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Civil Society Coalition for Climate Change (CSCCC)

CSCCC provides a networking platform for civil society organizations, climate experts, academia, researchers, media, private sector and concerned citizens to exchange ideas and build synergies while preserving and strengthening the autonomy and independence of its members. The coalition approach was adopted to enhance civil society capacity for effective engagement with policy makers to support mitigation and adaptation actions that build resilience and reduce vulnerability at all levels by integrating adaptation into relevant socio-economic and environmental policies for sustainable development. The concept of the coalition is in line with the Lima-Paris Action Agenda (LPAA) and Paris Agreement on Climate Change which recognizes civil society as a key player in framing climate policies to strengthen climate governance. The strategic focus of the coalition also covers Agenda 2030 for Sustainable Development particularly SDG13 (Climate Action). CSCCC works with "A Whole of Government Approach" and follows the guidelines of "Open Government Partnership (OGP)" to achieve its objectives.

The Civil Society Civil Society Coalition for Climate Change (CSCCC) is a licensed Coalition (registered under Section 42 of the Companies Ordinance, 1984) dedicated to highlighting the subject of climate change in Pakistan and influencing policymaking at the regional, national and subnational levels through research, knowledge-sharing, and advocacy.

CSCCC PARTNERS

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EXECUTIVE SUMMARY

The National Water Policy (NWP) approved by the Council of Common Interests in April 2018, awards the provinces a significant role in setting the direction for, and the actual implementation of the Policy. Given that irrigation, agriculture, rural and urban water supply, environment and other sub-sectors are provincial subjects, the preamble of NWP states, 'It is a national framework within which the provinces can develop their master plans for sustainable development and management of water resources'. The Policy calls for the setting of major national targets for the water sector on water conservation, water storage, irrigation, water treatment and drinking water, and states that, 'These targets can be firmed up in consultation with the provincial governments and reviewed periodically for inclusion in the 12th and 13th Five Year Plans and future plans.

The Civil Society Coalition for Climate Change undertook the task of convening water dialogues with a whole of government and civil society approach at the sub national level. The dialogue was designed to assemble stakeholders from the relevant government departments, civil society, academia, private sector and the media to develop a set of recommendations for the provincial Master Plan as stipulated in the NWP to achieve the provincial water targets. The high level plenaries were followed by breakout sessions in which the give broad thematic areas (water storage, water treatment, water conservation, irrigation and drinking water) were addressed by the participants in considerable detail. The key targets, challenges (institutional, technical and practices) and recommendations were compiled by a rapporteur to constitute part of the report.

CSCCCC, with the support of the Water Informatics and Technology Institute, LUMS, and the World Bank, conducted a review of the National Water Policy from the Punjab perspective at the Lahore University of Management Sciences (LUMS) on the 4th of December 2018. The Provincial consultative dialogue, titled 'Pakistan's National Water Policy, Punjab Perspective' comprised of robust representation from stakeholders from the government, private sector, civil society, academia and the media, and students of the host university.

The opening panel consisted of Dr. Syed Muhammad Abu Bakr, Director, Centre fore Water Informatics and Technology, LUMS, who delivered the opening remarks, Aisha Khan, C.E., CSCCC, Syed Babar Ali, Founder, LUMS, and Dr. Ishrat Hussain, who delivered the keynote address and is the current Advisor to the PM on Institutional Reforms with the status of a Federal Minister, and Former Governor State Bank. The Plenary consisted of Dr. Arif Anwar, IWMI, Ahmad Rafay Alam, Environmental Lawyer, and Dr. Mahmood Ahmad, Research Fellow, LUMS.

INTRODUCTION

National Water Policy

Over the past few decades, there has been a drastic change in Pakistan's water profile from being a water abundant country, to one experiencing water stress. While the total amount of available surface water has remained the same, the population increase has reduced per capita water availability from 5000 cubic meters in 1950 to 865 cubic meters in 2018. This places Pakistan not just under the 'water stressed' category of less than 1,600 cubic meters per inhabitant, but also below the 'water scarce' threshold of 1,000 cubic meters per capita. Rapid population growth, water-intensive farming practices, inefficient use and mismanagement, urbanization, increased industrialization, and the growing impacts of climate change are likely to exacerbate the situation.

On April 23, 2018, Pakistan's Council of Common Interests (CCI) adopted a "Water Package" consisting of a 41-page comprehensive National Water Policy (NWP) addressing the entire range of subjects concerning the integrated development and management of the country's freshwater resources and a shorter document called the National Water Charter. The NWP deals with the particular challenges of Pakistan's water resources such as: dependence on a single river basin whose major tributaries originate outside its national borders; the drastic decline in the supply per capita and deterioration in the quality of freshwater; consequent need for all out efforts to enhance water use efficiency and reduce the demands of the main user sectors, especially agriculture which draws upon over 93 percent of the water stock; resolution of inter-provincial disputes over the upper and lower riparian regions; the modernization of water infrastructure; and , above all, mitigation of the negative impacts of climate change most of which relate to the supply of freshwater.

Sub-National Context of the NWP

The NWP from the outset, awards the Provinces a significant role in setting the direction for, and the actual implementation of the policy. In its preamble, the policy states that 'it is a national framework within which the provinces can develop their master plans for sustainable development and management of water resources', given that irrigation, agriculture, rural and urban water supply, environment and other sub sectors are provincial subjects.

Under policy objectives, the document once again highlights that it is a broad framework, and a set of principles for water security on the basis of which provincial governments can formulate their respective Master Plans and projects for **water conservation, water development** and **water management**. In the same section, the NWP calls for the setting of major national targets for the water sector on **water conservation, water storage, irrigation, water treatment and drinking water**, and states that, 'These targets can be firmed up in consultation with the provincial governments and reviewed periodically for inclusion in the 12th and 13th Five Year Plans and future plans '(2.29). The NWP also calls for the provincial governments to formulate detailed policies and guidelines on subjects such as water pricing, drinking water, water quality and water treatment, within the broad parameters of water security as identified by the Policy, and keeping in view the National Environment Policy 2005, the National Sanitation Policy 2006, and the National Drinking Water Policy of 2009. The Policy also suggests that the provincial governments can formulate their own targets for watershed management, aquifer recharge, ground water extraction and drainage as part of their respective Master Plan for Water (28.6).

The NWP can be lauded for recognizing and systematically identifying the role of the provinces in the implementation of the Policy, consistent with the 18th Amendment to the constitution of Pakistan which devolved water related sub sectors to the provinces. While the formulation of the NWP itself was the much needed first step towards ensuring water security for Pakistan, there is an urgent need to initiate the provincial level actions for its implementation. The NWP calls for the formation of a National Water Council (NWC) headed by the Prime Minister of Pakistan, as well as Federal Ministers for Water Resources, Power, Finance, Planning, Development and Reform, Provincial Chief Ministers, Private Sector members from water related disciplines and the

Secretary, Ministry of Water Resources, that will meet annually. One of the functions of the NWC will be to review interprovincial water related projects and activities, and to partake in coordination and planning. The NWC will be supported by a Steering Committee, that will meet bi-annually, to ensure inter provincial coordination, among other functions. In light of this structure, it is crucial for provinces, including government and civil society, to initiate the process of developing targets and activities in line with provincial development agendas.

BACKGROUND & CONTEXT

Increasing stresses on water quality and availability, such as population increase, industrialization, macroeconomic conditions, socioeconomics, pricing etc are being felt throughout the world. The most notable stressor however, is climate change, described by economists as one of the greatest externalities that the world has ever seen. Climate change is not only observed to have impacted the availability of water, but has also led to extreme events that impact the hydrology and life on the planet in increasingly adverse ways. Signatories to the UNFCCC Paris Agreement in 2015 have agreed to work together to limit global warming to up to 2 degrees Celsius compared to pre industrial levels- however, research indicates that a rise in temperature of 1.5 degrees will have extreme consequences, most notably on water. The Intergovernmental Panel on Climate Change (IPCC) Special report (2018) notes that 'climate related risks to health, livelihoods, food security, water supply, human security and economic growth are projected to increase with global warming of 1.5 degrees and increase further with 2 degrees'[1]. The study also notes that limiting global warming to 1.5 degrees may reduce the proportion of the worlds population exposed to water stress by up to 50% (with variability between regions). The study reinforces that idea that countries must aim for higher ambitions to reduce greenhouse gas emissions to further limit warming below 2 degrees to 1.5 degrees- which the current commitments lag far behind in.

The IPCC report also notes robust synergies between 1.5 degree Celsius pathways and the Sustainable Development Goals (SDGs),[2] including goal 6 i.e. 'Ensure access to water and sanitation for all'. The targets aim for increased investment in the management of freshwater ecosystems and sanitation facilities on a local level in several developing countries including South Asia. The targets are shown in Figure 1 below.

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all

6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

6.A By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

6.B Support and strengthen the participation of local communities in improving water and sanitation management

Figure 1: United Nations Sustainable Development Goal 6, 'Ensure access to water and sanitation for all'

[1]IPCC, 2018: Summary for Policymakers. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P. R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.
[2]ibid

The SDGs note that 3 in 10 people lack access to safely managed drinking water services while 6 in ten people lack access to safely managed sanitation facilities. Approximately 70% of all water abstracted from rivers, lakes and aquifers is used for irrigation- and that floods and other water related disasters account for 70% of all deaths related to natural disasters; an alarming figure given that research indicates an increase in the frequency and intensity of such disasters. The SDGs also note the inequalities that are exacerbated by lack of water; women and girls are responsible for water collection in 80% of households without access to water on premises. Both the IPCC Special Report and the SDGs draw strong correlations between access to water and poverty.

In the case of Pakistan, poverty reduction has been coupled with an increase in access to WASH infrastructure. Access to within dwelling improved water increased substantially over the past decade and a half, largely through privately bored hand and mechanized pumps. The percentage of households with latrine facilities also rose significantly, again largely through self-provision- and as a result, the national rate of open defecation plummeted from 29% in 2004/5 to 13% in 2014/15, according to the World Bank[3]. However, the study also finds that access to even basic levels of improved water and sanitation varies widely. Access is much higher in urban areas- the capitals and other major cities in each province. There are also regional disparities in the functionality of piped water supply systems- 58% of connected households have more than 6 hours of water a day in Punjab, while the figure is just 7% in Sindh and 2% in Balochistan[4].

Average annual temperatures throughout South Asia have increased significantly in recent decades, albeit unevenly. Western Afghanistan and South Western Pakistan have experienced the largest increases with annual average temperatures rising by 1 to 1.5 degrees C between 1950 and 2010. Not only will this affect living standards through the impacts on agriculture, closely linked to water, but also through health, migration and other factors that affect economic growth and poverty reduction. There is evidence that precipitation patterns in Pakistan will either become more extreme, causing damage and economic disruption, but will also decrease in the arid areas, resulting in less overall water availability and reduce agricultural yields and water security in some areas. Figure 2 outlines the major climate hotspots within Pakistan and the impact on water availability in vulnerable districts[5].

Predicted Change in Living Standards and Characteristics of Provinces in Pakistan under the Carbon-Intensive Scenario in 2050

Province	Share of households (%)	Change in living standards (%)	Average length of road in (km/10km^2)	Average population density (per km^2)	Travel time to market (hours)	Water availability	Female household head (%)	Agriculture head (%)	Years of education	Electricity (%)
Sindh	25.2	-4.6	0.7	205.1	3.1	0.9	3.9	19.0	6.6	8.0
Punjab	59.0	-2.6	1.7	464.3	2.4	0.9	11.9	26.6	4.9	17.4
Khyber Pakhtunkhwa	12.9	-1.7	0.1	455.6	9.1	0.2	16.5	21.4	4.3	9.2
Balochistan	2.8	-1.3	0.1	79.5	7.1	0.0	0.7	25.2	4.5	5.6
Overall	100	-2.9	1.4	387.0	3.6	0.8	10.2	24.0	5.3	13.6

"Water availability" refers to the ratio of surface water use to groundwater use. A large value is good because it indicates that water use is more likely to be sustainable.

Predicted Change in Living Standards and Characteristics of the Top 10 District Hotspots in Pakistan under the Carbon-Intensive Scenario in 2050

District	Province	Share of households (%)	Change in living standards (%)	Average length of road in (km/10km^2)	Average population density (per km^2)	Travel time to market (hours)	Water availability	Female household head (%)	Agriculture head (%)	Years of education	Electricity (%)
Hyderabad	Sindh	4.3	-6.0	0.0	175.5	3.9	0.4	1.3	31.1	4.5	2.8
Mirpur Khas	Sindh	2.3	-5.7	0.0	151.2	4.6	0.0	2.2	41.8	3.9	1.8
Sukkur	Sindh	6.9	-4.1	0.1	183.0	3.7	0.9	2.7	20.2	6.7	5.8
Larkana	Sindh	11.8	-4.0	1.5	239.2	2.2	1.4	6.0	9.5	7.9	12.3
Bahawapur	Punjab	5.4	-3.2	0.1.	187.8	4.3	0.6	7.8	49.6	2.6	2.6
Faisalabad	Punjab	8.2	-2.8	2.7	581.6	1.6	0.1	11.4	30.4	5.2	7.8
Lahore	Punjab	4.3	-2.7	2.5	1,088.2	1.4	0.4	9.0	21.2	4.5	3.1
Multan	Punjab	8.1	-2.6	0.9	506.7	1.6	0.0	8.4	39.7	3.7	28.6
Dera Ghazi Khan	Punjab	4.9	-2.6	0.5	197.5	3.9	2.3	10.6	35.0	3.2	36.7
Sargodha	Punjab	9.0	-2.5	2.5	232.9	2.4	4.0	10.9	17.8	5.1	15.4
Overall		100	-2.9	1.4	387.0	3.6	0.8	10.2	24.0	5.3	13.6

"Water availability" refers to the ratio of surface water use to groundwater use. A large value is good because it indicates that water use is more likely to be sustainable.

Figure 2: World Bank, 2018

[3]Mansuri, Ghazala; Sami, Mohammad Farhanullah; Ali, Muhammad; Doan, Hang Thi Thu; Javed, Bilal; Pandey, Priyanka. 2018. *When Water Becomes a Hazard : A Diagnostic Report on The State of Water Supply, Sanitation and Poverty in Pakistan and Its Impact on Child Stunting (English)*. WASH Poverty Diagnostic Series. Washington, D.C. : World Bank Group.

[4]ibid

[5]*"Mani, Muthukumara; Bandyopadhyay, Sushenjit; Chonabayashi, Shun; Markandya, Anil; Mosier, Thomas. 2018. South Asia's Hotspots : Impacts of Temperature and Precipitation Changes on Living Standards. South Asia Development Matters;. Washington, DC: World Bank. © World Bank. https://openknowledge.worldbank.org/handle/10986/28723 License: CC BY 3.0 IGO."*

As well as a National Climate Change Policy (2012), Disaster Risk Reduction Policy (2014), the Government of Pakistan, Council of Common Interests in April 2018 approved the country's first National Water Policy, to address the looming water challenge. Within a month of the policy's approval, the Civil Society Coalition for Climate Change , with support from the Hashoo Foundation, conducted a comprehensive stakeholder review of the policy at a national level, convening stakeholders from government, academia, civil society, and the media. Key messages and recommendations from each interactive panel are shown in Figure 3 below.

Water Governance

- Run of the river projects should also be included alongside large dams to help in regulating and calibrating flows during heavy and low flow periods.
- Allocation of water at trans-boundary levels, between upper and lower riparian provinces need to be addressed explicitly and consensus reached.
- Difficult decisions need to be made around the subjects of allocation of scarce water resources for food, energy security, industrial needs, drinking water supplies, preserving habitats, ecosystems, biodiversity and prevention of sea water intrusion.
- Another difficult decision is the required balance between financial returns per cubic meter of water and the human needs for drinking, and possibly, basic sanitation.
- Over mining and pollution of aquifers is a serious challenge facing Pakistan, particularly in Punjab, which needs to be addressed.
- A plan needs to be developed to address fundamental issues: (i) Reduction in population growth rate; (ii) Change in cropping patterns; (iii) Reduction and elimination of water intensive industries; and (iv) Prevention mechanism for water losses.
- Based on experience of water management to date, replicate successful actions, avoid failed approaches and incorporate best practices.
- The proposed system needs to be decentralized to an extent that allows for decisions to be made in a timely manner.
- The roles and responsibilities of formal Institutions and organizations must be clearly defined to eliminate rivalries and unnecessary competition.
- Water governance must be depoliticized and influence of the powerful reduced to remove enabling conditions for elite capture of resources and allow for equitable sharing of resources

Water Management

- The NWP must take into consideration current research, particularly the work of CSOs.
- Policy decisions should be based on available research and concomitant efforts made to collect more info on issues where insufficient data impedes informed decision making.
- Since water is a provincial subject, the NWP, developed at the federal level must ensure harmonization in implementation with a high level of inter provincial coordination.
- The unsustainable population growth rate is the true determinant of ever decreasing per capita availability of water, and needs to be highlighted as a key factor in the NWP.
- For effective implementation, the NWP needs to clearly set out the 'when, where and how' of achieving its goals, as well as identifying the institutions that need to do this.
- Avoid delays in decision making to prevent cost escalations.
- The NWP Implementation plan must identify the 10 most vulnerable districts and begin work on implementation immediately, in consultation with the stakeholders.
- In order to create water provision for the China Pakistan Economic Corridor projects, the NWP must budget an appropriate percentage of domestic water for energy projects.
- Quality and access to water must be prioritized as key concerns in the NWP.
- A regulatory framework for abstraction and use of water for domestic as well as agriculture and industry, particularly for energy generation from coal and solar sources should be put in place.
- There is a need to shift from the approach of treating water as a commodity to making it – at least for drinking and basic sanitation - a human rights concern.

Figure 3

Transboundary water issues and future concerns

- Reaffirmation of the Indus Water Treaty. Engage India in a dialogue under the Treaty to address the role of the Permanent Indus Commission and the dispute avoidance and settlement mechanism as well as the Treaty's provisions regarding exchange of information and data and future cooperation.
- All issues of common concern which were not addressed by the IWT such as ensuring the sustainability of the entire Indus Basin through improved watershed management; the protection and preservation of the sustainability of the trans-boundary aquifers; joint studies on the effects of construction of cascades of hydropower projects on the western rivers on the ecology, economy and livelihoods in the lower catchment , and, above all, measures to adapt to the multiple negative effects of climate change on the water resources of the Indus Basin, should be discussed.
- Pakistan should enter into a dialogue with Afghanistan on the joint, cooperative development and management of the waters of the Kabul River Basin in collaboration with friendly third countries and international organizations for benefit sharing.

Figure 3

General Recommendations

- The civil society should have been taken on board during its development phase. The development of the Action Plans and Implementation Plans for the NWP now must engage civil society and other stakeholders in a meaningful and structured manner.
- While the NWP has been successful in bringing consensus among the federal and provincial governments, there are concerns about gaps and lack of clarity. Water problems, solutions, targets and priorities have not come out clearly and require more explicit formulations.
- While the second chapter of the NWP lists priorities, the nature of the priorities and clarity on the prioritization of one aspect of water over the other is necessary.
- Pakistan is a signatory to the SDGs that also address water issues in Goal no.6. The targets of SDG 6 can be mapped on to the NWP and synergies built between the two frameworks.
- There is a great deal of emphasis in the NWP on coordination; however, there is a need for analysis of why coordination in the past was unsuccessful, between institutions mandated with specific responsibilities.
- Farmers associations need to be restructured to ensure that representation is broad based, inclusive, participatory and empowered with legal safeguards to prevent intimidation and building capacity of stakeholders for playing a meaningful role.
- There is a strong need for regulating groundwater use, protecting it, providing stewardship and monitoring it to ensure that it is used in an efficient, sustainable and equitable manner.
- The NWP needs to establish precise targets for the priority areas of water uses identified in the policy.

Demographic Profile of Punjab

The Punjab is Pakistan's second largest province by area after Balochistan, and with a population of 110,012,442 in 2017, is its most populous province. The capital city of Punjab is Lahore. The province is divided into 9 divisions, with a total of 36 districts. These are further divided into 145 Tehsils. The population of Punjab increased 5 times in the last 60 years, and may reach an estimated 188 million by 2050. A majority of the population of Punjab is under 30 years of age, corresponding with the rest of country.

Of Punjab's 110 million inhabitants, 40 million are classified 'urban' while 70 million are classified 'rural'. The average population density is recorded at 536 persons per sq. km, making Punjab one of South Asia's most urbanized regions where approximately 40% of the populace resides in urban areas.

Agriculture is the basis of economic growth and development in Punjab, as the sector (including livestock) contributes a quarter of Punjab's GDP, while employing a large portion of its workforce, and contributing a large share to national export earnings and food security. This has been due to the world's largest integrated gravity flow irrigation system being in Punjab, along with climate conditions that are conducive to agricultural production. However, according to the Punjab Growth Strategy (2018), the last twenty years have seen a declining share of agriculture in provincial growth from 31% to 20%, while the manufacturing sector contribution increased from 20 to 24%. Overall, the services sector has taken the lead by contributing almost 56% to provincial output.

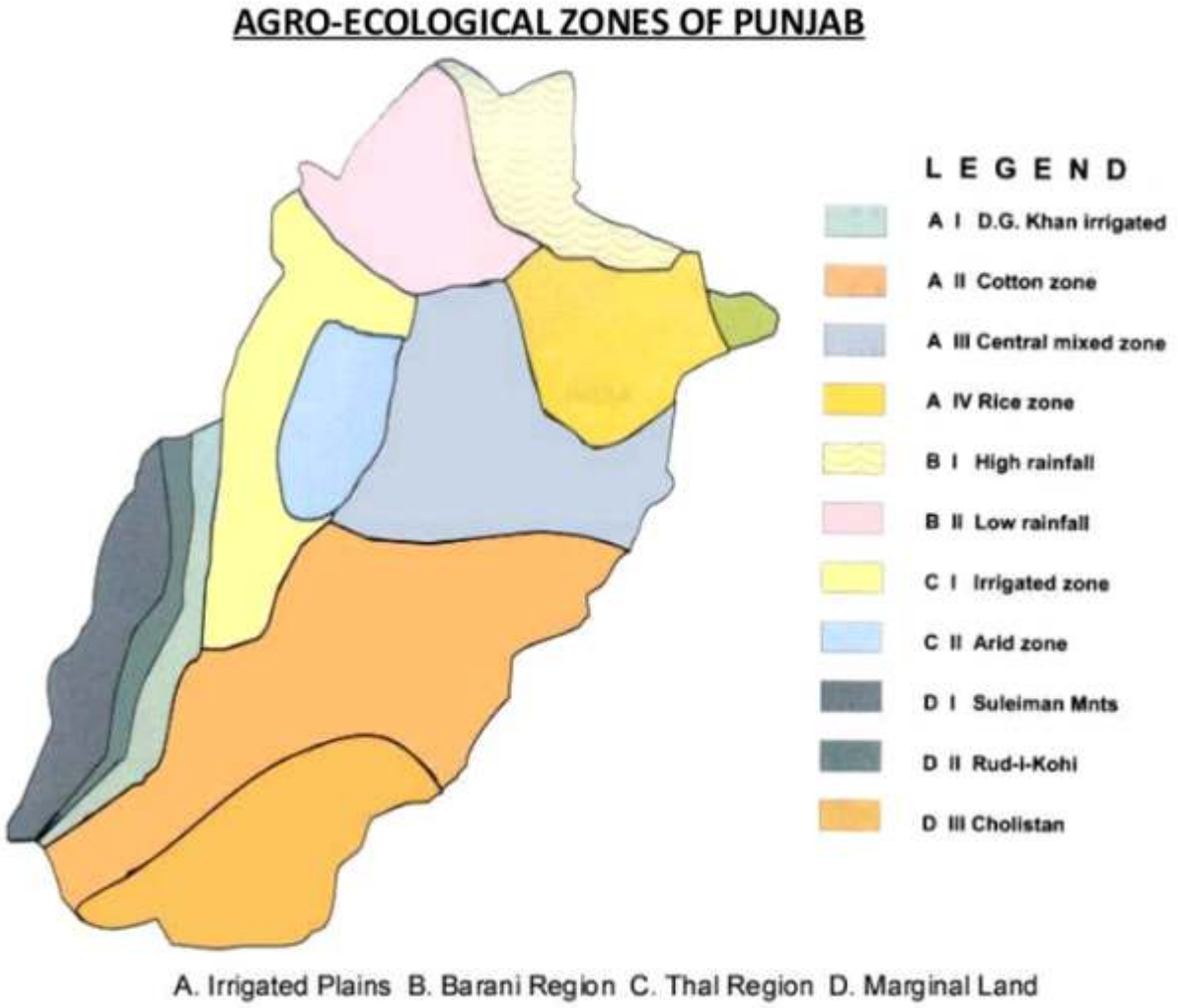

Figure 4: Source: P.A.R.C

Punjab's landscape is characterized by fertile alluvial plains, owing to the Indus river and its four major tributaries – Jhelum, Chenab, Ravi and Sutlej, which traverse the province from north to south. The province also includes mountainous regions, including the Sulaiman Mountains, Margalla Hills and the Salt Range. Deserts can be found in southern Punjab near the border with Rajasthan and near the Sulaiman range, as well as parts of the Thal and Cholistan region. The Pakistan Agricultural Research Council divides the province into four agro ecological zones, as can be seen in Fig.1: Irrigated Plains, Barani Region, Thal Region and Marginal Land.

Climate Profile of Punjab

As the second most urbanized province of Pakistan, with the second largest land mass and the highest population, as well as a varied topography, Punjab is particularly vulnerable to climate change. It retains the status of the 'breadbasket of Pakistan', whereby it contributes 56.1% to 61.5% to the country's agriculture sector, and as much as 76% to annual food grain production, with wheat and cotton as its largest crops. In the last 50 years, the annual mean temperature in Pakistan has increased by roughly 0.5 degrees C, and by the end of the century the annual mean temperature is expected to rise from anywhere between 3 to 5 degrees for a central global emissions scenario (ADB, 2017).

Between 1960 and 2007, there has been an increase of 0.97% in winter temperatures, 0.22% of summer temperatures, and an overall increase of 0.54% in annual mean temperatures. Similarly, Central and Southern Punjab have experienced a 0.63% mean annual precipitation change between 1951 and 2000. Studies indicate that there is some precipitation increase in the summer, and decrease in the winter over most of southern Pakistan, including Punjab. However, the

province is experiencing increasingly erratic monsoon rainfall patterns, which have led to flooding throughout its many districts. At the same time, irregular rainfall patterns have led to acute water shortages in desert areas, making it particularly dire for communities to rely on rain-fed agriculture for their subsistence.

Impact of Climate Change in Punjab

With an economy as heavily reliant on natural resources, climate change will impact all productive sectors of the economy and all social strata in Punjab. Some adverse impacts are already being felt, and have the potential to deter the developmental objectives of Punjab in key priority areas, as listed below.

Agriculture and Livestock

According to Pakistan Bureau of Statistics, 727,404.7 acres or 80.7% of the total land cover of Punjab is under agriculture. While most of the agriculture land is irrigated, variability of precipitation patterns has implications for the flow of water in the main rivers of the province, which feed the canals for agriculture and irrigation purposes. In some pockets of the province, increasingly variability in rainfall will have implications for crop yields and overall productivity.

Livestock plays an important role in the rural economy, contributing about 11.5% to national GDP and 55% to the agriculture sector's share of GDP. Almost 75% of Punjab's rural population is involved in the livestock sector, which buffers crop failure and is more easily saleable. Natural disasters have led to large losses or disease in livestock; droughts in particular have severely reduced grazing zones of the livestock. Increasing temperatures have spawned diseases that break out as epidemics.

Agriculture, land area under cultivation, cropping patterns11 (Punjab) 2013-2014

Trade and Industry

The industrial sector in Punjab contributes 24% to the provincial GDP coming out of 48,000 industrial units which employ 23% of the province's labour force. Many of the industries are linked directly or indirectly to agriculture. As climate change wears away physical infrastructure including electricity transmission lines and road networks, and disrupting economic supply chains, the resilience of the industry is put under strain. One of the biggest challenges faced by industry is inadequate energy and power supply.

Environment, Water Resources and Forestry

As Pakistan races towards the water-stressed status, there has not been any corresponding improvement in water usage practices. Studies have repeatedly suggested that the irrigation system in Punjab is severely inefficient and yields large losses at every stage of the delivery system (Ahmed and Gautam, 2013) and the associated menaces of water logging, salinity, nutrient mining and soil erosion result. In addition, access to tap water for domestic usage and drinking is very low in rural areas – 13% as compared to 43% in urban areas. The quality of water is substandard, and requires billions to be spent in mitigating waterborne diseases in the province (Punjab Saaf Paani Project, GoP).

In addition, the rapidly urbanizing province faces environmental degradation as a result of the unsustainable use of its natural resources for economic growth and development. Air quality deterioration, surface and ground water quality degradation and improper disposal of municipal and industrial waste contribute to this problem. While Punjab has over 12 national parks and 37 wildlife sanctuaries, it is pertinent to note that the rate of deforestation is high, as urban sprawl goes unchecked.

Physical Infrastructure

Changes in temperature, heavy rainfall, floods, frequent and intense storms have a collective bearing on physical infrastructure, particularly which is located in areas exposed to climate sensitive features, such as rivers. In 2001, heavy rainfall in Nullah Lai, a rain fed natural stream flowing through Rawalpindi city inundated nearby houses, bridges and roads, and led to 61 deaths and destruction of 800 houses. As extreme events are expected to rise throughout Punjab, damages to physical infrastructure and the associated disruptions in production, connectivity and access will also rise.

Energy

Punjab consumes 62% of Pakistan's electricity, at an estimated 47,000 GWh in 2010-11, compared to the total national consumption of 76,000 GWh. The majority of this is used at the domestic level,

followed by commercial, industrial and agricultural usage. With the largest population base and relatively high industrial output, the province relies heavily on the national power grid. Despite this, Punjab's industrial sector and domestic consumption face severe energy shortfalls that impact productivity and welfare. The province has struggled to reconcile its growth and associated energy needs with climate compatible development, and energy is likely to will remain long term challenge for Punjab vis a vis climate challenge.

Health

Climate change becomes obvious in extreme weather events, natural disasters and erratic rainfall patterns in Punjab, with manifest impact on safe drinking water, clean air, sufficient food and secure shelter (ADB, 2017). The rise in temperature also leads to the risk of water borne and vector borne diseases, such as dengue and malaria which have periodic outbreaks every year. Given some of Punjab's precarious health indicators, including four million malnourished children; a third of pregnant women estimated to have iron deficiency; and only 58% of the population having access to sanitation services, the vulnerability of the province's health sector is very high when confronted with climate change.

Impacts of climate change on water availability

Punjab has the world's largest contiguous irrigation canal networks, 2,3712 miles long. The five rivers of the Punjab and Indus Basin yield an average of 145 MAF per year. However, with the largest population in Pakistan, as well as water intensive agriculture and industrial sectors, the already stressed water profile of Punjab is set to become water scarce, as the river hydrology is impacted by rapidly melting glaciers, erratic rainfall patterns and higher temperatures, leading to evaporation. These are coupled with issues in water quality, particularly in the rural areas.

In Punjab, 7% of the rural population depends on dug wells and rivers for water supply. 79% of the province has access to fresh groundwater, while saline waters are mostly encountered in the central Doab areas. Irrigation systems in place are currently insufficient, and there is much loss of water and an overall lack of storage capacity, that will add to the already dwindling water supply in Punjab. Groundwater now supplements canal irrigation across virtually all canal command areas in Punjab and accounts for 29 percent (52 km^3) of the total average annual water withdrawals in all of Pakistan (180 km^3), compared to surface water withdrawals, which amount to 71 percent (128 km^3).

Studies also indicate the presence of high fluoride content and arsenic, which are well above WHO guideline values for safe drinking water, which further exacerbate the issue.

PUNJAB WATER DIALOGUE

Methodology

The overall objective of the consultative dialogue was to review the NWP from a sub-national perspective, while developing a list of joint stakeholders' recommended provincial targets for achieving the SDGs and NWP objectives. The 'Stakeholder Review of the National Water Policy in the Province/Regions' employed a whole-of-government approach, convening government, civil society, academia, private sector and media to jointly review the NWP through a moderated Panel Discussion, followed by a Focused Group Discussion on agreed thematic areas to identify key targets for the achievement of water security while dovetailing it with the targets of the National Water Policy and the Sustainable Development Goals (SDGs).

The event comprised of two components. The first was a moderated Plenary that convened experts from the government and civil society to assess various aspects of the NWP i.e.

i. Legal perspectives of the National Water Policy
ii. Water Management
iii. Gender mainstreaming into water policies

The second component consisted of 'Consultative Roundtables' in which the participants convened in roundtables of 6-8 participants, to discuss provincial targets for the Master Plan to be developed for the province under the NWP. The themes included water conservation, water storage, irrigation, water treatment and drinking water. The structured roundtables were facilitated by the CSCCC core team, as well as provided with customized datasets and tools to develop the targets. These were aligned with the SDGs, NWP and other relevant policies.

Dialogue Overview

CSCCCC, with the support of the Water Informatics and Technology Institute, LUMS, and the World Bank, conducted a review of the National Water Policy from the Punjab perspective at the Lahore University of Management Sciences (LUMS) on the 4th of December 2018. The Provincial consultative dialogue, titled 'Pakistan's National Water Policy, Punjab Perspective' comprised of robust representation from stakeholders from the government, private sector, civil society, academia and the media, and students of the host university.

The opening panel consisted of Dr. Syed Muhammad Abu Bakr, Director, Centre for Water Informatics and Technology, LUMS, who delivered the opening remarks, Aisha Khan, C.E., CSCCC, Syed Babar Ali, Founder, LUMS, and Dr. Ishrat Hussain, who delivered the keynote address and is the current Advisor to the PM on Institutional Reforms with the status of a Federal Minister, and Former Governor State Bank. The Plenary consisted of Dr. Arif Anwar, IWMI, Ahmad Rafay Alam, Environmental Lawyer, and Dr. Mahmood Ahmad, Research Fellow, LUMS.

Dr Muhammad Abu Bakr, *Director, Centre for Water Informatics and Technology (WIT) LUMS*, in delivering opening remarks noted that the WIT at LUMS was established three years ago, to fill the research and data gap on water in Pakistan. 'The WIT was conceived jointly by government and academia with the view of having a multi-disciplinary center that builds on the existing strengths of LUMS, which is already recognized as a centre for Excellence in Research in Pakistan to look at water, environment and development issues in a holistic way.' Dr. Abu Bakr highlighted the innovation in water informatics done by the Centre, including telemetering and water quality monitoring systems, as well as the socio-hydrology discourses. He welcomed the participants and emphasized the need for a holistic approach in designing such initiatives and the importance of public –private partnerships in the implementation of such programs.

Aisha Khan, *Chief Executive of the Civil Society Coalition for Climate Change*, delivered the welcome remarks, and explained the mandate for the Civil Society Coalition for Climate Change, in relation to its role in convening stakeholders across the country to deliberate

over the Water Policy. 'In April this year, the first National Water Policy of Pakistan was approved, which mandates the provinces to develop their own Master Plans, in five different sectors, which the coalition has set as its five themes for soliciting recommendations for provincial targets, whilst identifying the challenges to achieve these targets, from a multi-stakeholder perspective.' She highlighted the role played by CSCCC as a convener of multi stakeholder groups, in light of the fact that Pakistan is a signatory to a number of international agreements, including the Lima-Paris Action Agenda, the Paris Agreement and the Open Government Partnership, all of which enhance and encourage the role of civil society as a critical player in policy development. Ms. Khan explained that it is not the mandate of CSCCC to develop the Master Plans as set out in the NWP, but rather to recommend priority areas that may serve as a reference point for governments when developing the actual water master plans. She urged the participants of the working groups to consider the National Climate Change Policy, its associated framework, the National Water Policy and the SDGs, as well as the IPCC Special Report and the World Bank Report on South Asia's Hotspots, both of which reference new data that will cause unprecedented changes in South Asia and Pakistan in particular. 'The dialogue in Punjab is extremely important as it is the food basket for Pakistan', she said, 'and all the aspects of Punjabs water, including storage, treatment, management, conservation and sanitation and hygiene, will be crucial to achieving the goals of the SDGs and the National Water Policy.'

Syed Babar Ali, *the Founder of LUMS*, in his special remarks, commended the initiative taken by CSCCC and LUMS to review the policy from a provincial lens. Mr. Ali noted that while it is important to focus on 'macro' issues when it comes to water, the 'micro' issues are equally important. He highlighted the pollution of the river Ravi, which runs through the city and has seen massive environmental degradation over the past decade. 'It is important to note that 40 km downstream, this polluted water is drinking water for the communities, and disease and other maladies can be prevented if this river is cleaned' he said. Mr. Ali noted that economic benefits from the cleaning of Pakistan's rivers, such as the production of fertilizer and other by products from the waste collected from the rivers, would benefit target communities.

Mr. Illangovan Patchamuthu, *Country Director of the World Bank*, in his special remarks highlighted the interest of the World Bank in water in Pakistan, with a financing portfolio of 1.2 billion USD, focusing on irrigation, agriculture and water supply, as well as additional financing in the hydropower sector. Sharing highlights from the World Bank's latest report on Water Security in Pakistan, Mr. Patchamuthu said 'In terms of the economy, the study finds that there are many countries that have less water than Pakistan but are economically better off, which demonstrates that Pakistan has the scope for improved water conservation and management. The agriculture sector, which is the biggest contributor to GDP, Pakistan has the lowest productivity per drop of water in the entire region, which again demonstrates that there is scope for increased water efficiency- through better water regulation, pricing and management.' He also noted that the four major crops of Pakistan use the most water, and that there is a need to shift toward high efficiency irrigation systems which improve productivity per hectare of land, as well as the SMART project by the World Bank in Punjab which encourages alternative crops such as fruit and vegetable cultivation, which have higher demand in global markets. Mr. Patchamuthu emphasized the need for focus on environmental and ecological flows, something that the Indus Water Treaty does not also fully recognize, and called for greater attention to ensuring environmental flows than is currently the case. Speaking about the relationship of water with human development, he said 'there is a strong link between lack of sanitation and stunting, which disproves the theory that stunting is a result of lack of food fortification alone. Though Pakistan has made progress with stunting levels, according to reports, having fallen from 44% to 38%, Sindh and Balochistan remain outliers with higher levels of stunting- with stunting rates in Balochistan actually having increased'. Mr. Patchamuthu noted that water and its management will be a deciding factor for Pakistan's future, with studies suggesting that poor water management and disasters are already causing GDP losses of 3 to 4 % per year. Stressing the urgency of the situation, Mr.

Patchamuthu also highlighted the disruptive technologies making their way into the real economy, and noted that the way forward is to invest in new and innovative technologies that are spearheaded by entrepreneurs.

Dr. Ishrat Hussain, *Former Governor State Bank and Advisor to the PM on Institutional Reforms (with the status of a Federal Minister)* in his keynote address discussed the components of what would constitute a 'good' water policy. 'Pakistan has developed a number of policies since 1947' he said, ' but the question we should be asking is, what have we achieved as a result of these policies, and what should this NWP achieve.' Emphasizing the link between water and livelihood, Dr. Hussain noted that the per capita water availability for Pakistan has fallen to 1000 cubic meters compared to 5000, which raises questions on sustainability, as well as the increasing rural-urban migration which is creating its own set of issues- and should be at the center of any Water Policy for Pakistan. 'Another important area' he noted, ' is water efficiency, given that Pakistan faces water scarcity- and rather than prudence its usage, not only is water underpriced, but is also used as almost a free commodity- leading to over consumption and overuse of a very scarce resource.' He pointed out that due to the underpricing, it is common practice for farmers to flood their lands with water, leading to under productivity and under efficiency, to produce crops that are water intensive such as sugar cane; farmers are subsidized to produce this crop, at the same time, it is exported as we produce far more than can be consumed. In consideration that demand for meat, poultry, fruit and vegetables are increasing in demand, crop switching is an important component to be included in water efficiency. 'Drip and sprinkler irrigation have not yet been implemented in the country at the scale at which they should be' he lamented. He also noted that it is imperative for a water policy to be based on equity. 'There is a huge inequity in the distribution of water. The tail enders can improve their productivity of water by a factor of 2, if they are given water that is tampered with at the head by influential figures with vested interests, who over use the water and deprive the tail enders of their rightful shares in the warabandi system of irrigation' he said. He also noted the correlation between water availability and poverty, in particular that the areas with the least water availability are also where the most poverty exists. Water security was also noted as an important consideration, with climate change and variable water flows impacting the quantity of water, and while heavy, expensive, large water storage reservoirs are the most commonly implemented solution, many more cost effective alternatives exist.

'The final consideration I would put forward is 'harmony' said Dr. Hussain, 'There is a clear distinction between the upper and lower riparians; Punjab being an upper riparian and a relatively rich province, needs confidence building with the lower riparians, that injustice will not be done with them and they will not be deprived.' He noted that currently, there exists discord and mistrust between the upper and lower riparians, which impacts the harmony of the country, and this urgently needs to be addressed by the policy. Dr. Hussain lamented that of the considerations he proposed for the water policy, the reason behind all of them is the decay of institutions, such as WAPDA, which was formerly considered a top institution and had handpicked Engineers recruited by the World Bank. He lamented that the current status of WAPDA , PIDA and Irrigation Departments are marred by turf fighting, a lack of unison, and overlapping mandates. 'Finally, the responsibility of the use of water is squarely upon the provinces' he said,' And Punjab being the prime producer of Pakistan needs to develop an Action Plan, as well as to take a dispassionate look at its institutional framework as to how to overcome institutional barriers, in order to have high powered skills, technology and the clarification of authority and accountability so that we are able to get the maximum benefit from the NWP.'

Plenary

Arif Anwar, *IWMI*, presented 'Subnational Perspectives on the National Water Policy' and raised a pertinent questions regarding the current management of water in Pakistan. He compared research done prior to investments made at individual levels for buying properties to the meagre research done before investments in multi billion dollar investments in infrastructure such as large scale dams. 'We know that the Bhasha Dam is budgeted at 13.7

billion dollars, Tarbela extension, 1 billion dollars, Neelum Jhelum 1.2 billion dollars- even the average investments made in the Punjab for the rehabilitation of irrigation systems cost on average 300 million USD,' he said, 'all of this tends to be development bank borrowed money, which we are all paying for in some shape or form, and our children and even grandchildren will pay for this in the decades to come'. Our economic crisis in depreciating currencies and BOP deficits are all linked to these kinds of expenditures and borrowing.

Referring to the current focus on telemetry, such as the World Bank project at the federal level, the WCAP at 35 million USD investment following a 70 million USD investment, as well as significant investment in the Punjabs own irrigation department, with the aim of more transparent water accounting between the provinces, as well as an increasing trend of accounting of water, linked to article 28.4 of the policy. There is an increasing trend of unaccounted water. 'From 1977 to 2014-15, there is a considerable difference in the Tarbela inflows, measured at the rim stations, and the outflows measured by the irrigation departments, including outflows at Kotri mentioned by SIDA,' he noted, 'the discrepancy is known as volume balance error or losses and gains. The data shows more inflows than outflows, and the current figure is 30 MAF, the trend line referred to in the policy.' He stated that the unaccounted for water is enough to fill Mangla, Chashma and Tarbela, twice; in light of this data the question arises as to why Pakistan is willing to invest 13.7 billion USD for 6 MAF of storage when it cannot still account for 30 MAF of water. 'That is not to say the unaccounted for water is not being used- the Punjab alone uses around 50 MAF of water in a year'he said. While the 6 MAF of storage is necessary, the key question raised by Dr. Anwar was how this water is to be used- and he pointed out that most of it goes into the cultivation of wheat. 'Punjab, Sindh and PASCO are trying to get rid of 3.1 million tonnes of wheat. The support price is roughly 300 USD per metric tonne whereas international prices are 100 USD below that' he explained, ' so in order to export, you would have to pay close to 150USD just to export the wheat, with the risk of being fined by the WTO for 'dumping'. The cost of export is half a billion USD.' He highlighted the need for consideration in 'why' we are developing our water resources.

Dr. Anwar referred to Fertility Rates as an example of a human development indicator and its link to water. 'Around 1970 and 1980 we brought down fertility rates to 3.5 or 3.6. Two other countries such as India continuously dropped, and so did Bangladesh, all of which are around the 2.1 replacement rate. The question here is, in consideration of the Falkenmark Index, which has fallen due to the increase in population, are the investments Pakistan is making going to give you water security?' he said. He noted that while investments in water and water infrastructure are important, it is important to also consider the human development factors and other structural issues, keeping in view the vision of what Pakistan should look like in 2037. 'Our biggest asset and resource is our population. It is a huge market, and if it can be made middle class, prosperity and economic growth will follow' he observed, 'however, for this, we have to make the investments and be open for business.'

Dr. Mahmood Ahmad, *LUMS Water Centre in his overview of water management in Pakistan*, iterated the importance of water policies in addressing scarcity of water. 'Pakistan is not that water scarce, especially when compared to other countries, such as Egypt, Yemen, Syria, Jordan;' he said, 'the issue is that we are wasting water, and that our policies are flawed.'

Dr. Mahmood outlined the requirements for having an intensive national and provincial water policy, one of which is to have proper water accounting and auditing, which is an intensive exercise. 'Data is extremely important- data on accounting and auditing, volume of water, flows, quality, infrastructure, etc. For the auditing aspect important considerations are water management, governance, socioeconomic indicators, and finance, and legislation and institutions' he added, 'It is very necessary to consider the endless possibilities of double counting, such as the return flows which are disregarded, and upstream and downstream flows, and underground and above ground water'.

'The problems of water scarcity, groundwater depletion, sedimentation and waterlogging and

and regulate associated bodies

(As per the constitution of Pakistan, if a subject is missing from the Federal Legislative List, it automatically becomes the domain of the provinces). The example of a body is WAPDA, which was in charge of water and power, but since power has been devolved, the domain of WAPDA is now the construction of dams as power has devolved to the provinces So the CCI can therefore only direct WAPDA in its construction of dams, and should not have a role in the formulation of a policy for drinking water in Quetta, by way of example.

2. Decide on any complaints made by the provinces, ICT, or FATA as to any complaints as to interference with natural water supply

   The CCI is to mediate and develop commissions to address any complaints made by the provinces against each other in terms of the usage of water

3. Decide on the distribution of benefits from hydropower benefits. So essentially deciding, after the construction of dams, the development of the formula. The CCI has finally accepted the Qazi commission formula for water sharing.

4. Resolves disputes relating to electricity between the provinces

In his plenary session, Mr. Alam also provided the legal and historical basis for waters status as a provincial subject in Pakistan. Giving the example of the canal infrastructure of the Indus basin, in place in 1947, constructed by the British Empire through the late 19th and early 20th century, as provincial projects. 'The Northern India Canal and Drainage Act formed the basis for what is the Punjab Canal and Drainage Act. Similarly the Bombay irrigation act was the basis for the Sindh Irrigation Act. And it was acts like this that gave the provinces superior rights over natural resources. When the Government of India Act 1919 came into being, water including drinking, irrigation, sanitation even power and energy were all dedicated provincial subjects' said Mr. Alam, 'However, through the system is diarchy the British were still able to retain control

over infrastructure works on water. A conflict resolution mechanism was later introduced into

KEY TAKEAWAYS

Drinking Water

Targets

- Piped Water system established
- Regulation of groundwater
- Monitoring systems for septic tanks
- Regulations for self extraction of water
- Policy frameworks around pesticides established
- Mapping of groundwater resources completed
- Strategy to ensure Total dissolved solids to limit to 200 (current baseline is up to 500)
- Health strategy linked to water developed taking into account NWP

Challenges

- Drinking water
- Total Dissolved Solids (TDS) in public water sources up to 500 compared to the accepted 200
- Quality of self extracted water is very low, due to contamination from sewerage.
- Health problems from contaminated water
- Overpumping causing mineral mixing into the water
- Irrigation is being done through wastewater in some cases contaming the groundwater as well as the produce from these areas
- Pesticides and Fertilizer contamination
- Poor awareness among the general public
- Water Infrastructure contamination
- Lack of mapping of groundwater resources

Recommendations

- Regulating authorities/regulatory bodies should be established with a separate vertical to monitor and control drinking water (at subnational level)
- Transparency of the recommended regulatory bodies should be ensured through public dissemination of findings
- Awareness raising campaigns in the general public to encourage greater safety in drinking water quality and to counter unsustainable abstraction of water
- Pesticide and fertilizer contamination of water countered through measures such as lining of irrigation channels, and subsidizing organic farming measures

Water Storage

Targets

- Construction of more small dams to store water
- Water recharge to be made a priority
- Save water in irrigation sector using modern technology
- Completion og 100 dams project
- Construction of canals
- Delay action dams/storage dams
- Artificial recharge

Challenges

- Institutional political will
- Tubewell drilling
- Lack of coordination between departments
- Consideration of the geology
- Security
- Topographical failures
- Awareness
- Knowledge gap
- Lack of specialized courses offered in universities
- Lack of qualified hydrologists and ground water specialists

Recommendations

- Filling of knowledge gap between universities and the government
- Specialized training courses in water sector for in service professionals
- Construction of fams on sound technical and geological grounds
- Reforestation

Water Treatment

Targets

- Awareness raising campaigns at household/village/district and provincial levels on treatment options for water
- Development of local technologies and investment in local industry offering water treatment options to make them economically viable and encourage adoption
- Establishment of water treatment plants and regulation surrounding the outputs of these bodies
- Monitoring and public reporting
- Valuation on the quantum of waste being discharged by industries and revenue generated from this to contribute to water treatment and ecnourage cut down of these costs

Challenges

- Outdated laws and policies on water
- Lack of autonomy of departments
- Unclear mandates of departments
- Lack of technology
- Lack of capacity at institutional and individual level
- Erosive practices by communities

Recommendations

- Law and policy reforms for water (ground and surface)
- Indepedent authorities on water treatment established
- Clarification of mandates of departments
- Shift towards technology transfer approaches
- Capacity building of communities and institutions
- Practices (improved agriculture practices)

Water Conservation and irrigation

Targets

INVESTMENT IN
- High value crops
- Organic cotton
- Low delta crops

- Increased efficiency in agriculture
- Development of water infrastructire
- Soil water conservation targets and milestones set
- Baseline studies

Challenges

- Subsidy on tubewells leading to unprecedented abstraction
- Widespread use of flood irrigation
- Current water infrastructure contributing to water losses
- Lack of monitoring of water
- Lack of baseline data/research
- 65% of water is lost due to seepage and does not reach crops
- Low productivity of water 65% of water is lost due to seepage and does not reach crops

Recommendations

- Removal of subsidy on tubewells and enforcement of this removal
- Ban on flood irrigation particularly in water scarce areas
- Invesment in water infrastructure as a top priority
- Monitoring systems/technologies in place
- Partnerships with academia to conduct research/establish baselines of water banks