Pakistan NDC
Technology Roadmap for Waste & Water Sector

Kick-Off Workshop Report

22nd February, 2024 I Ramada Hotel, Islamabad

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1. INTRODUCTION

The Ministry of Climate Change and Environmental Coordination (MoCC&EC), through the Climate Technology Centre and Network CTCN's technical assistance, has started the development of Pakistan's Technology Roadmap for NDC implementation in the waste and water sectors. 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. This project is designed to initiate a collaborative process of designing a comprehensive waste and water sector Technology Roadmap aligned with Pakistan's development and climate targets.

A kick-off workshop was organized to create a shared understanding and ownership of the Nationally Determined Contributions (NDC) Technology Roadmap development process at national and provincial level. The purpose of this engagement was to understand the roles and responsibilities, ensuring alignment with government plans and priorities and to unlock the investments in waste and water technologies.

National Kick-off Workshop held on February 22, 2024, Islamabad was a multi-sectoral engagement consultative workshop held to develop Pakistan NDC Technology Roadmap for Waste and Water sector. Representatives from all provinces and regions were engaged in this workshop to identify priority subsectors in waste and water sector.

1.1. Kick-off Workshop Objectives

The Kick-Off workshop was a critical step in the process of developing the Technology Roadmap. The workshop brought together relevant stakeholders to establish a shared understanding, define the roadmap's scope, and identify the key priorities for achieving sustainable waste and water management in the country. The workshop was designed to

- Define the specific scope and sub-sectors within the waste and water domains that will be the focus of the technology roadmap.
- Identify key areas where technology interventions can be most impactful for achieving climate resilience and sustainability.
- Identify prioritized sub-sectors in water and waste domains important for climate resilience.
- Ensure alignment and consensus on the composition and functions of technology roadmap coordination mechanism.
- Update the documents registry to achieve completion of project activities, ensuring that all relevant documents are accounted for an inclusive technology roadmap

2. METHODOLOGY

The kick-off workshop agenda included facilitating discussions for prioritized sub-sector mapping. to moderate these discussions questionnaires and supporting materials were prepared by the team. The stakeholders were then divided and engaged in three different focused groups for water, waste and governance and enabling environment as per their expertise where questionnaires for key discussion 1, 2 and 3 (Questionnaires and supporting material is attached in Annex ii-iv) were disseminated for registering their valuable input. It was ensured that in group discussions each sector holds representation from all provinces and regions.

A total turnover of one hundred participants was recorded with fifteen females and eighty-five males from public, private, education and development organizations/ institutions. The attendance sheet of the participants is attached in the Annex V.

3. PROCEEDINGS AND FINDINGS

The proceedings started from the opening remarks by Dr. Saima Shafique, Director MoCC&EC. She introduced the project to the audience and highlighted the need for water and waste sectors to achieve Pakistan NDC targets. She mentioned that priority sub-sectors for waste and water need to be identified through an inclusive process, and workshop will serve this purpose. She added that these technology specific discussions and the roadmap for technology implementation are vital for creating a carbon neutral infrastructure in Pakistan. She also mentioned that discussion on decarbonized water and waste sector is unfolding soon for which they have identified the bottlenecks and are looking forward for collective collaborations to achieve this future goal through parallel initiatives. She concluded the remarks by thanking all the participants for joining in person. Followed by the opening remarks, MoCC&EC presented ongoing projects including on the Water and Sanitation Safety Planning which highlighted the current drinking water and management practices and promotion of safe sanitation system and practices in Pakistan. Key challenges, safety planning methodologies and way forward was shared for both water and waste sectors.

From here, GGC formally took over and the kick-off workshop proceeded with the project presentation titled as “Technology Roadmap for NDC Implementation in Waste and Water Sectors” presented by GGC. The presentation was delivered to introduce the project to the audience on NDC Technology Roadmap followed by highlighting the technology roadmap development process. The objectives and outcomes of this kick-off workshop were discussed with outlining the workshop agenda. Followed by the presentation the floor was opened for questions from the audience, no questions were asked.

After which the stakeholders were divided into three groups as stated in the methodology section previously.

3.1. key Discussion 1

Water

In key discussion one, members from different organizations engaged to provide their valuable input and feedback. A questionnaire (Annex ii) was designed for stakeholders to shed light on the aspirations and sub-sectors that need to be prioritized under water sector.

For section two, as per calculations done on the basis of questionnaire responses for sub-sector mapping and prioritization the three top priority sub-sectors identified were:

1. **Agriculture and Irrigation**
2. **Domestic/ Drinking water and Sanitation**
3. **Hydropower/ Energy**

The sub-sectors prioritized and challenges faced by different provinces and region are enlisted below.

- **Federal**: The priority sub-sectors were **Industry, Agriculture and Irrigation** and **Hydropower/ Energy.** Challenges faced by federal are related to mismatch between demand and supply of water as well as the unavailability of data for carrying out climate impact assessments and water storage and capacity monitoring.
- **Punjab**: The priority sub-sectors were **Agriculture and Domestic/ Drinking Water and Sanitation, Industry** and **Hydropower/ Energy.** The challenges associated with water sector in Punjab include water quality deterioration, availability of water, floods and changing precipitation patterns.
- **KPK:** The priority sub-sectors were **Domestic/ Drinking Water and Sanitation, Agriculture and Irrigation** and **Non-traditional Water Sub-sectors**. Challenges in KPK include drying out of groundwater resources, uncontrolled water tanker suppliers and lack of capacity building of the community.

  AJK: The priority sub-sectors were **Hydropower/ Energy, Domestic/ Drinking Water and Sanitation and Livestock and Fisheries** and **Flooding and Water-Related Disasters.**
- **Sindh:** The priority sub-sectors were **Agriculture and Irrigation, Domestic/ Drinking Water and Sanitation** and **Hydropower/ Energy**.

- **GB:** The priority sub-sectors were **Domestic/ Drinking Water and Sanitation, Agriculture and Irrigation** and **Shrinking Water Resources**. Challenges associated with GB include melting of glaciers, drying out of springs and over-exploitation of water for agricultural use.

In section one, sectoral aspirations representatives from different provinces and regions stated different goals for climate actions.

- **Federal:** Aspirations or goals for the water sector include water resource management, Climate risk assessment, and an integrated approach of cross-cutting sectors and departments. The goals should be realistic for 2030 or 2050. Focus should also be on integration of science and technology.
- **Punjab:** The future goals are improved access to safe drinking water, climate resilience and adaptation, and enhanced water resources management by 2030/2050. The water-energyfood nexus should be integrated.
- **KPK:** The goals are the promotion of a safe, affordable, and sustainable water supply for all. Adoption of water safety plan and implementation of water acts by a regulatory authority.
- **AJK:** The Goals are the provision of safe drinking water to urban areas, easy access to the public, and controlling water-borne diseases. Other goals include water conservation, testing, treatment, and availability.
- **GB:** The Goals are the conservation of water resources, controlling open defecation, promotion of health & hygiene and to declare GB as an open defecation-free region by 2030.
- **Balochistan:** The future goal for water storage and management is the construction of mega dams.

Section three inquired about the gaps and challenges present in the Water sector. Challenges were identified based on needs of different provinces as stated by their representatives. The provincial and regional responses are enlisted below.

- **Federal:** The challenges were water conservation/allocation & distribution, Climate-related risks/extremes, and lack of technology implementation. The measures that can be taken are preresearch analysis, implementation of advanced technology, and awareness programs. GLOF-I is an ongoing project in our province.

  Punjab: Challenges in Punjab included Groundwater depletion, water quality deterioration, limited access to safe water, inadequate sanitation facilities, and dependence on rainfall or snowfall patterns. Measures that can be adopted to overcome water challenges include canal

rehabilitation, drip irrigation systems, sanitation programs, public awareness, and run-of-river projects.

- **KPK:** The specific challenges in KPK included a lack of political will, governance, and capacity challenges. Measures like the establishment of regulatory authorities and enforcement of legal instructions can be taken.
- **AJK:** The challenges in AJK are related to finances and awareness, which can be addressed by water policy implementation, financing and water conservation and awareness programs.
- **Sindh:** The Challenges in Sindh are financial, technological, and governance. Source generation mechanisms can be implemented to meet demand at the community level.
- **Balochistan:** Challenges are financial.

In section four key measurement matrices were inquired about for the assessment of the identified subsectors. Key measurement indicators suggested include projecting the frequency and impacts of floods, climate extremes, droughts, crop production, and heat waves; quantifying water-use efficiency; and monitoring groundwater levels and water quality.; and monitoring groundwater levels and water quality.

Waste

In key discussion 1, members from different organizations where engaged to provide their valuable input and feedback through a questionnaire (Annex Section 1.2) designed to shed light on the aspirations and sub-sectors that need to be prioritized under waste sector.

In section two, sub-sector mapping and prioritizations of waste sector as per calculations done on the basis of questionnaire responses the top three waste sub-sectors identified are:

1. **Municipal Solid Waste**
2. **Plastic Waste**
3. **Agriculture Waste**

The sub-sectors prioritized, and challenges faced by different provinces, regions and organizations are enlisted below.

- **Federal (MoCC&EC):** The top three prioritized sub-sectors include Municipal Solid Waste, Plastic Waste and Industrial Waste. The challenges identified in the waste sector include health risks, contaminated water, and deteriorating municipal functions.
- **Federal (PBS) (CSO):** Three priority sub-sectors include **Municipal Solid Waste, Plastic Waste** and **Hospital Waste**. The challenges identified include climate change risks.

- **Federal (PBS-1):** Three priority sub-sectors include Municipal Solid Waste, Agriculture Waste and Industrial Waste. The challenges highlighted include absence of qualitative data for policy making.
- **Federal (PBS-2)**: Four priority subs-sector include **Municipal Solid Waste, Plastic Waste, Hospital Waste** and **Water Waste**. Challenges highlighted by PBS were increasing pollution, floods and associated health risks.
- **Federal (MoIP)**: Top three sub-sectors prioritized include **Water Waste, Hospital Waste** and **Industrial Waste**. Solid waste management is a major challenge identified by MoIP.
- **Federal (EPA):** The top three prioritized sub-sectors include **Municipal Solid Waste**, **Hospital Waste** and **E-Waste**. The challenges identified by the EPA were environmental degradation, adverse impacts on quality of life, and the spread of diseases.
- **Federal (PCRWR):** The top three prioritized sub-sectors include **Water Waste, Municipal Solid Waste** and **Plastic Waste**. The challenges identified by PCRWR included excessive use of plastic and absence of waste segregation.
- **Federal (NDRMF):** The top three prioritized sub-sectors identified are **Plastic Waste, Construction Waste** and **E-Waste**. The challenges stated by NDRMF are linked to GHG emissions and extreme weather events.
- **Punjab (GWMC):** Four priority subs-sector include **Agriculture Waste, Municipal Solid Waste, Plastic Waste** and **Water Waste.** The challenges identified included methane emissions, urbanization and lack of waste management facilities.
- **Punjab (SWMC):** The priority sub-sectors include **Plastic Waste, Industrial Waste** and **Agriculture Waste**. The challenges stated were related to emissions from waste harming the public health and climate.
- **AJK:** Three priority sub-sectors identified are **Municipal Solid Waste, Agriculture Waste** and **Water Waste**. The Challenges stated by AJK representative includes water contamination, disease aesthetics, climate variations and damage to vegetation caused by waste dumping.

In section one, sectoral aspirations representatives from different provinces, regions and organizations stated different goals for climate actions related to waste sector.

- **Federal (MoCC&EC):** Goals are focused on recycling, PPPs, and taxation on waste dumping or quality of waste. The basics of waste management and sanitation should be focused.
- **Federal (PBS) (CSO):** Goals are data collection, quantifying waste, and policy-making. Others are short-term projects and strengthening waste management companies.

- **Federal (PBS-1):** Goals include collection of relevant data, situation analysis, assessment of impact, formulation, implementation, and evaluation of policies. Further goals include waste recycling and re-use.
- **Federal (PBS-2):** Goals include quantifying waste management through data collection/analysis. Proper mechanisms of collection, transportation, segregation, recycling, and disposal should be developed.
- **Federal (MoIP):** The goal is proper waste management. Set short-, medium-, and long-term goals.
- **Federal (EPA)**: Goals include an effective system for waste collection, segregation, and excellent monitoring and surveillance systems. Integrated resource recovery should be developed, and STPs should be installed.
- **Federal (PCRWR)**: The goals are treating residential and commercial building wastewater, minimizing the production of plastic waste, and segregating waste for recycling. Other goals include the enforcement of treatment through Wastewater treatment plants for industries.
- **Federal (NDRMF)**: The goals are innovation, linking with economic benefits, and sustainability. Others include sustainability through resource efficiency.
- **Punjab (GWMC):** Goals include international collaboration and defined strategies for achieving net zero in the waste sector.

  Punjab (SWMC): Goals include Municipal waste treatment, segregation, and recycling. Other goals are to work on effective management of liquid waste, industrial waste and hazardous waste.
- **AJK**: The goals are to develop strong policies on waste reduction and control measures, create a complete waste profile, incorporate AI and modern tools, and enhance recycling through supply chain linkages.

Section three inquired about the existing gaps and challenges related to waste sector. The responses of the representatives from different provinces, regions and organizations are stated below:

- **Federal (MoCC&EC):** Challenges are Institutional incapacitation, financial constraints, and technological inefficiency, which can be addressed by segregation of waste, and the use of accessible and affordable abatement technologies by industries.
- **Federal (PBS) (CSO):** Challenges are poor management of construction, water and hospital waste, which can be addressed by making new waste management companies.

- **Federal (PBS-1):** Challenges are lack of technical equipment, lack of financial resources, and lack of commitment, which can be addressed by advanced technology, provision of funds, and commitment by stakeholders.
- **Federal (PBS-2):** Challenges in their region are technical, governance, financial, monitoring and awareness, which can be addressed by proper waste collection, recycling, and disposal, with effective monitoring.
- **Federal (MoIP):** Challenges are mostly financial in their region, which can be addressed through public-private partnerships (PPPs) and international finance.
- **Federal (EPA):** Challenges in their region include lack of effective monitoring systems, lack of capacity, lack of PPPs, and low participation of the stakeholders, which can be addressed by carefully and scientifically planning, developing, and operating waste management procedures. CDA is undertaking different SWM projects.
- **Federal (PCRWR)**: Challenges include plastic bags and bottles, poor waste segregation, and untreated industrial wastewater. These can be addressed through proper waste segregation, recycling of tin bottles, and plastic waste management. Societies must gather their garbage from houses, segregate it, and then dispose of the waste. There is a project of Rawalpindi Municipal Solid waste management handled by a Turkish company Al-bayrak, where the idea is to treat the waste gathered from the houses.

  Federal (NDRMF): Challenges are mainly financial, which can be addressed by strict compliance monitoring, innovation, and leveraging PPPs.
- **Punjab (GWMC):** Challenges are technological, financial, and governance that can be addressed by fixing political issues, acquiring finance, and maximizing diversion towards indigenous technology.
- **Punjab (SWMC)**: The challenges include financial constraints, constitutional limitations, and enforcement issues. These can be addressed through public awareness campaigns, landfill site development, recycling initiatives, and improved waste collection and transportation systems.
- **AJK**: Challenges in AJK are collection and segregation of waste, the capacity of workers and local public, and legal framework, which can be addressed by measures such as the development of legal framework, capacity building, and development of PPPs. SWM project is under planning.

In section four when inquired about the key measurement indicators, the indicators listed included waste generation per person, volume of waste generated per city, collection, treatment and disposal rate, waste assessment and impact of waste management on the GDP.

Enabling Environment

In key discussion 1, members from different organizations were engaged to bring valuable input to the table in context of enabling environment for climate action. A questionnaire (Annex Section 1.3) was designed for stakeholders to shed light on the aspirations and sub-sectors that need to be prioritized under water and waste sector.

Section two inquired about the sub-sector mapping and prioritization in the water and waste sector. Emerging or underdeveloped sub-sectors that require attention include:

1. Water table recharge potential
2. Developing climate resilient infrastructure for water
3. Development of water use and management policy
4. Integrating regional specific and low-cost technologies for water storage, conservation and management
5. Portable water
6. Surface water utilization
7. Sanitation system upgradation
8. Rain water storage
9. Re-use of flood water and preventing water contamination

In section two a prioritization matrix was also designed to identify the key priority areas that needed to be under focus in the water and waste sector.

The top priority areas identified in **water sector** are:

1. **Livestock and Fisheries**
2. **Agriculture and Irrigation**
3. **Hydropower/ Energy**

The sub-sectors prioritized for enabling environment by different provinces, regions and organizations for Water sector are enlisted below.

- **Federal (PPAF):** The top three priority sectors identified include **Hydropower/ Energy, Flooding and Water-Related Disasters** and **Domestic/ Drinking Water and Sanitation**.
- **Federal (MoWR):** Three prioritized sub-sectors include **Flooding and Water-Related Disasters, Agriculture and Irrigation** and **Hydropower/ Energy.**
- **Federal (NDMA):** Three prioritized sub-sector include **Livestock and Fisheries, Hydropower/ Energy** and **Domestic/ Drinking Water and Sanitation.**

- **Punjab (Health Department):** The three sub-sectors prioritized include **Domestic/ Drinking Water and Sanitation**, **Hydropower/ Energy** and **Livestock and Fisheries.**
- **Balochistan (PHED):** The three sub-sectors prioritized include **Industry, Non-Traditional Water Sub-sectors** and **Domestic/ Drinking Water and Sanitation.**
- **AJK (EPA):** The three sub-sectors prioritized include **Livestock and Fisheries, Hydropower/ Energy** and **Domestic/ Drinking Water and Sanitation.**

The top priority areas identified in **waste sector** for enabling environment are:

1. **Municipal Solid Waste**
2. **Industrial Waste**
3. **Biomedical Waste**

The sub-sectors prioritized for enabling environment by different provinces, regions and organizations for Waste sector are enlisted below.

- **Federal (PPAF):** The top three priority sectors identified include **Industrial Waste**, **Agriculture Waste** and **Municipal Solid Waste**
- **Federal (MoWR):** Three prioritized sub-sectors include **Biomedical Waste, Agriculture Waste** and **Municipal Solid Waste.**
- **Federal (NDMA):** Three prioritized sub-sector include **Municipal Solid Waste, Industrial Waste** and **Plastic Waste.**
- **Punjab (Health Department):** The three sub-sectors prioritized include **Biomedical Waste, Municipal Solid Waste** and **Industrial Waste.**
- **Balochistan (PHED):** The three sub-sectors prioritized include **Municipal Solid Waste, Agriculture Waste** and **Plastic Waste**
- **AJK (EPA):** The three sub-sectors prioritized include **Municipal Solid Waste, Plastic Waste** and **Agriculture Waste.**

In section one of the questionnaire, aspirations, and goals for creating an enabling environment for climate action in water and waste sector were asked to which the representatives from different provinces, regions and organizations replied with multiple aspirations stated below.

- **Federal (PPAF):** The future goals include developing good, integrated and inclusive policies with clear time bound action plans and well-defined roles and responsibilities to achieve future goals for climate action.

- **Federal (MoWR):** The major goals include implementation of existing policies.
- **Federal (NDMA):** The goal is to optimize the use of natural water resources through minimizing waste dumping.
- **Balochistan (PHED):** The goal is to go beyond safely managed sanitation and extract nutrients from wastewater to use them as nutrients in forestry and agriculture sector.
- **AJK (EPA):** The primary goal is to mainstream the climate change into development process at all levels. Capacity building at government and community level is also important.

Section three inquired about the gaps and challenges faced to enable climate action and inclusive development in the above prioritized sub-sectors. The challenges stated include absence of wellintegrated, inclusive and needs-based policies and data-based solutions, financial constraints, lack of technical capacity and excessive political influence rather than community involvement. To overcome these challenges, suggested actions that should be taken include carrying out of baseline studies to identify the scale of the problem, capacity building on training and technical level, proper line management, coordination, information dissemination at provincial and federal level and seeking national and international funding to overcome financial constraints. Governance issue and role of different organizations. Overlapping mandates of organizations serve as a challenge for any department to start any intervention. When implementing certain ground actions, the discussion on coordination with the line ministry and relevant departments becomes a hurdle. From technical perspective on finance, it is challenging to sustain financial opportunities for any implementation. Seed money may be available, but ownership of the technology is a challenge given the unclear mandates of different institutions, leading to the question of who owns the process and programs that bring in the technology. When communities are involved, projects tend to be more successful than government led processes.

3.2. KEY DISCUSSION 2

The aim of Key discussion 2 was to assess the existing technology mapping or feasibility documents and plans for inclusive development in the water and waste sector. The questionnaire for Key discussion 2 and supporting material for waste and water sector is attached in the Annex ii- iv.

Existing Technology mapping or feasibility Documents

- **For Water Sector:**
    1. Google Earth Engine, Remote sensing and GIS for water resource management
    2. AI integrated modelling for flood risk management

3. Solarization of tube wells for irrigation
4. Modern irrigation technologies (drip and sprinkler)
5. Solar-powered high-efficiency irrigation systems (HEIS)
6. Solar Powered water storage system
7. Solar technology labs for quality testing
8. Solar pumps and hydro ram pumps
9. Manual gauge systems
10. Solar-powered irrigation systems ● **For Waste Sector:**

1. Remote sensing for mapping the hotspots
2. Biological rotary discs
3. Septic tanks
4. Anaerobic filtration
5. Manual drain cleaning and sludge suction machines
6. Waste segregation
7. Landfill gas recovery
8. Engineered landfill technology- leachate collection
9. Plastic upcycling- pyrolysis plants, etc.

- **List of documents suggested by participants:**

1. Sindh Water Policy 2023
2. Drinking water policy 2017 Balochistan
3. GB climate change adaptation action plan 2022
4. Establishment of tourist facilities & other infrastructure facilities at ecological sensitive and critical area rules 2023
5. AJK climate change policy
6. GB Environmental Protection Act
7. Sindh agriculture policy 2018-30
8. Sindh climate change policy
9. SEPA Action Plan
10. Strategic Assessment for the Master Plan of Gilgit City by IUCN
11. Situation Analysis of Poverty, Agriculture, Health, Education and WASH, AJK

On the technology side of things, there were mixed opinions about subsectors. Some said we have the technology, points, and strategies, as well as R&D lessons, but bringing the technology to market and scaling it up is the challenge. Some technology items for water and water were proposed, but on the side of bringing the technology to scale was challenge in finance and sustaining it – keeping it operational long term – is a problem due to the governance issue.

Plans for inclusive development

- **Federal**
  Almost all departments ensured inclusiveness in hiring of staff through women quotas. Women can be a part of project designing discussions on gender-sensitive issues. Budget making decisions are not always gender or youth-sensitive. Humanitarian organizations work on genderspecific projects, but there is no progress at the government level. Women's participation should be ensured by increasing involvement in decision-making bodies, providing additional incentives, and providing training. Gender-sensitive budgeting is crucial to ensure that women involvements from all backgrounds. There is low awareness about gender-sensitive issues which can be addressed by gender inclusion.

- **Punjab:** Women's participation should be ensured in decision-making, and gender-sensitive budgeting is also important. Gender mainstreaming should be ensured during project planning. Women's participation is necessary, and creating jobs for women is a solution.
- **Balochistan:** Gender issues need a holistic approach. Women's participation is ensured when designing new projects. Women are included in decision-making as well. But gender-sensitive technologies is not discussed at government level. special projects for women and youth are designed and implemented through development sector support.
- **Sindh:** Women are involved in all the processes from decision-making to project implementation. Women participation is good but it should be further enhanced at the policy level.
- **GB** Women and youth are important in decision-making, but there is no such practice in GB. Only male groups are working, and there are no gender-specific targets as well. Water scarcity has a great effect on women. There are consultations and workshops for women's inclusion, but gendersensitive budgeting is lacking.
- **KPK:** Women's participation is present to some extent , however, improvement is needed.
- **AJK:** Women play a crucial role and their inclusion is mandatory. Government sector does not include women but it should be a priority. Donor funded programs ensure women participation.

For inclusive development gender sensitive technology and youth skill development was discussed further. Governments are looking at giving quota to women to be able to sit at decision making table and be part of policy discussion. While gender mainstreaming and youth engagement are not discussed at project planning and intervention unless the project is focused on youth and gender. Technology interventions with a focus on youth and gender sensitivity are typically discussed and implemented based on specific funding requirements. For instance, when the government is involved in a project, either through the domestic budget or Official Development Assistance (ODA), gender sensitivity may be a prerequisite for funding approval. Consequently, initiatives addressing gender-specific considerations may be more pronounced when linked to ODA, while domestic budgeting might see fewer dedicated allocations for such purposes.

3.3. KEY DISCUSSION 3

During this project, a national coordination mechanism was decided where three committees were composed; 1) Water committee, 2) Waste committee and 3) Technology Roadmap committee. Water committee provided their expertise to assess the water sector and in identifying the climate technologies for intervention in the high-impact sub-sectors of the water sector, Waste committee provided their expertise to assess the waste sector and identify climate technologies for intervention in the high-impact sub-sectors of the waste sector and Technology Roadmap Committee Contributed in the identification, financial feasibility analysis and assessment of climate technologies for intervention in the high-impact subsectors of the water and waste sectors in Pakistan.

In key discussion 3, the composition of technical committees was discussed and stakeholders were provided with the list of technical committees (Annex iv) to suggest any missing stakeholder organizations that can be beneficial for these consultations in the future.

For Technical Committee of Water, following institutes/departments/think tanks were suggested:

- Public Health Engineering Department- Balochistan
- BUITEMS
- WASH Unit LG&RD, GB
- Solid Waste Management Company GB
- Secretary water management and irrigation

For Technical Committee of Waste, following institutes/departments/think tanks were suggested:

- BUITEMS
- Pakistan Bureau of Statistics

- Solid waste management companies
- Law Department
- Bar Councils
- Civil Society representatives
- Influencers
- Climate Change Cell EPA
- MUST- Mirpur University of Science and Technology
- University of Ponch Rawalkot
- Karakoram Area Development Organization(KADO)
- Skardu Development Authority

For Technical Committee of Technological Roadmap, following institutes/ departments/ think tanks were suggested:

- University of Balochistan
- Water & Power department
- Agriculture Department
- Pakistan Poverty Alleviation Fund
- University of Engineering and Technology Peshawar
- Agriculture University Peshawar
- IMSIENCES-Hayatabad Peshawar
- Climate Change Cell AJK
- Energy and Water Resource PDO
- Agriculture Department
- Local Government Board
- Public Health Engineering
- University of Ponch Rawalkot
- Ministry of law and legislation Sindh
- Ministry of K & GB
- Pakistan Council for research in Water
- Local government and rural development
- Law, legislation and Human Rights
- Public health engineering department
- Agriculture and irrigation department

- Bar council
- NGO's
- Digital and social media
- SCEE NUST
- SMME NUST
- Rawalpindi waste management department

4. CONCLUSION

The highlighted key takeaways of the kick-off workshop include; 1) Prioritization of the sub-sectors from the waste and water sectors, for where technology interventions can be most impactful for achieving climate resilience and sustainability, 2) Importance of validity of data in all sectors that serves as the basis of planning, also the planning should be based on regional priorities identified through grass root level assessment and not by political influence, 3) Capacity building should be done prior to implementation of the technologies to make most out of them and 4) Policy implementation and compliance should be periodically monitored instead of repeatedly making new policies to streamline the already existing systems.

The kick-off workshop ended with the closing remarks of Dr. Saima Shafique, Director MoCC&EC in which she thanked all the stakeholders for their valuable presence in this engagement and also ensured them about transforming these discussions into technical roadmaps for improving the water and waste sectors in Pakistan through collaborative approach.

Annex-I Agenda

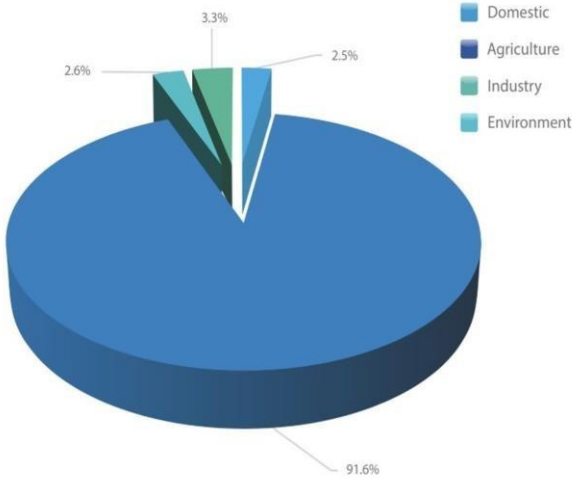
Time	**Activity**	**Lead**
08:30 – 09:00	Registration of Participants	GGC
09:00 – 09:10	Recitation and Introduction	GGC
09:10 – 09:20	Opening Remarks	MoCC&EC

09:20 – 10:15	Placeholder for MoCC&EC *Overview of water and waste Planning in Pakistan/sharing of learnings*	MoCC&EC
10:15 – 10:30	Scene setting presentation by Project team	GGGI/GGC
10:30 – 10:45	Q&A	
10:45 – 11:00	Tea Break	
11:00 – 01:00	Organization into sectoral groups: Moderator (5 minutes) **Group Discussion 1:** ● Seek inputs on sectoral aspirations (provincewise) ● Sub-sector mapping and prioritization ● Gaps and challenges (technical, governance, finance) ● key measurement metrics	GGC
01:00 – 01:30	Group Discussion Outcomes Presentation	GGC
01:30 – 02:30	Lunch Break	
02:30 – 03:30	**Group Discussion 2:** ● Existing technology mapping or feasibility documents ● Plans for Inclusive development	GGC
03:30 – 04:30	**Group Discussion 3:** ● Committee TORs ● Committee composition	GGC
04:30– 05:00	Outcomes and way forward	GGC
05:00 – 05:15	Closing Remarks Vote of Thanks	MoCC&EC GGC

2. Annex-ii - Key Discussion 1

Water-Sub Sector Mapping

Water use by sub-sectors in Pakistan

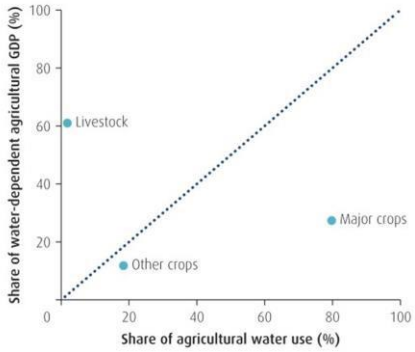


Source: Development Advocate Pakistan, Volume 3, Issue 4: UNDP (2016)

Sub-Sector: Agriculture

- The agriculture sector consumes around 91.6% of the total annual water use in the country, engaging 60% of the population and contributing 22% to the national GDP
- The four major crops alone (wheat, rice, sugarcane, and cotton) represent nearly 80% of all water use generate less than 5 percent of GDP
- It is a highly water -intensive, yet integral, sector responsible for Pakistan's food security along with economic and national growth.
- Irregular rainfall, rising temperatures, and extreme weather events like floods and droughts threaten crop yields and farmer livelihoods.
- 8-10% decline in agricultural sector is projected by 2040
- Water shortage in agriculture sector could reduce the GDP by more than 4.6%

Share of Agricultural Water Use and Water-Dependent Agriculture to GDP in Pakistan, 2016

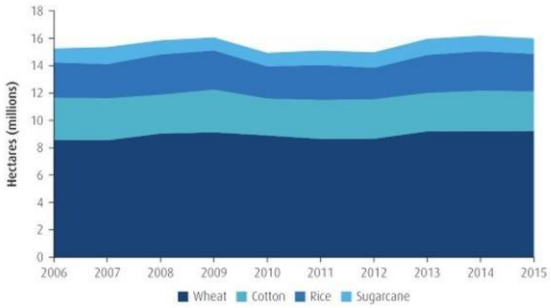


Pakistan: Getting More Water, World Bank (2019)

Sub-Sector: Irrigation

- While irrigation has been covered in the agricultural sector, a separate section has been added as it is one of the sub-sectors identified in two key policies. Pakistan's agriculture sector consumes majority of its water resources which contributes around one-fifth of national GDP, but less than half of this is from irrigated cropping.
- Irrigation contributes around US$22 billion to annual GDP.
- Irrigated agriculture plays a crucial role in food production, contributing to 90% of the total food output in Pakistan
- Inefficient and outdated irrigation methods lead to a drastic amount of water being lost such as the 40% loss due to old community watercourse irrigation method

Irrigation Areas of the Four Major Irrigated Crops in pakistan, FY 2006-16

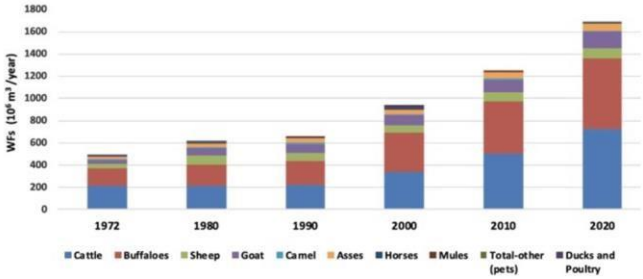


Pakistan: Getting More Water, World Bank (2019)

Sub-Sector: Livestock and Fisheries

- The livestock sector is a major component of Pakistan's agriculture, holding a 62% share and contributing 14% to the national GDP
- The fishing sector has a share of 1.39% in agriculture value addition and 0.32% in GDP and is also crucial to ensuring the country's food security and exports
- Pakistan's major fish & fish preparations buyers are China, Thailand, Malaysia, the Middle East, Sri Lanka, and Japan.
- Livestock and fisheries are adversely impacted by variations in climate and climate -induced disasters

Annual direct livestock blue water footprints in Pakistan 1972-2020

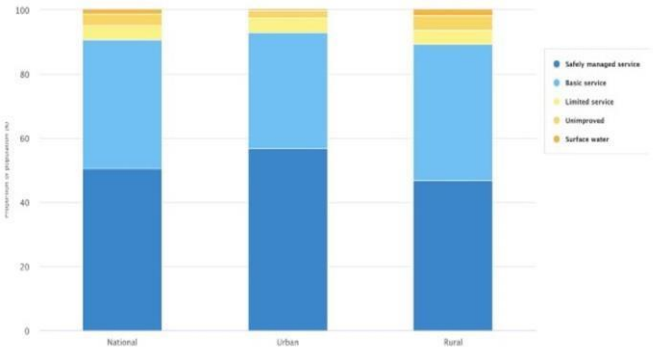


Source: Siyal, A.W., Gerbens-Leenes, P.W. and Vaca-Jiménez, S.D. (2023b) 'Freshwater competition among agricultural, industrial, and municipal sectors in a watescarce country. lessons of Pakistan's fifty-year development of freshwater consumption for other watescarce countries', *Water Resources and Industry* 29, p. 100206. doi:10.1016/j.wri.2023.100206.

Sub-Sector: Domestic/Drinking Water

- The domestic sector encapsulates residential and commercial sectors and accounts for 2.6% of water consumption in Pakistan
- According to the PCRWR, the per capita availability of water in Pakistan has declined from 5,260 cubic meters per person in 1951 to 1,017 cubic meters per person in 2021, which is well below the recommended threshold of 1,700 cubic meters per person per year
- The domestic water sector faces a number of issues ranging from inefficient water supply, lack of governance, and exploitation
- This is reflected in the fact that only 36% of the population has access to safely managed water
- Pakistan has the highest rate of urbanization in South Asia, signifying the urgency of this issue as the population will increase while water resources are not ensured

Proportion of population using safely managed drinking water services in Pakistan, by service level and location 2022



Source: SDG 6 Data

Sub-Sector: Industries

- The industrial sector consumes around 2.5% of the total annual water use in the country, and contributes about 19.1% to the national GDP registering a 7.2% growth rate
- · In Pakistan, 53% of textile industries fall under moderately water efficient and water inefficient categories
- According to the State Bank of Pakistan, the water crisis has reduced industrial output by around 30 percent
- The industrial sector is already facing a significant challenge from climate change.
- The 2022 floods destroyed 45% of cotton crops, impacting textile sector growth and exports.

Total country level water footprints for 4 sectors

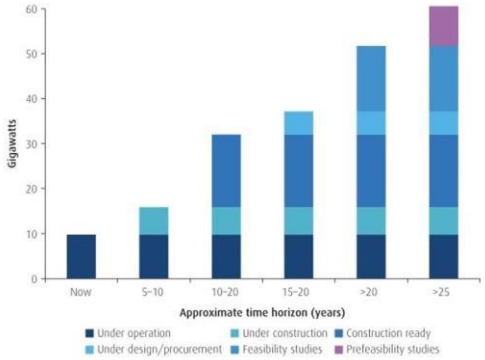
Sector	Blue Water footprint (m^3/t)	Total Pakistan production (tonnes/year)	Total Blue WF for sector (MCM/year)	WF type	Notes
Cotton textiles	5,258	3,203,000[1]	16,841	Blue WF	2006 production figure Data are all Pakistan totals
Leather tanning	377	108,000	41	Blue WF	
Sugar Molasses	1961 579	5,030,129 2,252,751	9,864 1,304	Blue WF	WF is total for sugar and molasses
Paper	348	2,780,000	967	Combined Blue WF and Green WF	98% of WF located outside Pakistan
Total			**29,017**		

Water Footprint of Key industrial Sectors in Punjab, Pakistan: WWF (2015)

Sub-Sector: Hydropower

- The water sector plays a pivotal role in power generation, especially hydropower.
- Pakistan's total installed capacity of hydropower generation that is operational estimates to be 10,852.85 MW.
- Currently, about 25% of Pakistan's energy generation is sourced through hydropower.
- Climate change and sedimentation in reservoirs significantly affect hydropower generation potential.
- The national water crisis has also aggravated the situation leading to power shortages and inflation, impacting industrial and commercial growth.

Projected Increases in Hydropower Capacity, Pakistan



Pakistan: Getting More Water, World Bank (2019)

Sub-Sector: Non-Traditional Water Use

- Non-traditional water sub -sector encompasses industrial waste water, municipal wastewater, agricultural waste water, industrial waste water and power and cooling wastewater.
- As per official data, about 4.36 billion m ^{3} (BCM) wastewater gets generated every year, of which 1.30 BCM is industrial wastewater, while 3.06 BCM is domestic water, while currently not even 1% is treated.
- It is a significant issue as nutrients from fertilizer in agricultural drainage, untreated municipal wastewater, and industrial effluent (especially from the textiles industry) are widespread and polluting freshwater ecosystems across Pakistan

Estimation of Total Generated Household Wastewater, 2020

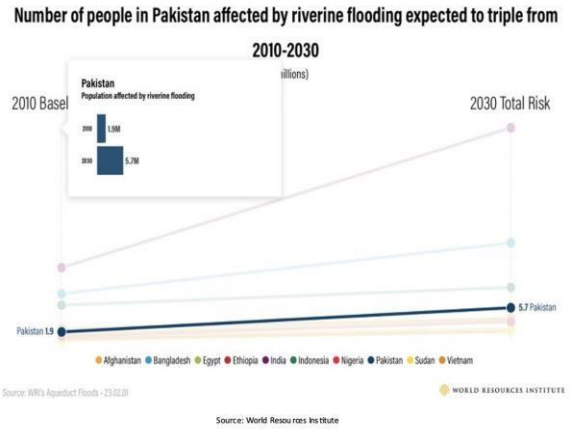
Population [1000s]			Water supply type by population [%]				Estimation of domestic water use						Estimation of total generated household wastewater			
			On-premises* water supply		Off-premises* water supply		On-premises* water supply [litres/person/day]		Off-premises* water supply [litres/person/day]		Total domestic water use [million m^3/year] [1] x [2] x [4] + [1] x [3] x [5]		Proportion of domestic water use converted into generated wastewater [%]		Total generated household wastewater [million m3/year] [6] x [7]	
220,892	E	[1]	71.5%	E [2]	28.5%	E [3]	120	A [4]	20	A [5]	7,374.181	C [6]	80%	A [7]	5,899.345	C [8]

Notes: [variable numbers shown in square brackets - see 'Data summary' worksheet for additional details]
A - Assumption (see methodological note for details)
C - Calculated value
E - Estimated value based on official national statistics
R - Reported value from official national statistics
* - On/off-premises refering to the location of the primary water supply

Source: https://cdn.who.int/media/docs/default-source/wash-documents/wash-coverage/2021-country-files-for-sdg-631/pakistan_pak_sdg631_2021.xlsx?sfvrsn=b6886ef6_6

Sub-Sector: Flooding and Water-Related Risks

- According to the Inform Risk index, Pakistan ranks 18 th out of 191 countries facing some of the highest disaster risk levels
- The country also has a high exposure to flooding, including riverine, flash, and coastal along with exposure to tropical cyclones and their associated hazards, and drought
- Between 2000 -19 climate change induced disasters and recurrent floods costed the country 30 lives per 100,000 and $3.8 billion in economic loss
- Floods of 2022 displaced 33 million people and causes losses worth US$30 billion, killed 1,400 people and destroyed 1.7 million homes



Source: World Resources Institute

- Projections note that the number of people exposed to flooding will increase from 1.9 million in 2010 to 5.7 million in 2030
- Due to weak institutional system of monitoring and lack of early warning systems, the drought and flood management system in Pakistan is extremely weak

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Water group- Questionnaire

Name _____

Your role/job title _____

Province _____

Department _____

Please note the role/mandate of your department _____

Does any water sub-sector (e.g. agriculture, industry) or water-related services fall under your department's mandate? _____

Sectoral Aspirations

1. In your opinion, what are the three aspirations or goals for the water sector in your province/region?

2. Are there any other relevant goals the water sector should have by 2030 or 2050? **Sub-sector mapping and prioritization**

    1. Please identify if the mapping shared by the moderators misses any important sub-sector. Are there any emerging or underdeveloped water sub sectors that you believe require attention and why?

    2. What impacts/challenges do you anticipate and/or already see connected to climate change, related to the water sector? Please rank these in terms of priority.

    3. Which sub-sector in the water sector should be a priority for Pakistan or province/region?

Sub-sector	Prioritization						
	Cost / Benefit to	Potential for green growth /	Addresses climate change	Potential for environment	Feasibility of development	Effective governance	Prioritized in government

	GDP	sustainable development	vulnerabilities	tal sustainability	nt in this sector	structures exist locally to plan and manage this subsector	nt planning
Scoring	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5
Agriculture and Irrigation							
Livestock and Fisheries							
Industry							
Domestic/ Drinking Water and Sanitation (Urban and Rural)							
Hydropower/Energy							

Non-traditional water sub-sector encompasses industrial waste water, municipal waste water,							
agricultural waste water, industrial waste water and power and cooling waste water							
Flooding and Water-Related Disasters (Flood Risk management and Drought Risk Management)							
Please add missing Sub-sector here							

4. Any information or statistic that you can add to support your answer above **Gaps and challenges (technical, governance, finance)**

1. What are the specific challenges in your province/region in the top 3 subsectors prioritized above?

2. What measures do you think are necessary to improve water management in the top 3 subsectors prioritized above?

3. Are there any completed or on-going water related projects in your province that have been initiated by the government in the noted subsectors?

Key measurement metrics

1. What are they key measurement indicators used to assess the noted sub-sector? Do you believe these are adequate?

2. Are there any other benchmarks you believe should be considered to assess performance of water sub-sectors?

Waste Sub Sector Mapping

Sub-Sector: Municipal Solid Waste

- Municipal waste comprises of residential and commercial waste
- Pakistan faces a key developmental challenge with its municipal solid waste generation amounting to 48.5 million tons annually, with an alarming 2.4% increase every year. On average, nationwide waste generation ranges from 0.24 to 0.65 Kg/capita/day
- This translates to cities like Karachi leading to over 16,500 tons of waste daily, while Lahore generates 7,690 tons, Faisalabad 5,017 tons, Rawalpindi 4,500 tons, Peshawar 2,048 tons, and Quetta 716 tons
- Weak institutional capacity and resource, outdated equipment, inadequate technology, and a lack of urban planning exacerbate the issue
- The sector holds tremendous potential for climate resilience through the inculcation of a sustainable circular economy based on recycling and mindful consumption along with effective management

Estimated Waste Characterization Percentages

Waste Fraction	Abbottabad	Faisalabad	Sahiwal	Lahore	Rawalpindi	Mirpur	Sialkot	Muzaffarabad	Mardan	Gujranwala	Peshawar	Islamabad	Kohat	Sahiwal	Mingora	Average
Kitchen green waste	66.74	72.67	34.21	56.32	54.70	62.33	38.14	68.24	62.96	62.50	53.74	59.95	55.82	56.90	49.21	56.96
Paper	11.86	1.59	8.90	3.20	2.40	4.46	12.95	4.95	3.91	15.30	7.32	7.26	8.2	5.219	13.1	7.37
Textile	1.78	3.87	2.21	9.21	6.05	3.05	3.54	2.71	3.71	3.87	2.35	1.81	2.75	3.71	3.53	3.61
Dry grass and wood	1.47	8.38	12.33	6.05	3.66	1.43	3.93	1.32	1.05	1.63	10.29	0.00	0.15	1.70	4.66	3.87
Plastic	9.46	4.16	9.67	10.64	10.51	12.52	10.22	10.22	7.36	7.70	9.34	7.49	12.00	9.54	14.69	9.71
Leather and rubber	1.07	0.08	0.54	1.00	1.20	0.84	3.20	1.09	0.61	0.77	0.63	0.00	0.723	0.88	0.33	0.86
Metal	0.08	0.38	0.58	0.06	0.03	0.31	3.20	0.26	0.20	0.23	0.72	0.68	0.025	0.375	0.46	0.51
Bottle and glass	0.75	0.21	1.96	0.69	0.64	1.03	7.13	1.31	0.87	1.16	2.32	2.79	9.73	0.75	0.74	2.14
Ceramic, stone, and soil, etc.	1.15	7.37	1.59	6.40	11.13	0.59	2.00	0.24	3.09	1.10	12.32	0.00	0.90	2.51	1.30	3.45
Domestic hazardous wastes	0.20	0.05	0.43	1.36	1.49	0.37	5.39	0.47	0.45	0.60	0.00	0.82	0.40	1.03	0.50	0.90
Sieve Remaining>6mm	0.05	0.00	5.39	2.00	0.00	1.61	2.00	0.78	0.00	3.23	0.00	0.00	0.76	3.06	2.86	1.45
Miscellaneous	5.39	1.24	22.25	3.07	8.28	13.47	6.00	8.41	15.79	1.91	0.97	19.20	8.54	14.33	8.62	9.16

mm = millimeter.

Solid Waste Management Sector in Pakistan, ADB (2022)

Sub-Sector: Plastic Waste

- More than 90 percent of plastic waste from the sample sites in Upper Indus Basin ends up in the river, wreaking havoc on the aquatic life and surrounding communities
- As a result, out of over 11,977 tonnes per annum of plastic reaching the mouth of the Indus, nearly 10,000 tonnes makes its way to harm coastal and marine life
- This plastic pollution the environment and water bodies while choking drains and contributing to overflowing drains and urban flooding during monsoons
- Microplastics remain in the environment and end up accumulating in the water bodies and food sources, leading to severe health hazards

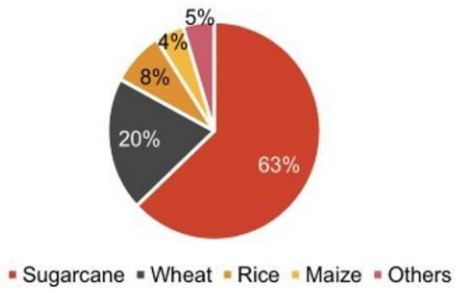
PET Waste Generation in each city (kg/month)

Pakistan: Scoping Study for Pet Waste Management in Pakistan, WWF and Coca Cola Pakistan (2020)

Sub-Sector: Agricultural Waste

- The agriculture sector consumes around 91.6% of the total annual water use in the country, 60% of the population is directly engaged in agriculture and livestock while 80% of Pakistan's exports are based on these sectors
- As an agrarian economy, Pakistan generates a large amount of agricultural waste
- Mismanagement and inefficient management have led to the widespread uptake of hazardous measures such as crop burning to deal with agricultural waste, fueling detrimental air quality nationwide.
- While livestock plays a vital role in the Pakistani economy, contributing 61.9% of agricultural GDP and 14.0% to the national GDP, its waste management poses a significant environmental threatas the most manure is produced by cattle (10 –20 kg/day), while poultry produce the least (0.08 –0.1 kg/day).

Total Crop Production in Pakistan

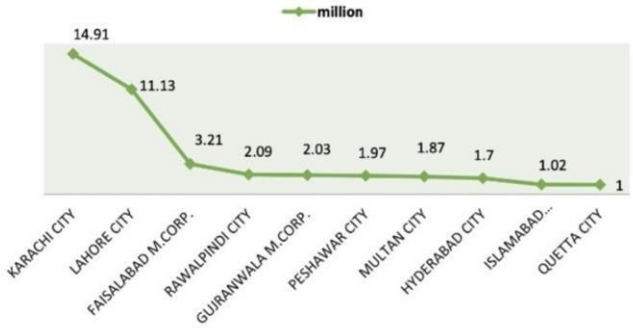


Source: Pakistan Economic Survey 2017-18

Sub-Sector: Construction Waste

- Pakistan is a developing nation with the highest rate of urbanization in South Asia
- Construction sector provides 380 billion PKR to our GDP, standing at a total of 3%
- Construction waste stands at around 14 million tonnes per annum
- A study conducted on 30 construction sites revealed that concrete (12.32%), metal (9.62%), brick (6.54%), plastic (0.43%), wood (69.10%) and others (2%) are some of the major categories of waste generated during construction
- Construction waste has severe environmental impacts leading to degradation and pollution, along with filling up of landfills and open spaces

Population in Millions: Top Ten cities

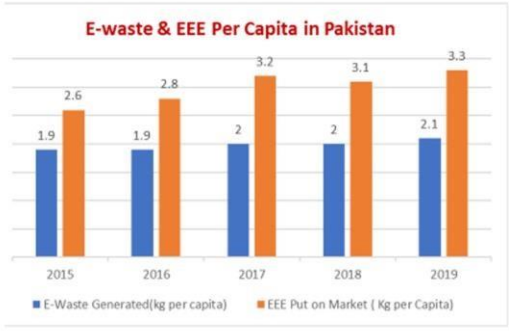


Source:https://invest.gov.pk/sites/default/files/boi/Housing%20and%20Construction.pdf?gtranslate=en

Sub-Sector: E-Waste (Hazardous Waste)

- Pakistan's ranking among the top 15 nations for risky e - waste dismantling and recycling highlights the need for improved practices in this realm.
- The import of hazardous waste further complicates the issue, with 80,000 tons entering the country annually and an additional 85,000 tons documented in 2019 from developed nations like the UK, Iran, and the UAE.
- These materials, often toxic and harmful to human health due to their corrosive and reactive nature, primarily originate from chemical production and industrial activities.
- Additionally, it can disrupt ecosystems, harm wildlife, and even contribute to climate change through toxic emissions.

E-waste per capita generated from 201519

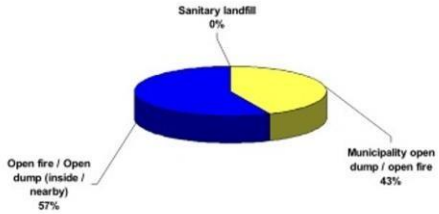


Source: https://invest.gov.pk/sites/default/files/boi/Housing%20and%20Construction.pdf?gtranslate=en

Sub-Sector: Hospital Waste (Hazardous Waste)

- Pakistan faces a significant challenge in managing hazardous waste, as evidenced by the generation of 250,000 tons annually from hospitals alone.
- 5.2 million people (including 4 million children) die each year from waste -related diseases.
- Hospital wastes pose a significant impact on health and environment.
- Hospitals, clinics, laboratories, and other medical facilities producing infectious and healthcare -related waste, these are majorly mixed with municipal waste in collecting bins at roadsides and disposed of, reuse of disposable syringes.
- This poses potential health risks due to improper handling, particularly for blood -borne diseases like AIDS, hepatitis, and tuberculosis.

Hospital Waste Management methods in 10 districts of Pakistan



Hospital waste management & environmental assessment in Pakistani selected facilities : JSI and US Aid (2006)

Sub-Sector: Industrial Waste (Hazardous Waste)

- The industrial sector consumes around 2.5% of the total annual water use in the country and contributes about 19.1% to the national GDP registering a 7.2% growth rate
- The cement industry, contributing 5.3% to the economy while the textile industry accounts for 8.5% of GDP
- While updated stats for industrial waste output are scarce, it is a significant contributor of water pollution, land degradation, and microplastic pollution, and more
- Additionally, the import of used clothing exacerbates environmental pollution and chemical use, which reached a staggering 1.4 million tonnes in 2021
- The sector holds tremendous potential for climate resilience and sustainable growth due to the opportunities existing for emission mitigation and transition to sustainable alternatives such as waste to energy recovery, composting food waste, and more

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21.https://www.dawn.com/news/1793784 22.
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Waste group- Questionnaire

Name

Your role/job title _____

_____

_____

_____

_____Province

Department

Please note the role/mandate of your department

Does any waste sub-sector or waste-related services fall under your department's mandate?

_____

Sectoral Aspirations

1. In your opinion, what are the three aspirations or goals for the waste sector in your province/region?

2. Are there any other relevant goals waste sector should have by 2030 or 2050?

Sub-sector mapping and prioritization

1. Please identify if the mapping shared by the moderators misses any important sub-sector. Are there any emerging or underdeveloped waste sub-sectors that you believe require attention and why?

2. What impacts/challenges do you anticipate and/or already see connected to climate change, related to the waste sector? Please rank these in terms of priority.

3. Which sub-sector in the waste sector should be a priority for Pakistan or province/region?

Sub-sector	Prioritization

	Contribution to emissions and Environmenta l Impact	Potential for adaptation and sustainable developmen t	Potential for mitigation/ emission reduction	Technology readiness	Capacity for implementatio n
Scoring	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5
Municipal Solid Waste					
Plastic Waste					
Agricultural Waste					
Construction Waste					
Industrial Waste(Hazardous Waste)					
Hospital Waste (Hazardous Waste)					
E-Waste (Hazardous Waste)					

Water waste					
Please add the missing Sub-sector here					

4. Any information or statistic that you can add to support your answer above

Gaps and challenges (technical, governance, finance)

1. What are the specific challenges in your province/region in the top 3 subsectors prioritized above?

2. What measures do you think are necessary to improve water management in the top 3 subsectors prioritized above?

3. Are there any completed or on-going waste related projects in your province that have been initiated by the government in the noted subsectors?

Key measurement metrics

1. What are they key measurement indicators used to assess the noted sub-sector? Do you believe these are adequate?

2. Are there any other benchmarks you believe should be considered to assess performance of waste sub-sectors?

Enabling Environment questionnaire

Name _____

Your role/job title _____

Province Department _____

Please note the role/mandate of your department _____

Does any water sub-sector (e.g. agriculture, industry) or water-related services fall under your department's mandate? _____

Does any waste sub-sector or waste-related services fall under your department's mandate? _____

Aspirations for enabling environment

1. In your opinion, what are the aspirations or goals for creating an enabling environment for climate action in the water and waste sector in your province/region? (e.g. on governance, capacity, finance, etc.)

2. Are there any other relevant goals to have by 2030 or 2050?

Sub-sector mapping and prioritization

1. Please identify if the mapping shared by the moderators misses any important sub-sector. Are there any emerging or underdeveloped water sub sectors that you believe require attention and why?

2. Which sub-sector in the water sector should be a priority for Pakistan or province/region?

Sub-sector	Prioritization					
Water						
	Technology		Governance		Inclusive development	
	High impact existing technologies	Readiness for emerging technologies	Existing institutional structure supports coordinated resource management	Existing legal and policy provisions supports technology adoption	Potential for Communitybased interventions	Promotes equitable access

Scoring	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5
Agriculture and Irrigation						
Livestock and Fisheries						
Industry						
Domestic/ Drinking Water and Sanitation (Urban and Rural)						
Hydropower/Energy						
Non-traditional water sub-sector encompasses industrial waste water, municipal waste water, agricultural waste water, industrial waste water and power and cooling waste water						
Flooding and Water-Related Disasters (Flood Risk management and Drought Risk Management)						

Please add missing Sub-sector here						
Waste						
	Technology		Governance		Inclusive development	
	High impact existing technologies	Readiness for emerging technologies	Existing institutional structure supports coordinated resource management	Existing legal and policy provisions supports technology adoption	Potential for Communitybased interventions	Promotes job creation
Scoring	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5	Low 1 to high 5
Municipal Solid Waste						
Agricultural Waste						
Industrial Waste						
Plastic waste						
Biomedical waste						
Please add missing Sub-sector here						

3. Any information or statistic that you can add to support your answer above

Gaps and challenges (technical, governance, finance)

1. What are the specific challenges in your province/region to enable climate action and inclusive development in the top 3 subsectors prioritized above?

2. What measures do you think are necessary to enable climate action and inclusive development in the top 3 subsectors prioritized above?

Key measurement metrics

1. What are they key measurement indicators on technology, governance and inclusive development used to assess the noted sub-sector? Do you believe these are adequate?

2. Are there any other benchmarks you believe should be considered to assess performance?

3. Annex-iii- Key Discussion 2

Water (Supporting document for Key Discussion 2)

Water Sector

Document Type	Title
National Policies and plans/ manuals or guidelines	● Climate Change Policy 2021 ● National Clean Air Policy 2023 ● National Climate ● Resilience and ● Adaptation Plan 2023-30 ● National Action Plan on ● SDG 12 ● Understanding the water resources in Pakistan ● Sub National Water Dialogue Gilgit Baltistan ● National Forest Policy 2015 ● Integrated Water Resources Management Implementation Guidelines for Pakistan ● Water Security issues of agriculture in Pakistan ● National Research Agenda on Water 2016-2025 ● UNICEF- Country Led Evaluation of the Clean Drinking Water for All ● National Water Conservation Strategy for Pakistan (2023-27) ● National Water Policy 2018 ● PAKISTAN WATER SECTOR STRATEGY Volume 2 ● Integrated Water Resources Management Implementation Guidelines for Pakistan
Water and WASH specific and other sectoral policies and plans	● National Water Policy 2018 ● National Sanitation Policy 2006 ● National Hazardous Waste Management Policy 2023 ● Alternative and Renewable Energy Policy 2019 ● National Electric Vehicle Policy 2021 ● Clean Green Pakistan Index Reports on WASH indicators ● Pakistan Water Supply and Sanitation- Vol 3 executive summaries

Provincial policies and plans	• Provincial Environmental Protection Acts • Sindh Water Policy • Sindh Drinking Water Policy • Punjab Water Policy • Punjab Water Act • Punjab Drinking Water Policy • Punjab Water Vision 2050 and Investment Plan • Balochistan Agricultural Sector Policy and Strategy • AJK Policy Brief- Situational Analysis of Poverty, Agriculture, Health, Education and WASH • Water and Sanitation Sector Analysis of Azad Jammu and Kashmir Baseline Survey Report • AJ&K Climate Change Policy 2017 • Water, Sanitation & Hygiene (WASH) in Public Sector Schools Strategic Plan for Balochistan • 2017 – 2022 • Sustainable groundwater management in Balochistan-PCRWR • Punjab Drinking Water and Sanitation Policy (2019) • Integrated water resource management strategy (KPK) • Punjab Spatial Strategy 2047 • Water, Sanitation & Hygiene (WASH) in Public Sector Schools Strategic Plan for Sindh ○ 2022 • Punjab water, sanitation and hygiene sector status report 2019 • Drinking water sanitation and hygiene Punjab Sector Development Plan 2014-2024

	• Sindh Water Policy 2023 • Sindh Agriculture Policy 2018-2030 • Sindh Strategic Sectoral Plan 2016–2026 Drinking Water, Sanitation and Hygiene • Integrated water resource management- Gov of KPK • KPK climate change policy 2022 • KPK climate change action plan • KPK Drinking Water Policy • KPK Hydropower Policy 2016 • Hydro Power Potential And Investment Prospects In GilgitBaltistan- Portal Of GB Gov
International Commitments and Multilateral Agreements	• Pakistan NDC 2021 • International Covenant on Economic, Social and • Cultural Rights • United Nations Framework Convention on Climate Change • SDGs and MDGs • Islamabad Declaration
Technical Guidelines and/or manuals	• Guidelines for Climate • Proofing Investment in the • Water Sector
	• Climate Change adaptation technologies for water: • guide to adaptation technologies for increased water sector resilience Technologies for climate change adaptation: Water sector • Water sector climate change adaptation guidance note or guidebook • Handbook on Climate adaptation in the water sector • UNEPCCC Technological Need Assessment for climate change • FAO Water availability, use and challenges in Pakistan • World Bank: Pakistan Water Sector Performance • Water and Sanitation Sector Analysis of Azad Jammu and Kashmir - Baseline Survey • WASH KAP Baseline Survey Report (RUSFAD: Phase-III)

	• Water Security in Pakistan: Issues and Challenges • Running on Empty: Pakistan's Water Crisis • Water Policy Reform in Pakistan • PCRWR Annual Reports
Reports	• Water Security in Pakistan by UNDP • WASH and NDC Policy Brief by UNICEF • When Water Becomes a Hazard: A Diagnostic Report on The State of Water Supply, Sanitation and Poverty in Pakistan • School WASH Research: Pakistan Country Report by WaterAid • UNICEF Pakistan Country Report 2022 • WASH Pakistan Endline Evaluation • Technologies for Climate Change Adaptation by IRC • Application of ICTs for climate change adaptation • in the water sector by IDRC
Journal articles	• Water Crisis in Pakistan • Water Crisis in Pakistan and Way Forward • WASH Situation in Primary Schools in • Pakistan • Water Sanitation Problem in Pakistan: A review on disease prevalence • A Policy Assessment of Punjab Water Act 2019
Past and/or current projects	• WASH data system by WaterAid Transforming • the Indus • Basin with Climate Resilient Agriculture and Water Management by • GCF • Oasis Box by Solar Water Project

Waste (Supporting document for Key Discussion 2) Waste

Document Type	Title

National Policies and plans/ manuals or guidelines	• Climate Change Policy 2021 • National Clean Air Policy 2023 • National Climate • Resilience and Adaptation Plan 2023-30 • National Action Plan on • SDG 12
Waste specific and other sectoral policies and plans	• National Hazardous Waste Management Policy • 2023 • Alternative and • Renewable Energy • Policy 2019
Provincial policies and plans	• Provincial • Environmental • Protection Acts • Sindh Sanitation Policy • Punjab Solid Waste Management Policy • Sindh Climate Change Policy • SEPA Action Plan • Sindh Waste to Energy Policy 2021 • Khyber Pakhtunkhwa Climate Change Policy • Punjab Provincial • Climate Change Action Plan • Punjab Climate Change • Policy (Internal Draft) • Punjab Clean Air Policy and Action Plan • Punjab E-Waste Management Plan • Prohibition of Non-Biodegradable Plastic Products and Regulation of Oxo-Biodegradable Plastic Products Rules 2017

	• Gilgit-Baltistan Climate Change Strategy and Action Plan 2017 • Punjab Industrial Policy 2018 • Punjab Sanitation Policy: Draft 2015 • Punjab Hospital Waste Management Rules 2014 • Plastic Management Strategy Punjab 2023 • Punjab Agriculture Policy 2018 • Balochistan Environment Act 2012
International Commitments and Multilateral Agreements	• Pakistan NDC 2021 • United Nations Framework Convention on Climate Change SDG and MDG

Technical Guidelines and/or manuals	• Technology factsheet for adaptation • Guideline on climate change mainstreaming into waste sector policies
Reports	• Pakistan Biennale Update Report • Technology Needs • Assessment for Climate • Change Adaptation by • MoCC • Solid Waste • Management Sector in • Pakistan by Asian • Development Bank • Waste Management in Pakistan by SwitchAsia • Rethinking Pakistan's • Relationship with • Plastics by UNDP • Waste Sector Inclusion in Revised NDC of Pakistan ADB Brief

	• KOICA-WB Joint study • on solid waste • management in Punjab, Pakistan • Technology for • adaptation to climate change by UNFCCC • Punjab's State of Environment Report • Waste Management & Waste-to-Energy; Projects and Policy Research Department • Pakistan: Sustainable Waste Management in Mountain Areas • Pakistan: Khyber Pakhtunkhwa Cities Improvement Project • Punjab Growth Strategy 2023
Journal Articles	• Assessment of Solid • Waste Management • System in Pakistan • Current practices and futuristic options in plastic waste management in Pakistan • Emission Profile of Waste Sector in Pakistan • Green technology approach to solid waste management • Waste as a resource for Pakistan • Feasibility of municipal solid waste for energy generation and its existing management practices in Pakistan • Municipal Solid Waste Management in Skardu: Current Status, and Corrective Measure
Past or present projects	• Waste to Energy Project in Lahore

Questionnaire-Key Discussion 2

- Existing technology mapping or feasibility documents
- Plans for Inclusive Development

Name

Your role/job title _____

Province Department _____

Please note the role/mandate of your department _____

Does any water sub-sector (e.g. agriculture, industry) or water-related services fall under your department's mandate? _____

Does any waste sub-sector or waste-related services fall under your department's mandate? _____

Existing technology mapping or feasibility documents

1. What is the existing technological landscape for water resource management/waste management?

2. Are there comprehensive technology mapping or feasibility documents for waste/water sectors? Please list.

3. Are there technologies that have proven effective in addressing both waste and water management challenges?

Plans for Inclusive Development

4. What policies, plans, or strategies do you have in place to ensure inclusive development?

*Note: Please inform the progress and challenges concerning gender mainstreaming, youth engagement, and including marginalized/vulnerable group

Policies, plans, or strategies	Actions & Progress	Challenges and constraints in achieving objectives

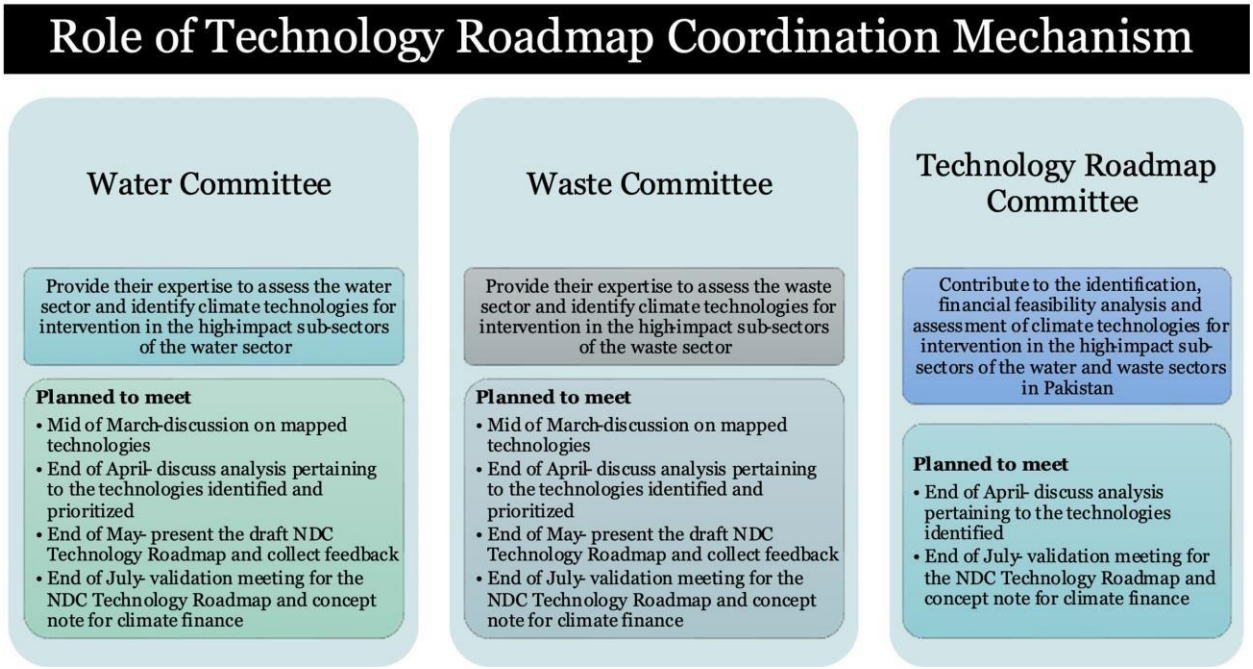
5. Do you think these directives are sufficient to cope with the challenges of current water scarcity resulting in gender pressure amid climate change?

6. How is women's participation ensured when designing new projects or forming a policy?

7. Is the budgeting done by the department gender sensitive? Is the involvement of women from every background and socioeconomic status in the policy-making process ensured?

8. Are gender-specific targets part of the fund application process in the public sector? Do you seek out funding where gender-specific problems can be addressed?

4. Annex IV -Key Discussion 3



Composition: Water Technical Committee

Federal	
Government	**Think tanks/academia/Civil Society**

• Ministry of National Health Services Regulations and Coordination, • Ministry of Water Resources • Chairman, Federal Flood Commission, Islamabad • Chairman, National Disaster Management Authority (NDMA), Islamabad • Ministry of National Health Services • Ministry of Climate Change and Environmental Coordination • Director General, Pakistan Environmental Protection Agency (Pak-EPA), Islamabad • Ministry of Planning, Development and Special Initiatives • Secretary, Ministry of National Food Security and Research, Islamabad	• Pakistan Council of Research in Water Resources (PCRWR) • Hisaar foundation • Pakistan Agricultural Research Council • Climate Energy and Water Research Institute • UN Habitat • WASH Specialist, UNICEF • WWF • WASH Sector Adviser, Welthungerhilfe Pakistan
Provincial and Administered Regions	

Sindh	
Government	**Think tank/academia**
• Climate Change & Coastal Development, Directorate of Climate Change (DoCC) • Environment & Climate Change P&D Board • Karachi Water Sewerage Board (KWSB) • Hyderabad Water and Sanitation Agency (HWASA) • Planning and Development, (P&D) Sindh • Health Department, Karachi • Irrigation Department • Sindh Irrigation and Drainage Authority • Public Health Engineering and Rural Development Department (PHEDRD), Sindh • Local Government and Rural Department (LG&RD) Sindh	• US Pakistan Center for Advanced Studies in Water, Jamshoro • Hisaar Foundation ● NED
Khyber Pakhtunkhwa	
Government	**Think tank/academia**

• Environment Protection Agency, Khyber Pakhtunkhwa. • Local Government and Rural Department (LG&RD) KPK • Public Health Engineering Department (PHED), KPK • Planning and Development, (P&D) KPK • Water and Sanitation Services Companies • Irrigation Department, Government of Khyber Pakhtunkhwa • Health Department, Peshawar, Khyber Pakhtunkhwa • Irrigation and Hydel Power Directorate, FATA Secretariat	• Center for Water Informatics and Climate Resilience, Institute of Management Sciences • Climate Change Cell, SBBW University
Punjab	
Government	**Think tank/academia**

• Director General, Environment Protection Department, Lahore, Punjab • Environment Protection Department P&D board • Secretary, Housing, Urban Development and Public Health Engineering Department (HUD & PHED), Punjab • Secretary, Local Government and Community Development Department (LG&CD) Punjab • Secretary, Irrigation Department, Government of Punjab • Secretary, Planning and Development, (P&D) Punjab • Managing Director, Water and Sanitation Agency (WASA), Lahore • Managing Director, Water and Sanitation Agency (WASA), Faisalabad • Managing Director, Water and Sanitation Agency (WASA), Multan • Managing Director, Water and Sanitation Agency (WASA), Gujranwala • Director General, Health Department, Lahore, Punjab • Chief Executive Officer, Punjab Rural Municipal Services Company	• Urban Unit Health • PCRWR regional office • Institute of Public Engineering and Research
Baluchistan	

Government	Think tank/academia
• Secretary, Public Health Engineering Department (PHED), Balochistan • Secretary, Local Government and Rural Department (LG&RD) Baluchistan • Director General, Health Department, Quetta, Balochistan • Secretary, Planning and Development, (P&D) Balochistan • Environment Protection Agency • Urban Planning and Development Department • Irrigation Department	• PCRWR regional office and • Water, Environment Sanitation Society
Gilgit Baltistan	
Government	**Think tank/academia**
• • Director General, EPA GB, Gilgit-Baltistan, Gilgit. Gilgit • Development Authority • Water and Power Development Department Secretary, Irrigation Sector of Works Department of • Gilgit-Baltistan • Department of Health Secretary, Local Government and Rural Department • (LG&RD) GB Secretary, Planning and Development, (P&D) Gilgit • Baltistan • Secretary, Public Works Department, Gilgit Baltistan • Agriculture, Livestock and Fisheries Department Gilgit Baltistan Disaster Management Authority	• PCRWR regional office • Department of Environmental Science, Karakoram International University Gilgit
AJK	
Government	**Think tank/academia**
• Director General, EPA, Muzaffarabad, AJ&K. • Secretary, Public Health Engineering Department (PHED), AJK • Secretary, Local Government and Rural Department (LG&RD) AJK • Secretary, Planning and Development, (P&D) AJK • Secretary, Irrigation Department Government of AJ&K • Health Department	• Geology Department, University of Azad Jammu & Kashmir • PCRWR regional office

Composition: Waste Technical Committee

Federal	
Government	**Think tanks/academia/Civil Society**
• Ministry of National Health Services Regulations and Coordination, Islamabad • Ministry of Climate Change and Environmental Coordination • Director General, Pakistan Environmental Protection Agency (Pak-EPA), Islamabad • Ministry of Planning, Development and Special Initiatives	• Sustainable Development Policy Institute • Pakistan Institute of Development Economics • Representative, Sustainable Development Policy Institute, Islamabad • Representative, GIZ Pakistan, Islamabad
Provincial and Administered Regions	
Sindh	
Government	**Think tank/academia**
• Sindh Solid Waste Management Board • Karachi Water Sewerage Board (KWSB), Karachi • Hyderabad Water and Sanitation Agency (HWASA) • Health Department, Karachi, Sindh • Planning and Development, (P&D) Sindh • Climate Change & Coastal Development, Directorate of Climate Change (DoCC), Govt. of Sindh • Environment & Climate Change P&D Board • Public Health Engineering and Rural Development Department (PHEDRD), Sindh • Local Government and Rural Department (LG&RD) Sindh	• AltaśPak, Hyderabad • Khan Renewable Energy Ltd • Concern Waste Pvt • Karachi Urban Lab • NED University
Khyber Pakhtunkhwa	
Government	**Think tank/academia**
• KPK Environment Agency, Peshawar, Khyber Pakhtunkhwa Local Government and Rural Department (LG&RD) • Wate Peshawar Waste Management Company Public Health Engineering Department (PHED), KPK Planning and Development, (P&D) KPK Health Department, Peshawar, Khyber Pakhtunkhwa r and Sanitation Services Companies	• Climate Change Cell, SBBW University • Peshawar Clean Air Alliance

Punjab	
Government	**Think tank/academia**
• Environment Protection Department, Lahore, Punjab • Environment Protection Department P&D board • Housing, Urban Development and Public Health Engineering Department (HUD & PHED), Punjab • Local Government and Community Development Department (LG&CD) Punjab • Planning and Development, (P&D) Punjab • Water and Sanitation Agency (WASA), Lahore • Water and Sanitation Agency (WASA), Faisalabad • Water and Sanitation Agency (WASA), Multan • Water and Sanitation Agency (WASA), Gujranwala • Health Department, Lahore, Punjab • Punjab Rural Municipal Services Company • Multan Waste Management Company, Multan • Sialkot Waste Management Company, Sialkot • Faisalabad Waste Management Company, Faisalabad • Gujranwala Waste Management Company, Gujranwala • Lahore Waste Management Company, Lahore • Bahawalpur Waste Management Company, Bahawalpur • Dera Ghazi Khan Waste Management Company, Dera Ghazi Khan	• Urban Unit blic Health • Sustainable Developm Institute Management • Institute of Engineering and Resea • BioMed Waste Company
Baluchistan	
Government	**Think tank/academia**
• Public Health Engineering Department (PHED), Balochistan • Local Government and Rural Department (LG&RD) Baluchistan • Health Department, Quetta, Balochistan • Planning and Development, (P&D) Balochistan • Metropolitan Corporation Quetta • Environment Protection Agency • Urban Planning and Development Department	• University of Balochistan
Gilgit Baltistan	

Government	Think tank/academia
● EPA GB, Gilgit-Baltistan, Gilgit. ● GB Waste Management Company ● Gilgit Development Authority ● Local Government and Rural Department (LG&RD) GB ● Department of Health ● Gilgit Baltistan Waste Management Company ● Planning and Development, (P&D) Gilgit Baltistan ● Public Works Department, Gilgit Baltistan ● Solid Waste Section of Municipal Administration Gilgit	● Karakoram International University Gilgit
AJK	
Government	**Think tank/academia**
● EPA, Muzaffarabad, AJ&K. ● Public Health Engineering Department (PHED), AJK ● Local Government and Rural Department (LG&RD) AJK ● Planning and Development, (P&D) AJK ● Health Department	● University of Azad Jammu and Kashmir

Composition: Technology Technical Committee

Federal	
Government	**Think tanks/academia/Civil Society**
● Ministry of Science and Technology, Islamabad ● Ministry of Industries & Production, Islamabad ● Ministry of Information Technology and Telecommunication ● Ministry of Climate Change and Environmental Coordination ● Pakistan Environmental Protection Agency (Pak-EPA), Islamabad ● Ministry of Planning, Development and Special Initiatives ● Global Change Impact Studies Centre (GCISC), Islamabad ● Ministry of Poverty Alleviation and Social Safety	● Pakistan Council of Renewable Energy Technologies (PCRET) ● Pakistan Council of Scientific & Industrial Research (PCSIR) ● COMSATS ● International Islamic University ● Unilever ● PepsiCo ● School of Social Sciences and Humanities (S3H), NUST
Provincial and Administered Regions	

Sindh	
Government	**Think tank/academia**
● Information, Science & Technology Department, Sindh ● Climate Change & Coastal Development, Directorate of Climate Change (DoCC), Govt. of Sindh ● Environment & Climate Change P&D Board ● Planning and Development, (P&D) Sindh ● Environment and Alternative Energy Department, Karachi, Sindh ● Industries and Commerce Department ● Social Welfare Department, Sindh	● NED Engineering and Technology Department ● Sindh Institute of Management and Technology ● Mehran University of Engineering and Technology ● IBA Institute of Emerging Technologies
Khyber Pakhtunkhwa	
Government	**Think tank/academia**
● Industries, Commerce and Technical Education Department ● Environment Agency, Peshawar, Khyber Pakhtunkhwa ● Planning and Development, (P&D) KPK ● Science & Technology and Information technology Department, KPK ● Social Welfare Department, KPK	● Pak-Austria Institute of Applied Sciences and Technology ● Technology department GIKI ● Kohat University of Science and Technology
Punjab	
Government	**Think tank/academia**
● Environment Protection Department P&D board ● Environment Protection Department, Lahore, Punjab ● Information Technology Department ● Planning and Development, (P&D) Punjab ● Industries, Commerce, Investment and Skill Development Department ● Planning and Development, (P&D) Punjab ● Social Welfare Department, Punjab	● AGAHE ● Lahore Institute of Science and Technology ● Centre for Water Informatics and Technology LUMS ● Department of Technology University of Lahore ● Pakistan Institute of Development Economics ● Lahore Institute of Science and Technology
Baluchistan	

Government	Think tank/academia
● Industries and Commerce Department ● Environment Protection Agency ● Planning and Development, (P&D) Balochistan ● Science and Information Technology Department, Balochistan ● Environment, Sports & Youth Affairs, Quetta, Balochistan ● Social Welfare Department, Balochistan	● Representative, Balochistan University of Information Technology, Engineering and Management Sciences ● Balochistan Institute of Technology
Gilgit Baltistan	
Government	**Think tank/academia**
● EPA GB, Gilgit-Baltistan, Gilgit. ● Information Technology Department ● Planning and Development, (P&D) Gilgit Baltistan ● Department of Industries, Commerce and Labor ● Social Welfare Department, GB	● Karakoram International University Gilgit ● COMSATS Institute of Information Technology
AJK	
Government	**Think tank/academia**
● Planning and Development, (P&D) AJK ● EPA, Muzaffarabad, AJ&K. ● Industries and Commerce Department ● AJ&K Information Technology Board ● Social Welfare Department, AJK	● University of Azad Jammu and Kashmir ● University of Modern Science ● Mirpur University of Science and Technology

5. Annex- V- Attendance Sheet

S. No	Name	Sector	Designation & Institution	Gender
1.	Muhammad Younas	Private	AWF (Pvt) Ltd.	Male
2.	Abdul Saboor	Private	AWF (Pvt) Ltd.	Male
3.	Asif Hussain	Government	Section Officer Works Dept, GB	Male
4.	Engr. Sherin Khan	Government	XEN/Irrigation, KPK	Male
5.	Engr. Faraz Ahmad	Development Organization	IRC	Male
6.	M. Naqqash Kadeer	Private	Manager, Landfill/ Gujranwala Waste Management Company	Male
7.	Qurat-ul-Ain Ahmad	Government	MoCC – GCISC	Female
8.	Fayyaz Salih Hussain	Government	Assistant Director SEDA	Male
9.	Dr. Sardar Muhammad Rafique Khan	Government	DD, EPA-AJ&K	Male
10.	Javeria Iqbal Malik	Private	AWF (Pvt) Ltd.	Female
11.	M. Ali Durrani	Government	NDRMF	Male
12.	Dr. Bahadar Nawab Khattak	Private	COMSATS UNI Abbottabad	Male
13.	Shahnawaz Arif	Development Organization	Advocacy Coordination, WHH	Male
14.	Syed Safi Pirzada	Development Organization	Sr. Manager Program Development, Islamic Relief	Male
15.	Sohail Ahmed	Development Organization	Sr. Program Officer, Humanitarian	Male
16.	Irfan Parvez	Government	D.D Environment Specialist (PPIB)	Male

17.	Hamid R. Afridi	Government	PPAF Specialist Green Growth & Climate Change	Male
18.	Hameed Ullah	Development Organization	Welt Hunger Hilfe	Male
19.	Mumtaz Ali	Government	DD, EPA - KPK	Male

20.	Engr. Summera Fakhir Khan	Private	Lecturer, CME/UNESCO Chair at COMSATS WAH Campus	Female Male
21.	Rizwan Ali	Government	Assistant Chief (Env. & CC)/P&D Board Punjab	Male
22.	Atta ur Rehman	Development Organization 56	ISET - PK	Male

23.	Tayyab Suhail	Government	A.D (Tech), Ministry of Water Resources	Male
24.	Sanam Zafar	Government	AD, Planning & Development Deptt. Gilgit-Baltistan (GB)	Female
25.	Kiran Anwaar	Government	Dir., PCRWR	Female
26.	Akram Aziz	Government	Dy. Dir., PCRWR	Male
27.	S. Tahreem Zeeshan	Private	Finance-GGC	Female
28.	Engr. Altaf Hussain	Government	Assistant Manager (SDG), Engineering Development Board (EDB), Ministry of Industries and Production	Male
29.	Zafar Iqbal	Government	SE (Floods) FFC, MoWR	Male
30.	Niazullah Khan	Private	Consultant	Male
31.	Ghufran	Private	WASH Facilitation Officer	Male

32.	Abul Hassan	Private	Admin & Finance	Male
33.	Iftikhar Alam	Government	LG, KPK	Male
34.	Binyameen	Government	DCP, Dir (EPA/MoN.), PAK-EPA ISD	Male
35.	Mirza Karim	Government	Deputy Director, LG & RD GilgitBaltistan	Male
36.	Imran Mukhtar	Government	Executive Engineer PHED Muzaffarabad AJ&K	Male
37.	M. Asif	Government	CSO/PBS	Male
38.	Liaqat Ali	Government	CSO/PBS	Male
39.	Hafsa Anwar	Government	Statistic Officer/PBS	Female
40.	Dr. Naheed Raja	Government	Dir., MoWR	Female
41.	Raja Zulqarnain	Government	Deputy Dir., LG&RD, AJK	Male
42.	Zaheer Khattak	Development Organization	URDO	Male

43.	M. Dawood	Development Organization	UNESCO	Male
44.	Ahsanullah	Government	Assistant Design Expert, PHED Punjab	Male
45.	Syed Mohsin Abbas	Government	Inspector Environment Recp.	Male
46.	Muhammad Abbas	Private	Student	Male
47.	Muhammad Ramzan	Government	PNR – DIV	Male
48.	Dr. Nasir Javed	Private	Consultant	Male

49.	Naveed A. Cheema	Private	AS, Fauji Cement	Male
50.	Faheem Ashraf	Private	ZENS Energy	Male
51.	Henro Takahesh	Development Organization	UNICEF	Male
52.	Dr. Abdullah	Government	PIDE	Male
53.	Engr. M. Hamza Ashad	Government	PARC	Male
54.	Dr. Chunpir Hashim	Development Organization	GIZ	Male
55.	M. Amjad	Development Organization	Snr. Scientific Officer, GCISC	Male
56.	Syed Arshad Hussain Shah	Government	DG (J) Irrigation Deptt. Govt. of Balochistan	Male
57.	Muhammad Umar	Government	DRR Technical Advisor	Male
58.	Tanveer Rahim	Government	D.S (Development) P.H.E.D	Male
59.	Fayyaz Salih Hussain	Government	Assistant Director Sindh FDA	Male
60.	Sikandar Ali Shito	Government	Chief Engineer (OEM/PHED)	Male
61.	Samreen Liaqat	Government	Scientific Officer, GB-EPA	Female
62.	Manahal Fatima	Private	Manager Programmes, AWF (Pvt) Ltd	Female
63.	M. Arif	Government	Environmental Specialist, Ministry of Water Resources	Male
64.	Uzair Naqvi	Government	Environmental Geologist, AJ&K PDO	Male
65.	Hamza Arshad	Private	GGC Research	Male

66.	Syed Kumail Abbas	Private	GGC (Research)	Male
67.	Mubarak Ali Sarwar	NGO	C.E.O, AGAHE	Male
68.	Hafsa Rizwan	Private	Pvt Consultant	Female
69.	M. Azfar Abbas	Government	DD, NDMA	Male
70.	Umer Zia	NGO	RA, AGAHE	Male
71.	Hussain Kamran	Government	PRMSC, GoPB	Male
72.	Ijlal Hussain	Government	AD, LG&RD, Gilgit-Baltistan	male
73.	Saddiq		Islamic Relief	Male
74.	Sajjad	Government	MD, NEECA	Male

75.	Zeeshan Ullah	Government	Director Building, NEECA	Male
76.	Dr. Arshad Ashraf	Government	PSO, NARC/PARC	Male
77.	Umera Ali	Government	PSO, NARC/PARC	Female
78.	Zkiya Rubab	Government	MoCC & EC	Female
79.	Shafiq-ur-Rehman	Development Organization	AWFCO	Male
80.	Susano Loidies	Development Organization	UNOPS	Female
81.	Dr. Ejaz Ahmed Ghalloo	Government	CEO, Health RwP. Behalf of DG. Health	Male
82.	Faisal	Private	LUMS	Male

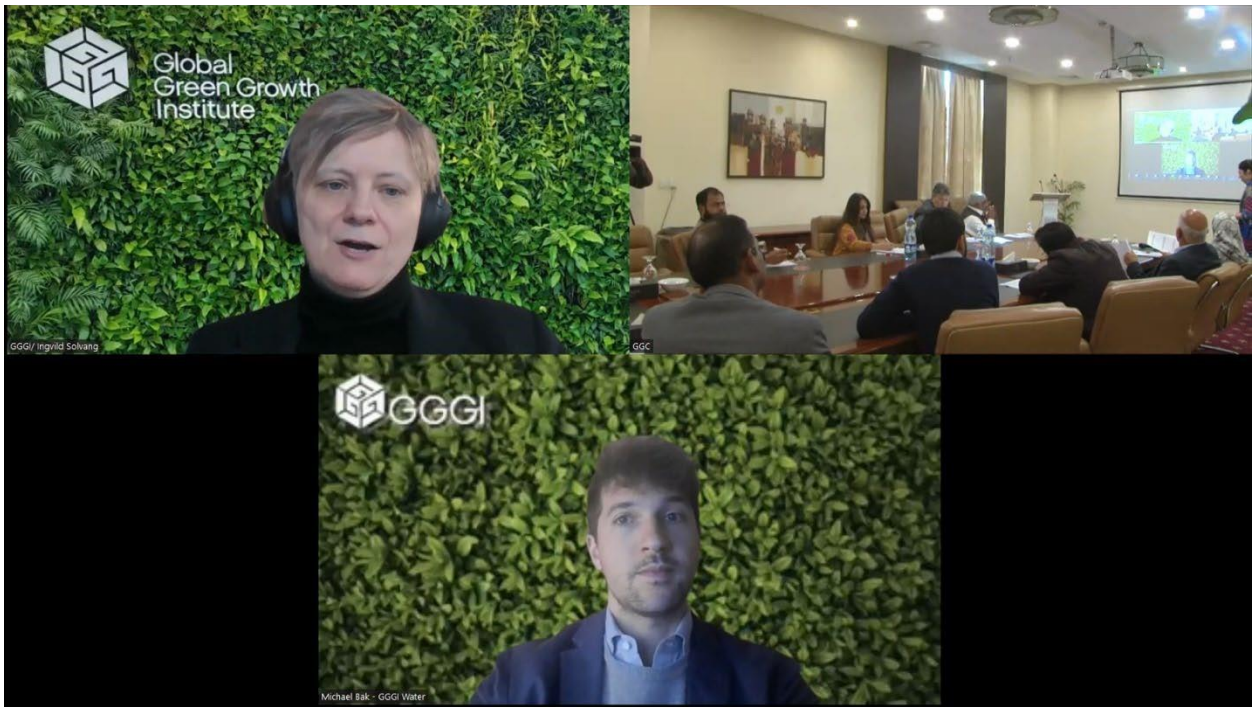
83.	Zaid Bin Murad	Development Organization	AWF	Male
84.	Aisha Jaushea	Development Organization	WHO	Female
85.	Muhammad Asad	Government	Admin & Finance Officer, MoCC	Male
86.	M. Waqas Tahir	NGO	PM, AGAHE	Male
87.	Syed Shahneel Hassan	Government	Coordination Expert, MoCC	Male
88.	Obaid-ur-Rehman	Government	Assistant, MoCC	Male
89.	Shahbaz Ali	Government	Assistant, MoCC	Male
90.	Sama Zulfiqar	Development Organization	Project Coord. ADPC	Female
91.	Sajid Naeem	Development Organization	ADPC – Country Representative	Male
92.	Kashif Hussain	Government	NHW – A&FC	Male
93.	Asim Saleem	Private	Meraj Corps	Male
94.	Touqeer Abbasi	Development Organization	UNOPS	Male
95.	Dr. Khalid Farooq	Government	CSO – PBS	Male
96.	Saleem Shamsi	Government	ED, SPU / NDMA	Male
97.	Syed Kiyani	Private	SMD	Male
98.	Abdul Wahab	Government	IT / CC	Male
99.	Saqib Ameer	Government	IT / MoCC	Male
100.	Ahsan Ghalib	Government	IT / MoCC	Male

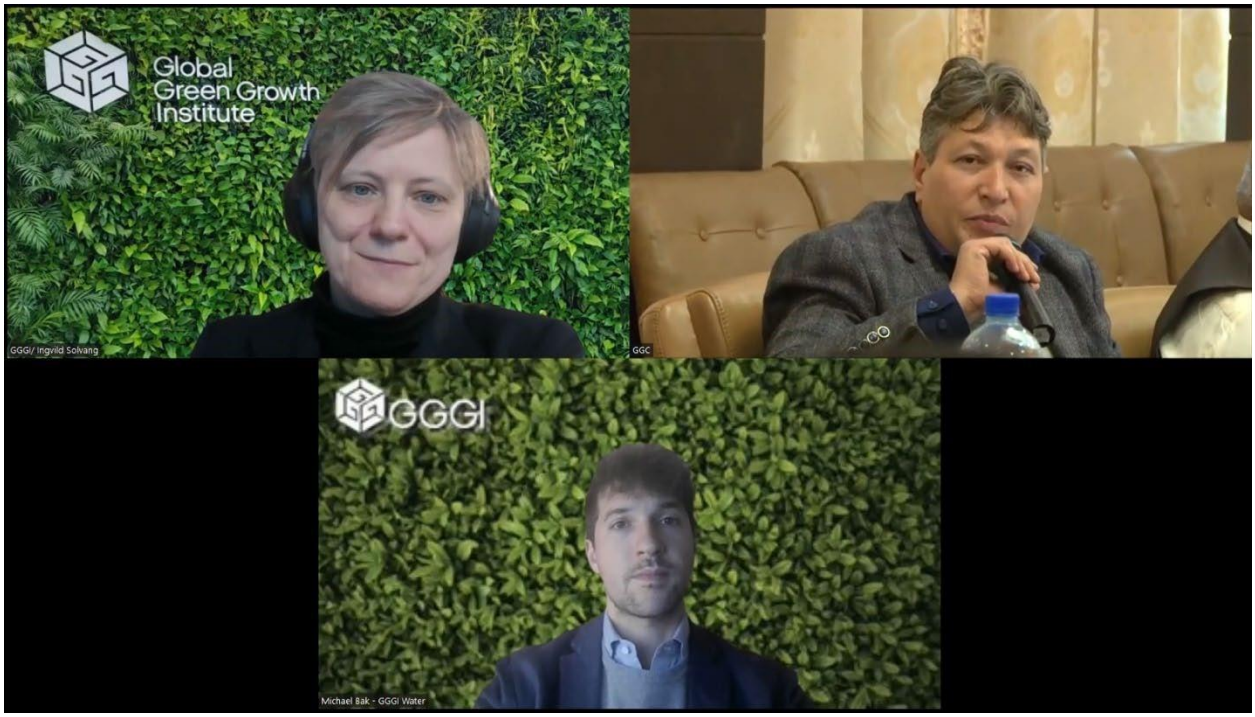
6. Annex VI- Pictures


GGC
Technology Roadmap for NDC Implementa
in the Waste and Water Sectors


National Guidelines for Water Safety Planning
1
Current Drinking Water Management
2
Rationales and scope of guidelines
3
Overview of the draft Guidelines
4
Conclusion and Next Step


Ministry of Climate Change and Environmental Coordination
UN environment programme
CTCN
GGGI
GGC
Green Growth Consultants
National Kick off for Technology Implementation Plan for Waste and Water Sector
22 February 2024
Islamabad, Pakistan
6 CLEAN WATER AND SANITATION
13 CLIMATE ACTION


Global Green Growth Institute
GGGI/ Ingvild Solvang
GGC
GGGI
Michael Bak - GGGI Water


Global
Green Growth
Institute
GGGI/ Ingvild Solvang
GGC
GGGI
Michael Bak - GGGI Water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