Research in Water Resources

5 Faizan-ul-Hassan
   Pakistan Council of Research in Water Resources

Pakistan Agricultural Research Council

6 Shafiullah
   Mountain Agriculture Research Centre (MARC)

7 Doulat Baig
   National Agricultural Research Centre (NARC)

8 Hasil Khan
   Mountain Agriculture Research Centre (MARC)

Provincial Government (Gilgit-Baltistan)

9 Mir Waqar Ahmed
   Agriculture, Livestock, and Fisheries Department, Gilgit-Baltistan

10 Shahid Zaman
   Forest, Wildlife and Environment Department, Gilgit-Baltistan

11 Abdul Khabir
   The Economic Transformation Initiative, Gilgit-Baltistan

12 Farid Ahmad
   Gilgit-Baltistan Disaster Management Authority (GBDMA)

13 Khadim Hussain
   Environment Protection Authority, Gilgit-Baltistan

14 Sher Jahan
   Directorate of Water Management, Gilgit-Baltistan

15 Zaheer Uddin Babar
   Gilgit-Baltistan Disaster Management Authority (GBDMA)

16 Ishfaq Ahmad
   Forest, Wildlife and Environment Department, Gilgit-Baltistan

17 Zakir Hussain
   Forest, Wildlife and Environment Department, Gilgit-Baltistan

18 Mahmood Asghar
   Agriculture, Livestock, and Fisheries Department, Gilgit-Baltistan

19 Mahmood Altaf
   Home and Prisons Department, Gilgit-Baltistan

20 Khadam Abbas
   Forest, Wildlife and Environment Department, Gilgit-Baltistan

21 Muhammad Arif
   Forest, Wildlife and Environment Department, Gilgit-Baltistan

22 Imran Haider
   Forest, Wildlife and Environment Department, Gilgit-Baltistan

23 Mastan Ali
   Livestock Dairy Development Board, Gilgit-Baltistan

Academia

24 Atta Ullah Shah
   Karakoram International University

25 Syed Moazzam Nizami
   Karakoram International University

26 Aftab Khan
   Karakoram International University

27 Ishrat Roomi
   Karakoram International University

28 Farida Begum
   Karakoram International University

29 Irfanullah Jan
   National Center of Excellence in Geology (NCEG)

30 Seema Gul
   Karakoram International University

Private sector organizations

31 Rab Nawaz
World Wide Fund for Nature (WWF) - Pakistan

32 Muzaffar Uddin
Aga Khan Rural Support Programme (AKAH)

33 Yasmeen Qalander
Aga Khan Rural Support Programme (AKAH)

34 Haider Raza
World Wide Fund for Nature (WWF) - Pakistan

35 Fazal Karim
World Wide Fund for Nature (WWF) - Pakistan

36 Rehmat Ali
World Wide Fund for Nature (WWF) - Pakistan

37 Syed Hassnain
World Wide Fund for Nature (WWF) -Pakistan

38 Jalal Uddin
Hashoo Foundation

39 Deedar Karim
Aga Khan Agency for Habitat (AKAH)

40 Melad-ul-Karim
Aga Khan Foundation

41 Fazal Karim
World Wide Fund for Nature (WWF) - Pakistan

Representatives of project communities

42 Gohar Aziz
Ghulkin Village Organization

43 Ali Qurban
Passu Development Organization

44 Sitara Ali
Women Organization, Ghulkin village

45 Hajat Baigum
Women Organization, Khyber village

Print and electronic media

46 Muhammad Essa
Kay2 TV, Pakistan

47 Zuhaib Akhter
Kay2 TV, Pakistan

48 Nazakat Ali
Pakistan Television (PTV)

ICIMOD

49 David Molden

50 Arun Shrestha

51 Ghulam Rasul

52 Abdul Wahid Jasra

53 Farid Ahmad

54 Ghulam Ali

55 Muhammad Ismail

56 Ajaz Ali

57 M. Mudassar Maqsood

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