

Impediments in Planning of National Water Resources: A Case of Pakistan

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ARTICLE INFO

Keywords:

energy security, water
resources, water reserves,
challenges

Vol: 02, No: 01, 2024

Page Range: 29-37

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Published Institute For
Educating Environmental
Resilience And Governance

ABSTRACT

This research under basic question of how Pakistan can improve its agriculture. There is great potential for doubling and tripling the agro-output with same amount of water and land or even with more land. To cope with the economic and ecological challenges, food and fiber demands of growing population, it requires integrated approaches, sustainable water resources management, access to modern agrarian technologies, knowledge of land use and cropping patterns, water pricing, socio-economic components and water policies for climate change and hydrology of conventional water resources, site-specific hydro-policies, efficient use of water and conservation strategies at domestic and agrarian level, are key to economic and agricultural growth. It would be productive to reduce poverty, high value-added agro-processing business, foreign exchange saving and to curtail the glitches of food shortage for ever-increasing population. Notions of “soft path” and “more crop per drop” can be imperative to raise water productivity and food production for Pakistan. This is qualitative research, and the data has been collected mostly, from secondary sources.

Introduction

Regardless of the extreme water security and scarcity challenges, intensified water demands, food and energy security, ever-swelling gap between demand and supply of water and ecological perils, Pakistan is still lacking conservation and developmental skills for available water reserves. Following are some of the complications which are pivotal hurdles in the management and sustainability progress of water resources at national level.

Socio-Economic Deviations and Amplified Consumption of Water Resources

According to UNESCO report, after evapotranspiration, if the residual water volume is less than vanished, it results in drying of water reserves, revealed as renewable hydrological resources, are allude to indicate the water scarcity index or water stress of a nation (UNESCO, 2012). As, the transition of Pakistan to industrial and urban economy has widen demand-supply gap and elevated competition of water resources to agriculture sectors. According to UN estimates, Pakistan is expecting to increase in population up to 230 million by 2025, consequently the water demands are increasing 10 % per annum (Population Reference Bureau, 2012). Since, the surface and groundwater resources of the country are undergoing overexploitation. Pakistan is undergoing swift societal and biological fluctuations during last few decades, predominantly economic expansion and population escalation with hasty urbanization. In response of this, agriculture is being replaced by industrialization and standards of life have improved contrary to this, the ecological contamination predominantly water quality deterioration in reservoirs, reduction of drinking water and considerable rise in its consumption has become severe. Steady upsurge in water demands is anticipated due to

inhabitants mounting, urbanization, industrial uprising and high living standards (Tushaar, 2009). Contamination of aquifers by pesticides, water pumping indiscrimination, unspecified number of extra wells, mining of aquifers (chiefly in Baluchistan) and growing salinity of tube-wells speedily triggering water resources depletion from couple of last decades, which require sophisticated plan to manage necessities, if not it can even limit economic development.

Urban Migration and Rural Dispossession Apprehensions

Pakistan is enduring rampant instability and volatility due to water dearth strains. Migration towards urban and semi urban zones, increased number of rural dispossessions of tenant and small farmers from their lands (usually in southern and central Punjab), land rights, growing commercial agricultural techniques, criminality, gang's monopoly in urban zones, and violence based on gender are most common issued skewed water ricks. Meager sanitation and urban water supply are serious concerns which influence human security, as "water mafias" are quite strong in urban areas (Taimur, 2012). Particularly in Karachi (since the city generates more than quarter GDP for state), sprouting political volatility, insurrections related to water and civilian discontent. The southwestern zone of Baluchistan province is also looming the crisis of groundwater scarceness. The tapping of groundwater by electric pumps ruined traditional irrigation structures of Karez and about 83% of total groundwater reserves has been extracted (Daanish & Qazi, 2008).

Intensification of Floods and Droughts

The leading challenges posed by ecological variations on Pakistan's water division are intensity, location and timing of floods and perils of droughts, which are considered as a trial of institutional preparedness, management and responses. During the last couple of decades, disparities in precipitation systems basis the record- breaking increased floods occurrences around the entire globe which are the stark reminder of future ecological encounters (Amoore & Goede, 2011). Particularly, rains in 1998 produce extreme flood conditions never dealt before. The effectiveness of flood control capability by previously constructed versatile dams has deteriorated. The drought in late 1990s and then early 2000, last almost for decade in the southwest and 2010 floods in the northwest of the country, affected about 1.8 million homes and 21million people. The government ability to prepare and respond these ecological perils raised numerous concerns on the overall accountability, legitimacy and political structure (Mustafa & Wrathall, 2011).

The floods and droughts also root dynamic shifts in plantation periods, social dislocation of communities and penetrates the vectors of several new diseases. In Pakistan, the floods are generally labelled as anthropogenic phenomenon, chiefly due to inundation of humans' habitation near basin, spoilage to the infrastructure of diversions and breaching of side levees which put pressure of barrages during floods. It seems clearly a technical issue, since it often deems as political matter and which has stronger political base the up-streamer or the down-streamer. As, the inhabitants of upstream desire quick breaching while the communities living in down-stream aims no or delayed breach (McCarthy, 2001). However, this alienation considerably accentuates when the people with less political capital got inadequate relief and devastation of their lands. Therefore, the mounting vulnerabilities of floods perils and discrimination of agrarian water supply to poor ranchers stimulate the extremist ideologies in the young of rural areas.

Substandard and Deteriorated Water Supply System

The key supply of archetypal water resources, construction and maneuver of multipurpose dams was established under the standards of IWT in 1960. Most of the criteria for mega projects for water reserves were settled, keeping in mind the readily available data and current experiences in 1950-60s by developers. However, the historical data demonstrate that treaty gratified those circumstances, since it overlooked the imminent ecological variations and swift gap in demand and supply for urban and agrarian necessities due to amplified population and economy (Archer et al., 2010). So, the existing supply system was unable to

sufficiently provide water for public demands due to deteriorated pipes and giant water loss via distribution system, which fallouts in extreme socio-economic turmoil.

Water supply system is enduring exciting issues of water quality, persistent interruptions in distribution services and water loss mainly due to depreciated and scaled pipelines. This consequence in abate water flow, suffer cracks effortlessly and water leaking from cracks, soars disruption in flow and disrupt system's efficiency, susceptible to earth load, traffic and pressures, corrode easily and recurrent culture of biofilms on inner side of deteriorated pipes that origins water contamination earlier to reach a faucet. Alarming, the nuclear reactors in Pakistan are mostly along Chashma Barrage near Indus banks. In case of any accident or leakage at nuclear sites can possibly contaminate the water and a considerable stream of food supply for country can be pretentious (Archer et al., 2010).

Rainfall Harvesting and Groundwater Reserves

Ground water is a key water resource with growing repute; hence many recent studies analyzed that rainfall can be used as a secondary mean to rural and urban water supply and harvested rainwater might be valuable for recuperation of wastewater and recycle systems. Rainfall harvesting is lucrative to deal water scarcity in seaside, inlands and also in urban zones where its wide use curtail the direct runoff (Han & Kim, 2004). Despite having plentiful advantages, rainfall harvesting is still in early stages and entail proper system and inclusive researches. Pakistan grasps four distinct seasons as falls in tropical and subtropical zone. The average temperature is 47 oC in summer, sub-zero in winter and 170.6 mm per annum precipitation, since unevenly distributed. Indus Basin is temporally and ornately intensive at the heavy rain spells during summer monsoon season, bear flood prevention, ma be interpreted both as an opportunity and a grave hazard. While in dry season the procurement of water for domestic, agrarian and industrial usage, also become a critical matter, as the vital source of rainwater for utilization is lost (Immerzeel et al., 2010). Sharp transformations in the annual patterns of rainfall, deviations in precipitation and massive volume loss by evapotranspiration, decreased the amount of available water for usage.

Governance Inefficiencies and Policy Alignment Issues

Pakistan's water disputes are chronic in nature, as the perennial canal system accused water deficiency with bad faith and deception among the provinces. Insufficiency of water rights and laws, the deficiency of institutional and regulatory framework, cooperative and communicative failure, feeble mechanism for enforcement of law and policies, notoriously corrupt bureaucracy obliging to large landowners predominantly politicians, futile internal administrative system for check and balance, paying of bribes for entitlements of water and leisurely legal system with no concrete enforcement of rights, are the most alarming factors seemingly averting active management of water resources and generating apathy, agony and water rights' proxy among stakeholders (Kamal, 2009). The Canal and Drainage Act 1873, is the key context for the regulation and legislation of water- related management of agriculture sector, with virtually no provision of accountability to public, while substantial authorities to departmental officials for jurisdictive and administrative decisions and dispute adjudication. This act legitimizes the rotating scheme of irrigation for fixed time (warabandi), the structural and geographical inequalities of irrigational system, i.e. providing much lesser water by watercourses to tail enders, since absolute authority to department for collective penalty to those who challenge to sabotage irrigational structure (Mustafa, 2001).

Under this act, all the water resources are recognized as government property and water rights are allied with land or precisely dependent on land (since dynamic and vivacious market of water exists independent of land). Inheritably, the farmers got water on their turn regardless of the time and quantity they need (warabandi) and water rights are enthusiastically traded by cash payments or for mutual times. Water tax (abiana) remained active since early 1970s, when Zulfikar Ali Bhutto's government froze it resulted in incurring huge suffering to deliver operative and appropriate administration and maneuvers to water resources system. However, the water donors forced government for decentralization of

bureaucratic water system and replace with farmer-run-system for more active collection of revenue, increase of water tax, cooperation and change of allocation of water by farmers. In response of this pressure, The Provincial Irrigation and Drainage Act (1997) was passed to handover provisional irrigational powers from government to regulatory/supervisory authorities. Hence, there is still no actual modification in practice of government and administrative approaches. The appendix A provides an overview of hydrological legislation in Pakistan.

The extreme dependence of Baluchistan province on groundwater resources and their mining, lead to outlined „The Baluchistan Groundwater Rights Administration Ordinance (1978)“ for licensing of tubewell management (area- specific) and groundwater mining, however majority of the systems come to naught in post-drought era of 1990s and the clashes between Karez stakeholders and tubewell adopters continued (Mustafa & Qazi, 2008). According to 18th Amendment in 2009, now the management of water management is under the jurisdiction of Ministry of Water and Power at federal level, with assigning the authorities to each province to govern all water related matters of their zones. Indus River System Authority (IRSA) circulates the date of water use after every ten days to provisional departments of irrigation and then gets it back in IRSA, however collection and sharing of data among provinces is contentious and source of distrust (Mustafa, 2002). Supply and sanitation services to both domestic and industrial distribution are corrupt and unreliable. Real and practical institutional and political reforms can only erode powerful traditional structures and socio-economic disgruntlement of public on governance and rule of law in the country. An overview of the water-related institutions is shown in the figure below.

Source: USIP.ORG (2013).

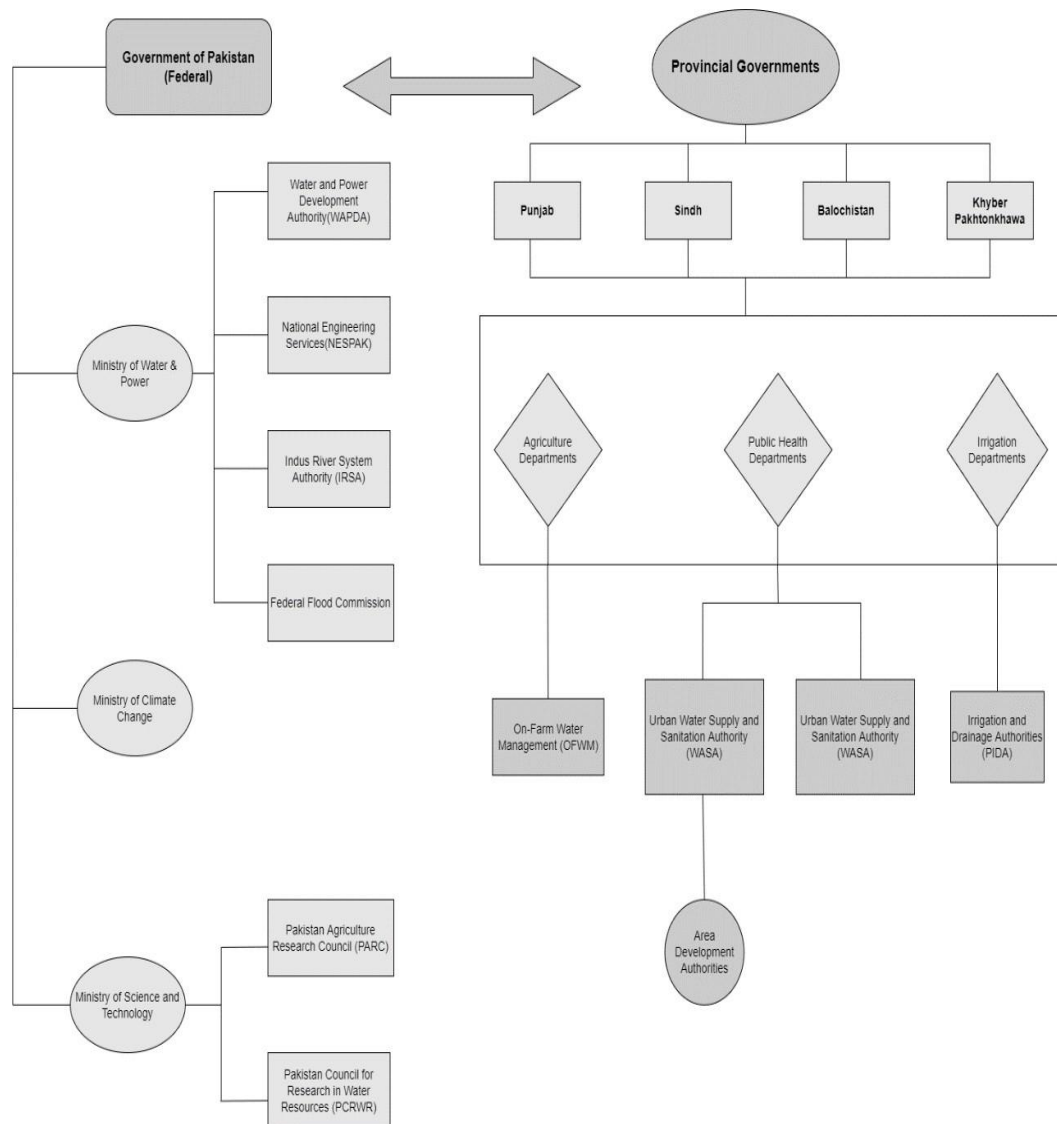


Figure 5.6: Organizational Framework of Water-Governance Structure in Pakistan

Inter-Provincial Clashes and Anxieties of Water Contamination

The most notorious inter-provincial distress is on water distribution between the up-streamer of IBS, geographically and economically dominant Punjab and down- streamer Sindh province, the ethno-nationalist movements with separatists' agendas, dam's construction and royalties' issues between KPK and Punjab province, are chief infuriating elements for country. The Inter-Provisional Water Accord 1991, signed by all provinces distributed the average 114.35 Million Acre Feet (MAF) flow of IRS by allocating 48.76 MAF to Sindh and 55.94 MAF to Punjab, since the perpetual inter- provincial water conflict aligned with the ethno-nationalist sentiments (Bhatti et al., 2009). As, the accord lacks participation of all stakeholders of provinces particularly from smaller ones and non-transparent negotiation process, suspected the legitimacy of accord. Besides, it made Kalabagh Dam and hydro-electric power projects controversial, entrenched to polarized the Sindh public while perceiving the dam construction as a part of insult series by Punjab. Furthermore, both KPK and Baluchistan provinces have apprehensions on Kalabagh dam construction because of claiming its adverse effects on their lands (Ministry of Water and Power, 2002).

Nevertheless, the critical question for the country is not to nurture the supply and distribution infrastructure but how to equally distribute the due share to all consumers. As, the failure of dam construction is a nightmare scenario. The issues of water contamination are sourcing serious health concerns for people, particularly it harshly and disproportionately effects the children and women, as they are responsible for water collection and generally unbalance to

leave cultural boundaries. About 8.8 % of country's GDP is being lost due the water contamination effects on human capital, such as the dengue fever outbreak in Pakistan during 2011-2012 summers, fallout severe public outcry and adversely hit Lahore (the provincial capital of Punjab) (UNESCO, 2012). The contamination of water along with hazards of climate change, unfortunate drainage of water and pathetic conditions of sanitation services delivery accentuated the jeopardies of water-borne diseases for public health. So, both the water and access of sanitation, effecting human capital and resulting in tensions and violent riots at local and provincial levels. The appendix B describes key inter- provisional hydrological conflicts in Pakistan.

Nevertheless, the nexus of water scarcity and security in Pakistan is leading part of society and economy and relatively complicated as well. Generally, there are three key perceptions for ignoring water management services. Firstly, the people associated with water sector typically hold engineering background, emphasis primarily on the resolutions of supply-side rather than the amplified water demands of society with the fluctuating dynamics of climate. Secondly, the decision makers are habitually in power and unpretentious by uncertainties of water, also having minute incentives of managerial modifications and systemic deviations. Thirdly, the provincial clashes among leaders, discrepancy and grave atmosphere of mistrust that avert collaborative and productive approaches for water resources development. Water matters have extensive finger-pointing from all over the country, since feasible solutions are merely superficial and the main culprits of this problem often lack collaboration and teamwork. The water scarceness and security nexus are progressively addressed as politico-technical calamity and swotted by institutional lens, since the political lens should be filtered from technological contributions. The lack of consensus between decision makers and profound mistrust among water stakeholders are the outcome of contentious water crisis and engendering vacuum in enlightening water resources management. Hence, the change can only be instigated with political will.

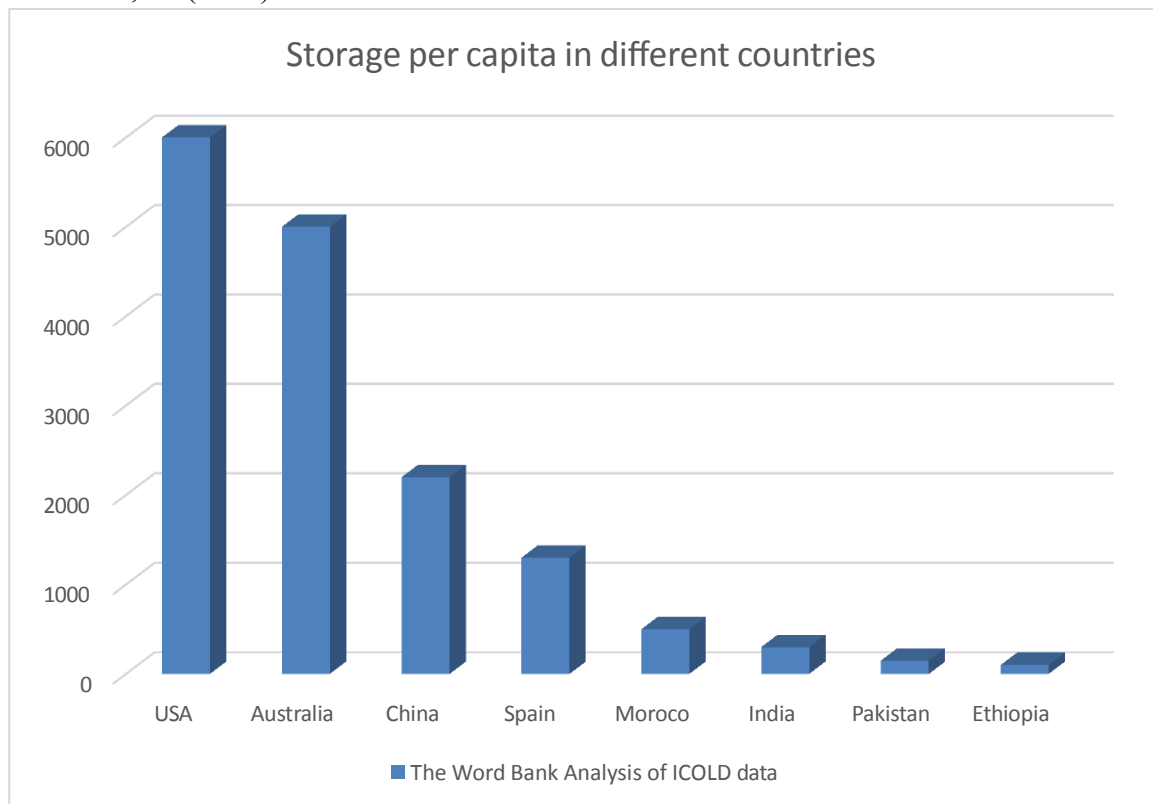
Country's Water Woes

According to the World Bank Report (2008) on "Pakistan's Water Economy: Running Dry", Pakistan is amongst the world's utmost arid states, people and economy profoundly contingent on annual water flux in Indus River System emanating from Himalayas of neighboring states, while taking average rainfall below 240 mm per annum. The numerous natural and political challenges to water economy in 20th century were managed by shrewd enactment of science and technology and IWT with India. Since, the country is again facing extreme water- related threats for its existence, portrayed by facts which are quite stark. The per capita water availability is readily declining, expected to as low as 1000 m³ per capita by 2035, making country as one the most water-scarce state (Mustafa et al., 2013). The deep reliance on single river system and no additional water to inject the system making situation pretty hazardous. Large scale degradation of natural water resources by unrestrained pollution, salinity, inadequate water level, overexploitation of groundwater and quality deterioration, flooding, silt, narrow embankment for river flow, climate change, retreat and rapid melting of Western Himalayas and several drainage issues exaggerated the priorly existing snags. Awkwardly, during last few decades, little attention is paid to manage Indus River Basin and to outline knowledge based human and institutional infrastructures (Muzammil et al., 2020).

Most of water infrastructure is financially unsustainable, poorly managed and repaired, funds inadequacy for services and operation, absence of modern Assets Management Plan and Capital Investment Projects due to deferrals in accomplishment, unproductive bureaucracy, incompetence and overruns of cost and time, derisory water distribution, low charges for user, ill managed supply system, quality decline, corruption, persistently conflictual and distrust atmosphere, are the key fault lines that hovering the country blindly into a perilous future (Bahtti et al., 2009). Pakistan is among one of the lowest precipitations grasping states and water storage is also alarming than other arid states. The country has 218mm rainfall per

annum, whereas Malaysia has 2366mm, USA 1201mm, Japan 1400mm and India holds 2168mm annually. China's storage capability is 2200 m³ per capita, Australia 5000 m³, the US has 6000 m³ (900 days water holding), South-Africa 500 day, India 120-220 days, while Pakistan has merely 150 m³ per capita with 30 days hold of river- run-off (Yan, 2019). The figure below shows the per capita storage capacity in different semi-arid countries.

Source: Yan, K. (2019).



Storage Capacity in Different Semi-Arid Countries (Cubic meters per capita)

Mangla and Tarbela dams are deliberately undergoing silting. The severe discrepancy between head and tail-enders and efficient and inefficient farmers, is ironically triggering low water productivity and crop yields both per cubic meter and per hector internationally. Although the Pakistani farmers consumes 100% more water than Californian and 60% more than Indian farmers for wheat production. In 2008, the total water availability at farm gate was 62 BCM of groundwater and 119 BCM of surface water resources. The declining of groundwater table is mainly due to the absence of law for vulnerable groundwater resources protection (Saeed et al., 2002). There is dire need of enhanced managerial practices and operational costs to expand groundwater abstraction. Although, it was assumed that upgrading of water-courses, new dams' construction and infrastructure progress by government policies might improve water availability about 187 BCM, 195 BCM and 205 BCM by 2010, 2020 and 2030 respectively. Since, the water demand-supply gap was 19 BCM in 2010, while the construction and advancement of new infrastructure may lessen this gap by 3.7 BCM and employment of modern agrarian technologies to 5 BCM by 2030 (Pakistan Economic Survey, 2007-08).

Major Challenges and Solutions

Knowledge-Based Capacity Building

The enduring and single most challenging mission for Pakistan is the sustainable development and management of intricate, giant and interlaced natural resources in three dimensions of social sciences, natural sciences and engineering sciences. As, Pakistan most probably relies on outer knowledge, chiefly in sciences. The current scenario demands the country to develop its indigenous competence to nurture new institution to provide technical,

policy and scientific support in the disciplines of hydrology of ground and surface water, climate, limnology, soil sciences, agronomy, river geo-morphology, plant physiology, economics, organization of industries, conflict management, sedimentation handling, politics, chemistry of water, financing, coastal and terrestrial ecosystems and structuration of hydraulic to deal with scarceness of water (Randhawa, 2002). The country also requires a sturdy cadre for problems credentials and resolutions finding, advancement of monitoring, evaluation of outcomes and regulating of conditions regarding demands.

Infrastructure Rehabilitation, Mounting and Sustaining

Most of the hydraulic systems in Pakistan are close to meet their ends, accenting for plans of Asset Management on federal and provincial levels, which grasps the craving of replacement, convalescence, preservation and maneuver of assets, associated cost and financing proposal, urgent construction of new and huge storage dams on Indus River which is exceedingly contentious. However, to strive the forthcoming challenges and to progress, it entails massive reserves to outspread water and sanitation amenities for both rural and urban residents, appropriate jettisoning and treatment of industrial and municipal effluents, viable strategies for investments" paying, demonstrable and transparent enactment of Water Accord 1991 for the distribution of rational and entitled quantity of water to all provinces, effectual usage of limited financial possessions and to ensure the policies for cost-recovery policies on priority bases (Briscoe & Qamar, 2008).

Pragmatic and Ethical Adaptation

Need to adapt better actions, laws, information management and policies by government to strengthen the governance of water, improve integrated water resources management by empowering women, participation and consultation of different stakeholders and introduction of pro-poor safeguards to water services like irrigation, sanitation, drinking water supply, hygiene, drainage, etc. (Yan, 2019). The resilience through better forecasting, prevention, mitigation, recovery and relief systems (disaster management), sustainable water resources management through recycling of waste water, control of water pollution, rehabilitation of watersheds, water rights trading, conservation of water by applying tariff policy, institutional arrangement and initiation of prioritized sequenced reforms by understanding that one order can't fit all, are few paradigms which demand rational approaches to curtail perils of the climate change and water scantiness (Muzammil et al., 2020).

Instigation of Organized Framework and Modern Technologies for Sustainable Development

The government has to perform the character of a regulatory body and entails diverse sort of state machinery at federal and provincial levels, for the modernization and enhancement of water resources management. In this regard, the key emphasis should be on the instrument to develop relations between water users, introduction of indentures between different parties, enactment of transparency, accountability and efficiency, unbundling of mainstream dispersal and transmission enterprises, competition among surface water suppliers, provide public-private partnership as a substitute to irrigation sector and moving away from monolithic model of services. Although, the bulk of water services and business will probably govern by the state, hence some key services would concession to private sector operators (Randhawa, 2002). It would be accommodating in enhancing sophisticated management of natural resources, administration of ground and surface water reservoirs, lands and water systems capacity and active development and management of ground waters can be the lynchpin of this paradigm.

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