Water Technical Committee Meeting

1st Meeting Report
March 21, 2024

Table of Contents

List of Abbreviations

AJK	Azad Jammu and Kashmir
CTCN	Climate Technology Centre and Network
EPA	Environmental protection Agency
GB	Gilgit Baltistan
GCF	Green Climate Fund
GEF	Global Environment Facility
GGC	Green Growth Consultants
GGGI	Global Green Growth Institute
GIS	Geographic Information System
KP	Khyber Pakhtunkhwa
MoCC&EC	Ministry of Climate Change and Environmental Coordination
NDC	Nationally Determined Contributions
PCRWR	Pakistan Council of Research on Water Resources
PEDO	Pakhtunkhwa Energy Development Organization
PHED	Public Health and Engineering Department
SEPA	Sindh Environmental Protection Agency
SWTP	Surface Water Treatment Plants

1. Introduction

A technology roadmap for NDC implementation is a strategic planning tool that provides a structured approach to identify, prioritize, and sequence the deployment of technologies to address climate change challenges and promote sustainable development. Pakistan's *Nationally Determined Contributions 2021* prioritizes technology-based interventions as a means towards climate action and calls for technology transfer and interventions for key sectors in Pakistan, including water and waste. Pakistan is dedicated to leveraging technology to enhance its climate action by integrating technology into its NDC implementation, it aims to create an enabling environment that promotes efficiency, inclusive access and adequate management of its water and waste sectors. To achieve this, the Ministry of Climate Change and Environmental Coordination (MoCC&EC), through the Climate Technology Centre and Network CTCN's technical assistance, has initiated the development of Pakistan's Technology Roadmap for the waste and water sectors for NDC implementation.

Taking the lead from the kick-off workshop organized in February to highlight the priority subsectors and technology options, along with finalization of the Water Technical Committee, the **1st stakeholder feedback water technical committee meeting** took place on the 20th of March, 2024 to further assess and shortlist the technologies identified through stakeholder sensitization and desk review for the **water** sector.

2. Objectives of the Meeting

The primary goal of this meeting is to ensure that the process to formulate the NDC Technology Roadmap is collaborative, inclusive and data-driven. The aim was to interact with the Committee to conduct a sectoral-level assessment and technology prioritization from the long list of technologies developed through prior consultation in the kick-off workshop and research phase. The three primary objectives of the meeting are listed as follows:

- **Identify and map region-specific issues in the waste sub-sectors:** Through interaction with provincial and sectoral stakeholders assess and identify what issues, specific to your region and socio-economic context, have plagued the waste sector and impact efficient and equitable management and delivery.

- **Prioritize Technologies for each identified sub-sector:** Through an interactive session we will ask you to select the technologies for each identified sub-sector, that most suitably and effectively address the identified region-specific issues

- **Identify issues that hinder the adoption of prioritized technologies in respective regions:** to assess significant barriers that hinder effective management and delivery of the water sector.

This component aims to identify region-specific issues that may arise and adversely impact the adoption and utilization of the prioritized technologies for the 3 sub-sectors and provide a grounded view that will help us pave the way forward toward successful uptake of the identified technologies.

3. Methodology

The meeting was held online through a pre-shared Zoom link and was attended by 20 participants of the technical committee, excluding the GGGI, GGC, and MoCC&EC teams. The technical committee was formulated by GGC with technical assistance from the MoCC&EC, a list of participants from relevant sectors was finalized by MoCC&EC. The list can be find attached in the (**ANNEX-I**). Following the identification of three water subsectors during the kick-off workshop which took place on 22nd February 2024, a comprehensive list of technologies was formulated for each of the three sub-sectors: Domestic, Agriculture, and Hydropower. Next, through extensive desk reviews technologies for each sub-sector were identified and supplemented through stakeholder consultations in all provinces/regions (Punjab, Sindh, Balochistan, Khyber Pakhtunkhwa, Azad Jammu & Kashmir, and Gilgit-Baltistan).

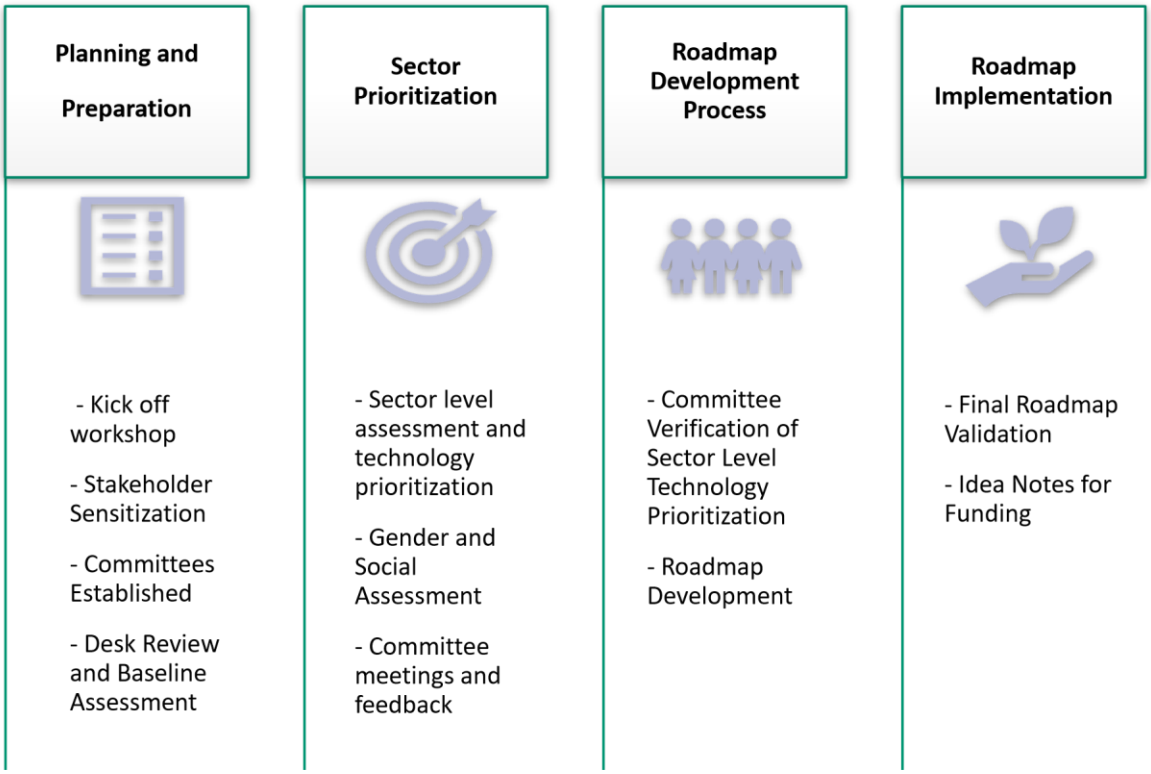
This meeting was conducted utilizing three critical platforms: Zoom, Mentimeter, and Google Forms. During the meeting, moderators encouraged the stakeholders to verbally share their opinions and to ensure smooth flow of information to meet the meeting's objectives. Mentimeter software was utilized to hold an interactive discussion session with participants to identify water sector issues, prioritize technologies, and identify challenges that hinder implementation. This session was recorded on Zoom. Following this, a Google Form was shared with participants to record their inputs on these three questions. This meeting and recorded responses successfully facilitated the identification of prioritized technologies for each sub-sector that will be examined and assessed further.

4. Discussions and Outcomes

The following discussion and outcomes were generated during and after the water technical committee meeting helping through Zoom with the technical committee members, GGC, and GGGI team.

4.1. Roadmap Development Process

Before the technical committee meetings, GGC, in consultation with GGGI, developed a comprehensive work plan, which can be improved upon feedback. The main activities of the roadmap development process are given below, out of which some are completed and others are in process:



4.2. Sector-Specific Issues

Stakeholders identified a wide range of issues related to water management in the **domestic**, **agricultural**, and **hydropower** sectors. Here's a breakdown of the challenges identified through Google Forms and the responses recorded verbally through zoom platform are stated underneath.

i) Domestic

- **Water scarcity** was identified as a major issue along with concerns regarding water depletion due to excessive groundwater extraction, unregulated use and lack of storage/recharge facilities. Stricter regulations were noted as necessary.
- **Water quality** and unsafe drinking water was highlighted as a concern as water contamination due to unregulated and unmanaged sewage and waste degrades the water quality, leaving it unfit for consumption
- **Infrastructure limitations** and inadequate infrastructure for water supply and sanitation was identified as a major issue
- **Unequal water distribution** of available water leads to a lack of equitable and efficient water supply

- **Public awareness** regarding water conservation practices is lacking leading to an absence of community mobilization or ownership efforts

ii) Agricultural Water Sub-sector

- **Water scarcity** was noted as a major concern due to various reasons, such as inefficient water management and climate factors
- **Waterlogging** in substantial areas owing to poor management. Especially prevalent in Azad Jammu and Kashmir.
- **Irrigation inefficiency** as flood irrigation practices lead to excess water wastage.
- **Climate change** and erratic weather patterns impact agricultural water supply. The dry climate is especially impacting Balochistan agricultural yield.

iii) Hydropower

- **Financial resources** are lacking which impacts the development of hydropower infrastructure.
- **Integration with irrigation and drinking** water is lacking and should be prioritized along with hydropower development
- **Climate change** and erratic weather patterns impact hydropower efficiency and reliability as an energy source.

Stakeholders also identified some key issues that were brought up for all the water sector and all noted sub-sectors. The concerns raised through Google Forms and the challenges that were recorded by stakeholders verbally and through the Zoom platform are also covered here:

Improved water management in the country faces several hurdles. **Limited financial resources** act as a barrier to implement even the most promising solutions. Stakeholders also raised concerns about the **affordability and accessibility** of new water management technologies, particularly for low-income communities. Even with the right technology**, effective project management** is crucial for successful implementation. This includes ensuring clear roles and responsibilities, efficient resource allocation, and a well-defined communication plan. Informed decision-making requires **improved data collection and analysis**. New technologies like **Geographic Information Systems (GIS) and remote sensing** are promising for improved data management. A significant challenge comes from **climate change**, which threatens water resources due to erratic weather patterns. Developing adaptation strategies is essential for long-term water security. Finally, building the **capacity of stakeholders** involved in water management, from government officials to farmers, is critical for the success of any initiative. By addressing

these challenges, we can move forward with confidence in our ability to manage water resources effectively.

Additionally, stakeholders highlighted specific needs in different regions:

- In AJK, climate change has impacted agricultural patterns, requiring the introduction of climate-resistant crop varieties. Water erosion is another concern in the northern parts. Gravity-fed water systems with flocculation and chlorination are seen as the most cost-effective solution currently.
- Due to the higher elevations in AJK, farmers face significant challenges related to water scarcity, particularly during the drought season. The rugged terrain and elevation differences make it difficult to access water sources and distribute water effectively for agricultural purposes. Farmers in these areas often struggle to pump water to higher elevations, where their fields are located. As a result, they may experience reduced crop yields, financial losses, and increased vulnerability to food insecurity during prolonged dry periods.
- Technologies should be identified for high-altitude areas of AJK.
- In AJK most springs became contaminated because of lack of proper sewerage treatment systems in cities as well as villages. As springs are a major source of drinking water, people are reluctant to drink chlorinated water. The sewage treatment system is in dire need of ours.
- In Sargodha, water management is a major issue, with limited clean water availability.
- In Gilgit Baltistan, GIS mapping for water resource management should be adopted.
- In Khyber Pakhtunkhwa, Waste Water Treatment Plants are lacking and absent, there is a dire need to construct WWTP in Peshawar and other cities of KPK.

4.3. Prioritized Technologies

A total of 17 responses were received from the technical committee, out of which 3 were in repetition, which includes 6 from KPK, 4 from AJK, 2 each from Sindh, Gilgit, and Punjab, and 1 from Federal.

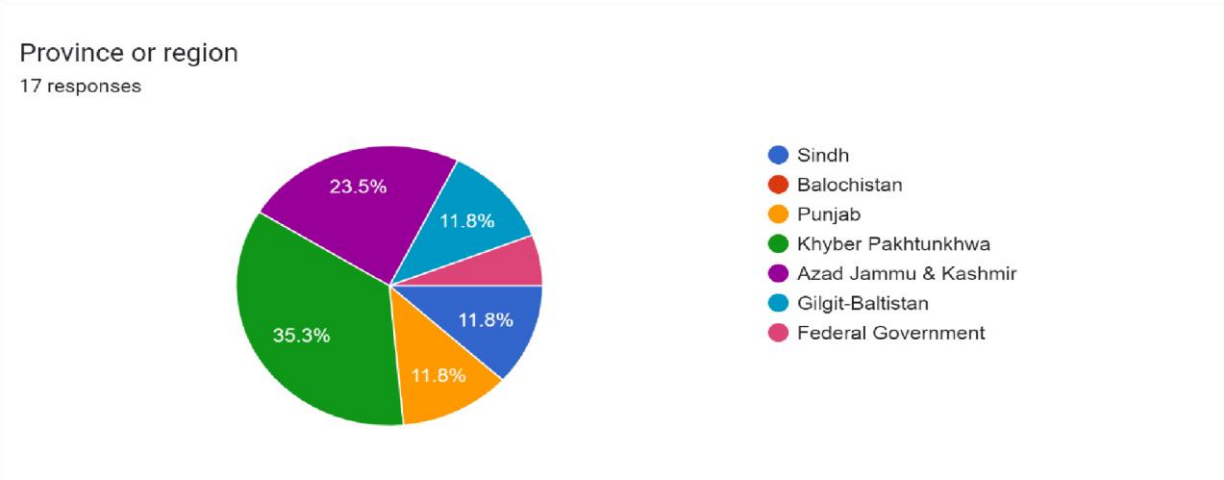


Figure 1: Provincially distributed participation percentage

The meeting discussions and feedback involved identification and mapping of technologies, through voting by provincial stakeholders involved closely in the management and delivery of the water sector. The technologies prioritized by the participants through Google Forms questionnaires, and Mentimeter tool statements recorded by stakeholders verbally and through the Zoom platform are also covered here.

i) Domestic Subsector

Stakeholders were given a list of technologies which consisted of existing and emerging technologies among which they had to prioritize their preferences. The following results were yielded for the domestic subsector.

Prioritized Choices (Existing Technologies):

- **Rainwater harvesting** is the highest prioritized technology for the domestic sector with a total of **12 votes.** This technology captures and stores rainwater for later use, reducing dependence on other water sources. It's a simple and cost-effective solution for domestic water needs.
- **Chlorination** is the second prioritized technology with a total of **5 votes.** It is a well established method for disinfecting water by adding chlorine, eliminating harmful bacteria, and making water safer for drinking.

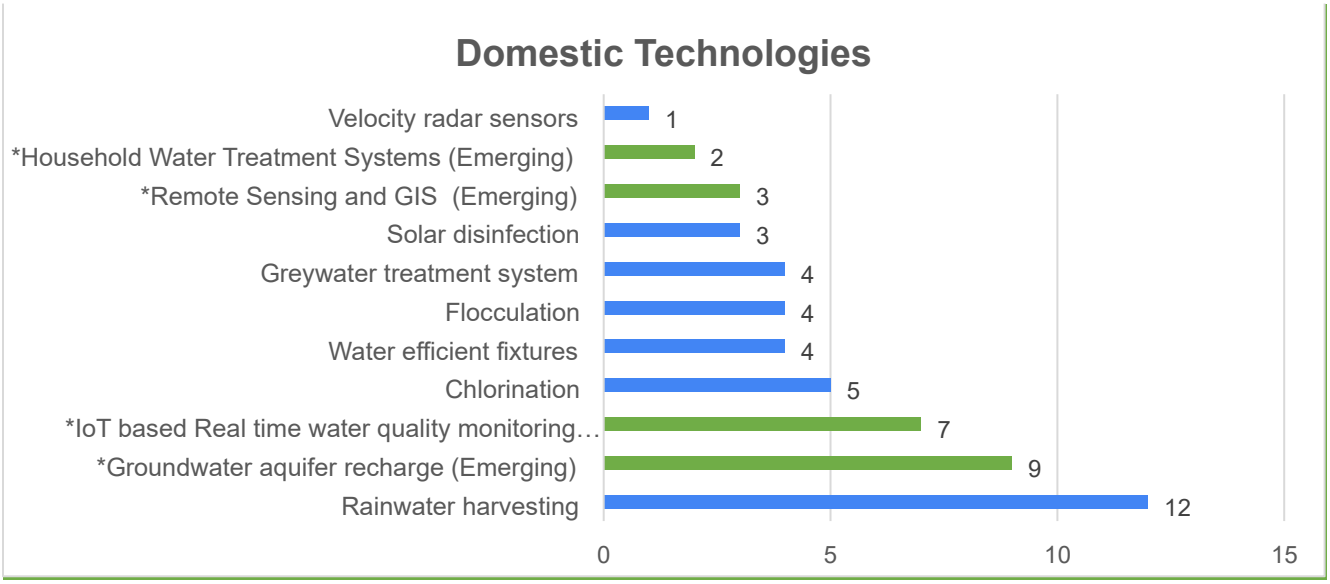
Prioritized Choice (Emerging Technology):

- In the emerging category **Groundwater aquifer recharge** received **9** votes. This technique replenishes underground water reserves by directing excess surface water

back into aquifers. It helps mitigate overexploitation and maintain sustainable groundwater levels.

Stakeholder responses also highlighted the potential of other technologies, including water efficient fixtures, greywater treatment, and solar disinfection. However, these received fewer votes.

(Emerging technologies *)



ii) Agriculture Subsector

Prioritized Choices (Existing Technologies):

- **Leaky Dams for Water Storage** received 10 votes**.** These small dams constructed across waterways allow controlled water infiltration into the ground, replenishing groundwater reserves and providing a source for irrigation during dry periods.
- **Drip Irrigation** was also prioritized with total 10 votes**.** This water-efficient method delivers water directly to plant roots through a network of tubes or emitters, minimizing evaporation and water waste.

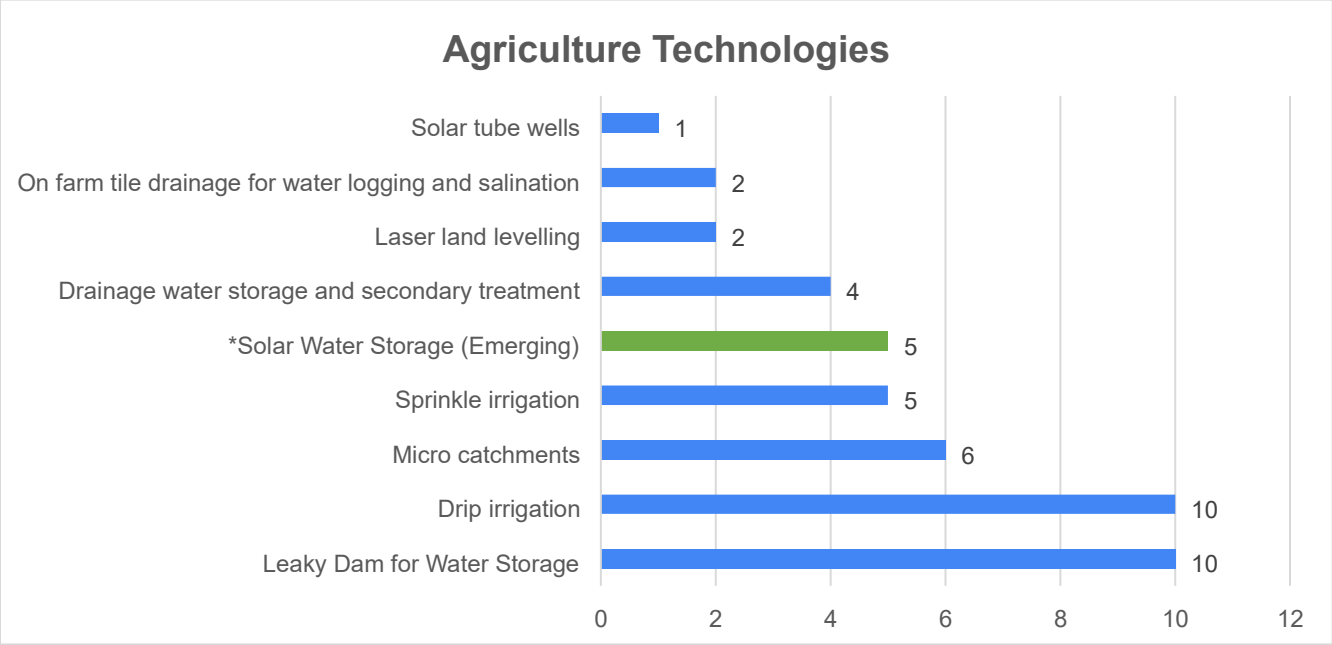
Emerging Technology:

- In the emerging category **Solar Water Storage** was prioritized with total 5 votes. This technology utilizes solar energy to pump and store water for later use in irrigation, reducing reliance on grid electricity.

Stakeholders prioritize water conservation and efficient irrigation methods like drip irrigation and leaky dams. There's growing interest in utilizing renewable energy through solar water

storage for irrigation. Technologies addressing drainage or specific soil conditions received lower scores, suggesting a focus on broader irrigation solutions.

(Emerging technologies *)



iii) Hydropower Subsector

Prioritized Choices (Existing Technologies):

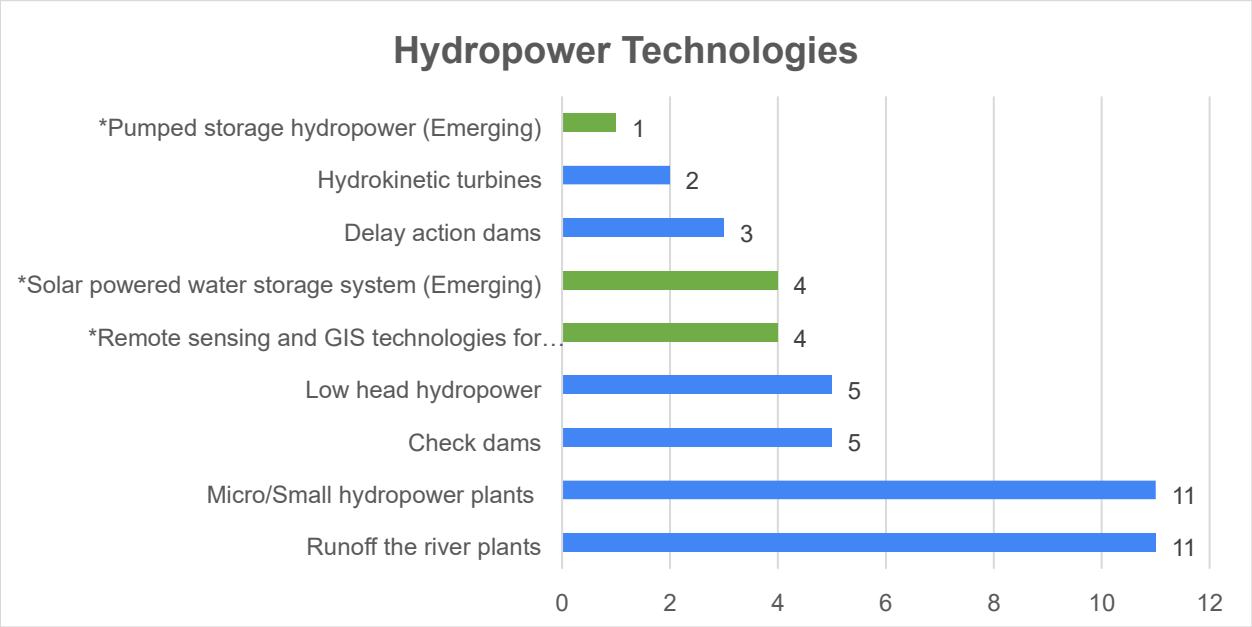
- **Run-off-the-river plants** received 11 votes. These hydropower plants utilize the natural flow of a river without requiring large dams. They can be a good option for areas with reliable water flow.
- **Micro/Small hydropower plants** were also prioritized with 11 votes. These smaller-scale hydropower plants generate electricity using the energy of moving water. They are wellsuited for locations with smaller rivers or streams.

Emerging Technologies:

- **Remote sensing and GIS technologies** are prioritized in this category with 4 votes. These tools can help identify suitable locations for hydropower projects and optimize their design.
- **Solar-powered water storage systems** received 4 votes as well. This technology could be used in conjunction with hydropower to store excess energy generated during high water flow periods, making it available during dry seasons.

Stakeholders prioritized renewable and run-of-the-river hydropower solutions for electricity generation. There was a visible interest in exploring emerging technologies like remote sensing, solar storage, and pumped storage for potential future applications. Technologies with specific functionalities (hydrokinetic turbines, delay action dams) received lower scores, suggesting a focus on broader hydropower generation solutions.

(Emerging technologies *)



4.4. Technology Specific Challenges

In the session conducted through the Mentimeter tool participants were asked to vote for challenges that have impacted the utilization of their chosen technologies and multiple possible options (ranging from affordability to technical issues, etc.) were provided to them to vote for the dominant challenges. For smooth execution and ensuring maximum participation moderators encouraged the stakeholders to record their voice through verbal inputs as well. The challenges that were recorded by stakeholders verbally and through the Zoom platform are also covered here.

Recorded verbal statements suggest the absence of essential wastewater treatment technologies and a lack of proper sewage water treatment systems across the country which poses a significant environmental and health risk. The high cost of technologies like solar tube wells and laser land leveling hinders adoption by farmers. While these technologies are currently available, they require improved promotion and subsidies to increase accessibility. Also, the emphasis on solar energy for surface water irrigation suggests a need to shift away from reliance on groundwater extraction using solar tube wells. However, this unsustainable practice is causing a decline in

groundwater availability which is a negative factor. Furthermore, it was suggested that the use of floating solar power plants could be useful in Wastewater Treatment Plants. The construction of water storage facilities, irrigation infrastructure improvements, and the promotion of water efficient farming practices were noted as essential. Investing in sustainable water management strategies, including rainwater harvesting, watershed management, and soil conservation measures, can help mitigate the impacts of water scarcity and enhance agricultural resilience in Azad Kashmir

Additionally, stakeholders noted some challenges in their responses for specific technologies, noted in the table below:

Technology	Identified Challenges
Solar Irrigation	Solar irrigation tube wells are operating for flood irrigation and for a long time which results in groundwater depletion.
Runoff River Plants	Financial Challenges to implement run-off river hydropower projects, The runoff river technology is capital-intensive.
Micro Power Plants	lack of Micro Hydro-power generation at feasible points
Micro Catchments	Pakistan is flood-prone country, we find opportunities to store potentially dangerous flood water but we do not have ample storage structures; the same is required even in the micro catchments.

i) Economic and Financial Feasibility

The economic feasibility of the chosen technology received mixed responses from stakeholders. Stakeholder responses suggest **rainwater harvesting, drip irrigation, solar-based technologies, check and delay dams, and some hydropower options like micro/small** plants are generally economically feasible. Technologies like **real-time water quality monitoring and advanced treatment like greywater treatment** need further assessment for economic viability, while drainage treatment, **on-farm tile drainage, and low-head hydropower** have uncertain economic viability depending on specific contexts. Upfront costs for large **run-off-the-river hydropower** projects remain a challenge from an economic point of view.

From the incentive point of view, stakeholders suggested there are no current incentives for technologies like Chlorination, Flocculation, IoT-based real-time water quality monitoring for drinking water supplies, Remote sensing and GIS for water resource management, Rainwater harvesting, and solar disinfection. Some also suggested that the **National Water Policy** provides provisions for subsidies and incentives for viable **solar pumping in rain-fed areas** where groundwater depth is shallow. Suggestion were recorded that these technological solutions can be supported by international donors under international commitments like the Paris Agreement, NDCs target achievements through GCF, GEF, and other institutions working on combating climate change.

ii) Technical Feasibility

According to the results of the 1st water committee meeting, stakeholders suggested that most of the chosen technologies are available in Pakistan but some might need to be imported from other countries. Also, the country must focus on increasing research and development for enhanced adoption of these technologies in the local market. PCRWR has successfully piloted some technologies so there is a need to upscale them through effective inter-departmental coordination and adequate allocation of fiscal resources.

iii) Legal and Regulatory Landscape

These stakeholder responses on the legal and regulatory framework for water sector technologies provide a breakdown of the several national and provincial level policies and strategies which are presented as follows:

For **run-off river and small hydropower** projects, clear guidelines based on economic and technical feasibility are already in place. Climate change adaptation is another area where Pakistan has made progress. The recently established **KP Climate Change Policy and Action Plan 2022** demonstrates a proactive approach to addressing the challenges of climate change on water resources. Project management is also supported by existing policies. **The KP Hydro Power Policy 2016** provides a framework for effective project execution, which is crucial for the success of any water management initiative. I**n Azad Jammu and Kashmir (AJK)**, a more comprehensive set of policies exists. These include the **AJK Climate Change Policy, Water Policy, Draft Agriculture Policy, and the AJK Environmental Protection Act 2000**. This framework addresses legal, regulatory, and environmental considerations for water management projects in the region.

However, the response also highlights some gaps. **Limited existing guidelines** were reported for certain chosen technologies, suggesting a need for further policy development for water sector related technologies. There's also a lack of clear guidance regarding legal, regulatory, and financial feasibility which creates uncertainty and hinders technology adoption and implementation. Despite these gaps, Pakistan possesses a foundation for sound water

management practices as the **National Water Policy** provides the overarching framework for integrated water resources management across the country. Additionally, various provincial water policies and strategies offer more specific guidance. **The Water Act 2017** establishes a legal framework for water management, further strengthening the national approach.

iv) Effectiveness and Efficiency

For all the prioritized technologies stakeholders strongly voted and vouched for their effectiveness and efficiency. The emission mitigation and climate resilience qualities were also noted for these technologies, along with their contribution to improved water management efficiency can have a greater positive effect. A suggestion was recorded stating the opportunity to explore international reports for additional efficiency-enhancing technologies, indicating a willingness to learn from best practices around the world. It emphasized the importance of **integrating new technologies with existing infrastructure**, such as surface water treatment plants and distribution networks. Equipping the sub-sectors with these technologies will aid in the promotion of efficient and equitable management and delivery of water-related services and ensure community resilience to climate change.

A response for **surface storage technology** noted that it should be supplemented with a surface water treatment plant having a proper distribution network to meet increasing drinking water demands. For the new dam/surface water storage projects, SWTP and allies' distribution systems should be provided as well. Additionally, investments and efforts towards groundwater recharge need to be increased through the implementation of technically sound, economically viable, and climate-resilient projects.

5. Way Forward

Participant stakeholders were also asked to note their suggestions as to how the prioritized technology can be promoted in the region. Their responses were as follows:

- Streamlining regulatory processes and providing incentives, such as tax credits, along with offering financial support through low-interest loans and grants, are pivotal steps.
- Fostering public-private partnerships can further enhance these efforts, facilitating effective water management initiatives.
- Education and public awareness campaigns must be conducted comprehensively across all channels.
- Recognizing the necessity for affordable electricity nationwide, a priority adaptation policy for hydro generation should be embraced by all stakeholders.
- Focus on climate resilience within water management frameworks.

- Mass awareness efforts and the reinforcement of legal regimes within government departments are imperative in this regard.
- Community awareness campaigns and increased budget allocation to departments such as the Public Health Engineering Department (PHED) are essential steps toward comprehensive water resource management.
- Given Pakistan's vulnerability to floods, addressing storage inadequacies, both on a macro and micro scale, is critical.
- Sensitizing stakeholders and reinforcing legal frameworks within government departments are foundational elements of this effort.

6. Conclusion

The 1st Stakeholder Meeting of the Water Technical Committee has led to the contribution of vital feedback from the Committee which is crucial to guide the NDC Technology Roadmap for the Water Sector. It has enabled the successful short-listing of technologies for further assessment and analysis, advancing our progress towards the final formulation of the Roadmap.

7. ANNEX-I Participants List

Name	Gender	Sector	Institution & designation	Province
1. Muhammad Luqman Hakeem	M	Gov	Planning Officer, Energy & Power Department, GoKP	KPK
2. Engr Ubaid Ullah	M	Gov	Research Officer, PHED Khyber Pakhtunkhwa	KPK
3. Dr Ali Asghar Mahessar	M	Gov	DD Water, Irrigation Department, Sindh Province	SINDH
4. Sardar Rafique	M	Gov	DD, AJK EPA	AJK
5. Uzair Naqvi	M	Gov	Environmental Geologist AJK PEDO	AJK
6. Dr. Arif Shah	M	Gov	Director Agri, Agriculture Extension Balochistan	BALOCHISTAN
7. Mumtaz Ali	M	Gov	Director, EPA	KPK
8. Rizwan Ali	M	Gov	Assistant Chief, Planning & Development Board Punjab	PUNJAB
9. Shahnawaz	M	Gov	AD, Energy Department, Sindh	SINDH
10. Shahzad Shabir	M	Gov	Director, EPA	Gilgit
11. Engineer Zahid Hussain	M	Gov	Superintendent Engineer, Power Division	Federal
12. Waris Ali	M	Gov	Director SEPA	SINDH
13. Waqas Abdullah	M	Gov	Assistant Director Agriculture	Muzaffarabad, AJK

14. Dr. Farooq	M	Gov	CSO Pak. Bureau of Stat Islamabad	Federal
15. Abdul Khaliq	M	Gov	Deputy Director, Energy	Balochistan
16. Imran Mukhtar	M	Gov	Executive Engineer, PWD PHE Division-II,	Mirpur Azad Jammu Kashmir (AJ&K)
17. Abdul Qadeer Kakar	M	Gov	Additional Secretary, PHED	Balochistan
18. Shahid Habib	M	Gov	Deputy Director (Environmental & Social Safeguard) SPRU (Irrigation)	Punjab
19. Mehfooz Kazi,	M	Gov	Director Alternate Energy	Sindh
20. Zafar Iqbal	M	Gov	Superintending Engineer Floods, Flood Commission	Federal