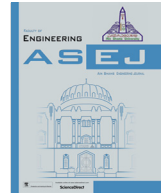




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Towards sustainable transboundary water cooperation between Afghanistan and Pakistan: A case study of Kabul River

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ABSTRACT

Afghanistan has been trying hard to gradually develop its largely underused water resources. The transboundary Kabul River basin (KRB) between Afghanistan and Pakistan contributes almost one quarter to the water resources generated nationwide. Currently, there is no cooperation mechanism pertaining to KRB, despite growing demand for irrigation and hydropower particularly on the Afghan side. This paper presents a state-of-the-art review on transboundary water issues between Afghanistan and Pakistan based on geographic, hydrographic, hydrologic, historic, institutional, and political aspects. The challenges and opportunities are carefully examined, and a path forward is presented. A persistent lack of trust between upstream Afghanistan and downstream Pakistan has hindered meaningful dialogue for cooperation. Both neighbors have high stakes in cooperation given that Afghanistan's water resources are almost 90% transboundary and Pakistan has high dependency for water resources. This study presents a cooperation framework emphasizing benefits-sharing as a principle going beyond water needs and rights.

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1. Introduction

Afghanistan has five major river basins, out of which four are transboundary that make up about 90 % of the national water resources. Transboundary cooperation with riparians is, therefore, important to the country to meet its growing needs for water, energy as well as its food security as unilateral resource capture can potentially spur disputes with downstream riparians [1]. Kabul River Basin (KRB) is one of these transboundary basins. It flows into Pakistan contributing almost 21 billion cubic meters annually [2]. It is an important source of water for municipal, agriculture and hydropower use in both Afghanistan and Pakistan. However, Afghanistan has underutilized the full potential of the river so far. Limited studies, continuous conflict, unavailability of sufficient finances and lack of commitment by the international donors

hinder Afghanistan's intended plan to efficiently utilize the water resources of the Kabul River. Currently, Afghanistan has no transboundary cooperation mechanism with downstream Pakistan on Kabul River. Occasional efforts have been made in the past but were largely fragmented. In transboundary water basins, building new storage and diversion facilities can impact downstream riparians often leading to strained relations [3]. This applies to development efforts by Afghanistan on the Kabul River.

Afghanistan is not the only country with transboundary water resources. Globally, there are 286 transboundary river and lake basins covering more than 50 % of the total land surface of the globe and account for almost 60 % of world freshwater flow [4,5]. Most of these basins have some form of agreement concerning various aspects of managing the river in international basin. Some agreements address hydropower, others flood and drought, some focus on pollution and about 117 have some component dealing with sharing water [6]. Within each transboundary basin, demands for various uses have constantly been increasing due to growing population and needs of the economic development, although the total quantity of freshwater reserves remain almost constant historically. Equitable distribution of transboundary water resources between and among riparian states is vital for the scientific community in terms of science-policy agenda. This is

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necessitated by the fact that almost 40% of global population are potential beneficiaries of shared water resources [7]. The optimism about collaboration between Afghanistan and Pakistan is based on the fact that nation states have far frequently collaborated on shared water resources than they have clashed over it [8].

Resolving transboundary water issues and conflicts has been challenging over the course of old and modern history. After the establishment of modern nation states, transboundary conflicts have been a common occurrence leading to geo-political tensions between co-riparian states. However, recent history also shows several good examples of transboundary cooperation between and among states that have ended in successful conclusion of transboundary agreements. Such cooperative agreements have been win-win for the participating parties or governments instead of zero-sum escalation of tension. The Mekong Treaty established in 1995 between Cambodia, Lao PDR, Thailand and Vietnam is an example of effective transboundary cooperation on Lower Mekong River Basin aimed at sustainable development of the co-riparian countries [9].

When Pakistan became independent after the end of the British Rule in 1947, tensions arose with India over the use and allocation of the transboundary Indus River, which required cooperation between the two riparian states. With the mediation of World Bank, India and Pakistan were able to successfully conclude the Indus Water Treaty (IWT) in 1960 determining water rights of both countries [10]. Despite its shortcomings, IWT is considered to be a fairly successful conflict resolution model, that Afghanistan can learn from going forward on its potential cooperation on Kabul River with downstream riparian Pakistan [11]. If political adversaries like India and Pakistan were able to reach transboundary cooperation agreement, it offers Afghanistan and Pakistan with some level of optimism to follow suit.

Although there is no universal treaty in place for the shared water resources to be regulated by co-riparians, the UN Convention on the Law of the Non-Navigational Uses of International Watercourses (referred to as the UN Watercourses Convention-UNWC) is considered as the most powerful available international legal instrument. It was approved by the UN General Assembly on 21 May 1997 and entered into force on 17 August 2014 [12]. The UNWC has been ratified by only 36 countries so far that exclude Afghanistan and Pakistan [12,13]. Thus, it is not legally binding on the two countries. Yet, the UNWC offers the two countries a good foundation and important criteria to start with and move forward toward cooperation [14]. When co-riparian states realize that the benefits of cooperation on shared water resources far outweigh non-cooperation, they prefer to engage with each other. [15].

The modern approach learned from international experience is based not on dividing water between and among riparians but equitably allocating benefits accrued from development of shared water resources [16]. This paper provides an in-depth analysis of transboundary water cooperation on Kabul River between Afghanistan and Pakistan including political, economic, legal, institutional and technical factors and goes beyond water.

2. Materials and methods

2.1. Data and information

The Kabul River on the Afghan side suffers from shortage of technical, engineering and hydrologic data as Afghanistan has continued to suffer from war, conflict and instability that has caused disruption in data collection, maintenance and preservation. Some limited technical data were available for this study mainly from secondary sources mainly the United States Geological Survey (USGS) and relevant documents and reports from the World Bank

and the United States Agency for International Development (USAID). Some studies have been conducted by Afghan government that were also used during the analysis.

On the transboundary issue of the Kabul River, a number of research studies have been conducted mostly by non-Afghan scholars and some by Afghan scholars in co-authorship with others. An extensive literature review of available papers on KRB was conducted that encompassed technical issues and broader perspective of cooperation. The author's personal experience in the Afghan government as former senior official was also helpful in understanding and analyzing the Kabul River's transboundary issues with Pakistan.

2.2. Methodology

The methodology used in the preparation of this paper is based on state-of-the-art review on transboundary water issues between Afghanistan and Pakistan, based on geographic, hydrographic, hydrologic, historic, institutional, legal and political aspects. The challenges have been identified and analyzed. Opportunities have been discussed and a path forward is presented based on mitigating the challenges that hinder progress on potential transboundary water cooperation on Kabul River.

An attempt was made to look at the historical evolution of cooperation on Kabul River even before the creation of Pakistan in 1947. Although limited progress has been made in the past, the information is significant and is used to build on for the way forward. The relevant legal framework in both countries has direct bearing on the process, the way the two riparians can and how will interact with each other and the framework of the dialogue. Afghanistan and Pakistan's institutional, legal, regulatory and policy framework have been looked into together with the roles of various institutions and their jurisdictions. The available international legal instruments have been assessed for their applicability to this particular context. The UNWC 1997, although not ratified by either of the two countries, provides a foundation for progress.

The political and economic dimensions are presented with associated challenges and opportunities. Politics has a strong defining role in decision-making with regard to transboundary cooperation. Frequent political changes including changes of regimes, political systems, government priorities both with upstream Afghanistan and downstream Pakistan influence the pace and direction of transboundary dialogue on Kabul River. A good understanding and analysis of the technical and engineering characteristics of the basin is vital for any cooperation model as it provides essential knowledge about the natural system and environment as well as the climatic conditions related to the basin. A technical assessment of the basin especially the potential impacts of KRB development on downstream riparian Pakistan is discussed to lay the foundation for further investigation in this regard.

The paper attempts to present a benefit-sharing framework in which the focus is not just on the classic water allocations between riparians. Instead, the benefits are diversified including those resulting directly from water resources development through equitable utilization and those going beyond water like increase in trade, improved political and economic ties, contribution to bilateral security and stability and increased trust. Quantification of benefits can become an important topic for future researchers and is beyond the scope of this paper.

3. Historical evolution of transboundary cooperation on Kabul River basin

The historical evolution of transboundary cooperation on KRB as summarized from Atef [17] and Thomas et al. [1] is shown

comprehensively in Fig. 1. The cooperation on Kabul River dates back to 1921 and 1933. The two agreements between the then British Empire and Afghan government have had no practical mean-

ing and/or enforcement with the end of the British empire and creation of Pakistan. In 2003 i.e. more than 50 years since Pakistan's creation in 1947, Pakistan initiated efforts to begin bilateral

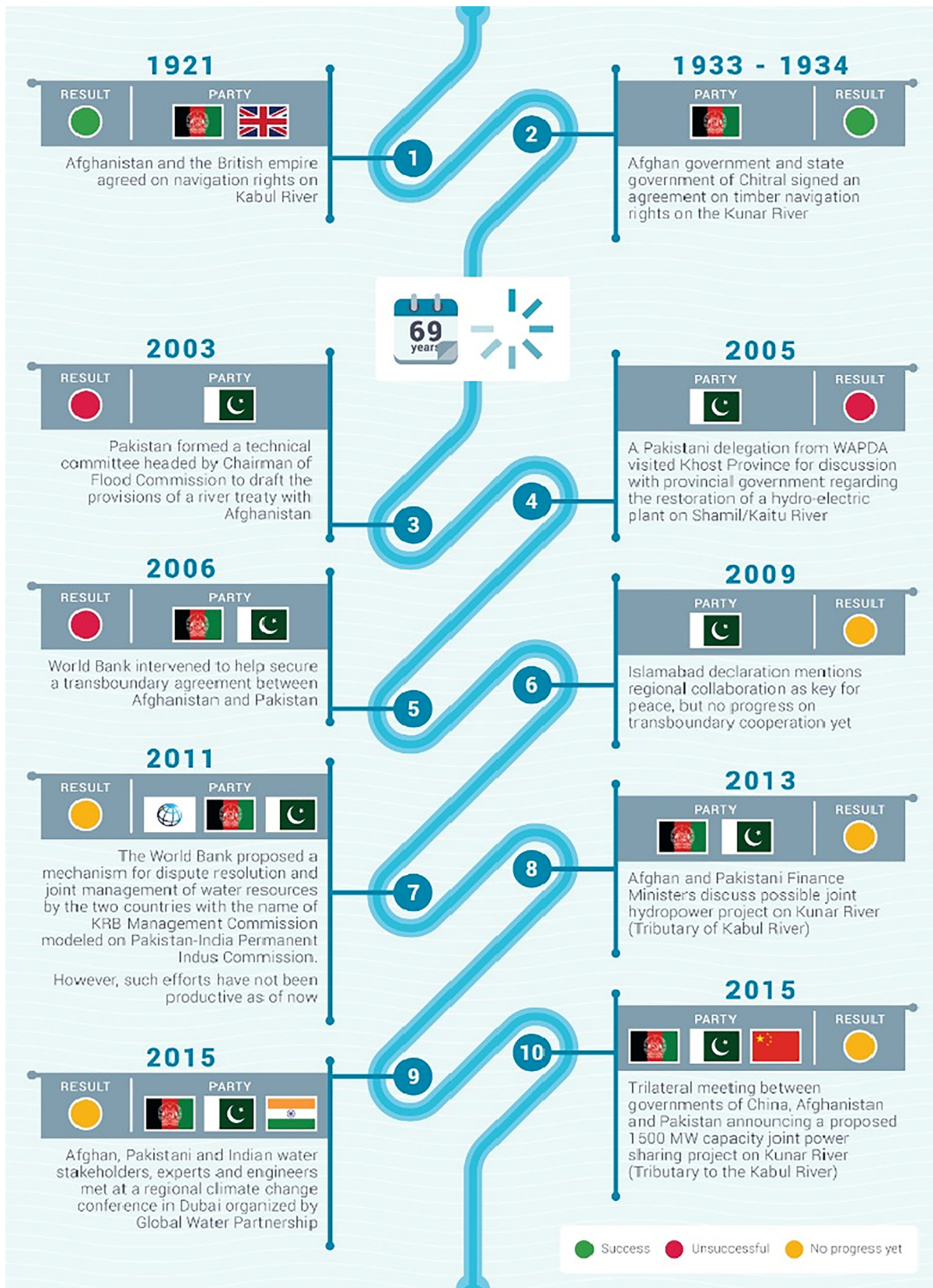


Fig. 1. History of cooperative measures on Kabul River (Reference [13]).

Table 1
International water treaties and lessons learnt for Afghanistan.

'Name of Treaty	Name of River/Basin	Year signed	Lessons learnt for Afghanistan
Indus Water Treaty (Pakistan and India)	Indus River	1965	In spite of tensions between India and Pakistan, the two were able to reach agreement. Afghanistan and Pakistan have far less tense relations and thus can reach agreement.
Israel Jordan Treaty (Jordan and Israel)	Jordan River	1995	Establishment of joint river commission, data bank and joint projects. Ambiguity on how water will be allocated in times of drought led to tensions. Power asymmetry can lead to lack of implementation. Afghanistan and Pakistan have somewhat resemblance in terms of power imbalance.
Mekong Water Treaty (Thailand, Vietnam, Cambodia and Laos)	Mekong River	1995	The Mekong River Basin countries duly recognized the immense value of the Mekong River and its associated natural resources and environment for the economic and social well-being and living standards of their peoples. The treaty goes beyond allocation of waters among participating states toward sustainable development of the basin countries. Both Afghanistan and Pakistan can follow similar path forward beyond the narrow focus of water sharing.
Ganges Water Treaty (India and Bangladesh)	Ganges River	1996	The treaty is seen to have favored India, which is perceived to be a hydro-hegemon compared to weaker Bangladesh. It is based on water allocation rather than benefits sharing. Afghanistan, being an upstream riparian, is occasionally considered a hydro-hegemon. While Pakistan more powerful militarily and economically is some time tagged as hydro-hegemon. It is important for both Afghanistan and Pakistan to cooperate on Kabul River in a more equitable manner without the hydro-hegemonic perception.
Helmand Water Treaty (Afghanistan and Iran)	Helmand River	1972	Although water sharing with riparian is generally perceived to be undesirable among Afghan politicians, the Hilmand water treaty with Iran signed by former Afghan Prime Minister Musa Shafiq is still recognized by the Afghan government as a valid agreement and feasible for Afghanistan. It is also considered as a diplomatic achievement.

Source: [19–26].

cooperation with Afghanistan on Kabul River but without any perceived progress till 2013.

As evident from Fig. 1, from 2003 till 2013, there has not been notable progress toward reaching some kind of transboundary cooperation mechanism. However, in August 2013, there was a kind of breakthrough when finance ministers of the two countries discussed the possibility of building a joint hydropower plant on Kunar River, a major tributary of the Kabul River, with 1500 MW capacity based on benefit sharing principle [18]. They also agreed to make progress toward the Kabul River Basin Management Commission. The idea was further promoted in 2015 when representatives of Afghanistan, Pakistan and China met and further elaborated the concept [17]. However, no concrete results have yet come out mainly due to the conflict in Afghanistan and the political tension between the two countries.

4. Lessons learnt from international experience

Transboundary cooperation agreements like Israel-Jordan Treaty, IWT, Ganges Water Treaty and Mekong Treaty offer successful models of cooperation on shared water resources. Table 1 presents useful lessons from these treaties for Afghanistan and Pakistan on KRB.

Each of the above-mentioned treaties have inherent lessons to be drawn by Afghanistan in various policy domains. For example, IWT was concluded between Pakistan and India having tense relations over Kashmir. In a similar manner, Afghanistan and Pakistan should not use their historically tense relationship over Durand Line as an excuse to hinder progress on transboundary cooperation. It is understood that there is no one-size-fits-all model that can be replicated as each basin is unique having peculiar hydrologic, climatic, geopolitical and economic context that affects both the negotiation process as well as the eventual cooperation mechanism that is ultimately agreed between riparians.

5. Political context

5.1. National sovereignty & riverine integrity

Rivers follow the rules of the nature by flowing across political boundaries, with nation states more inclined to treat them as their own national resources within their sovereign authority so far as

they remain within their territories [27]. This explains the most common challenge to transboundary cooperation between and among riparian states. Both Afghanistan and Pakistan follow this pattern of thinking. The dominant view in Afghanistan is that it has the sovereign right of use of available water resources within its territory in line with its national sovereignty. On the other hand, Pakistan believes it is entitled to its historic use of the water using the riverine integrity thus foreclosing Afghanistan's just right to use its waters for its current and future needs. The issue is addressed by the UN 1997 Convention with twin principles of "equitable and reasonable utilization" and "No Significant Harm". If the two countries hold on to both principles, the issue can be addressed. However, there are neither quick fixes nor short cuts to achieving transboundary cooperation as it has historically remained a complex and lengthy process full of daunting challenges [28].

5.2. Power asymmetry

In the domain of politics, power is defined as the ability to influence a particular course of action because of some inherent qualities in terms of military and economic strength, knowledge, institutions, geographic location or having upper hand in any concerned jurisdiction. The exercise of power to impact transboundary relations between Afghanistan and Pakistan is discussed here.

For some understandable reasons including but not limited to Afghanistan's limited hydro-meteorological capacity, shortage of expertise and lack of capacity to negotiate at international platforms, the country seems less enthusiastic to engage in regional transboundary dialogue [29]. On the other hand, international community, particularly the World Bank and USAID have offered to mediate over the past years in promoting transboundary dialogue between Afghanistan and Pakistan on Kabul River [30]. The country's water sector has been led recently by mostly young graduates with some project management knowledge, but no policy-level dialogue capacity.

Disparities between co-riparians in terms of socio-economic development, water management capacities, infrastructure development, the maturity of political and legal institutions pose challenges to effective and coordinated development as well as to the joint management of transboundary water resources. On the positive sides, such differences also open new avenues for cooperation

in capacity building and promotion of social and legal institutions [28]. Comparison of economic indicators between Afghanistan and Pakistan, as reported by the World Bank [31,32], is illustrated graphically in Fig. 2.

Fig. 2 clearly shows that Afghanistan is an aid-dependent country with much smaller GDP compared to Pakistan. For example, Official Development Assistance (ODA) in terms of percentage of GDP for Afghanistan is 21 times that of Pakistan, implying Afghanistan's over-reliance on foreign assistance compared to Pakistan.

Afghan-Pak trade is much more significant for Afghanistan than it is for Pakistan. This is supported by the fact that almost 45% of Afghanistan exports are to Pakistan, which for Pakistan translates into less than 0.5% of its imports. Thus, trade reliance on Pakistan makes Afghanistan in less advantageous position in terms of economic power asymmetry [1]. In terms of material and political power, magnitude and dependency of trade, technical and institutional capacities, Afghanistan is no match to Pakistan. Thus, Afghanistan is concerned that negotiations over transboundary

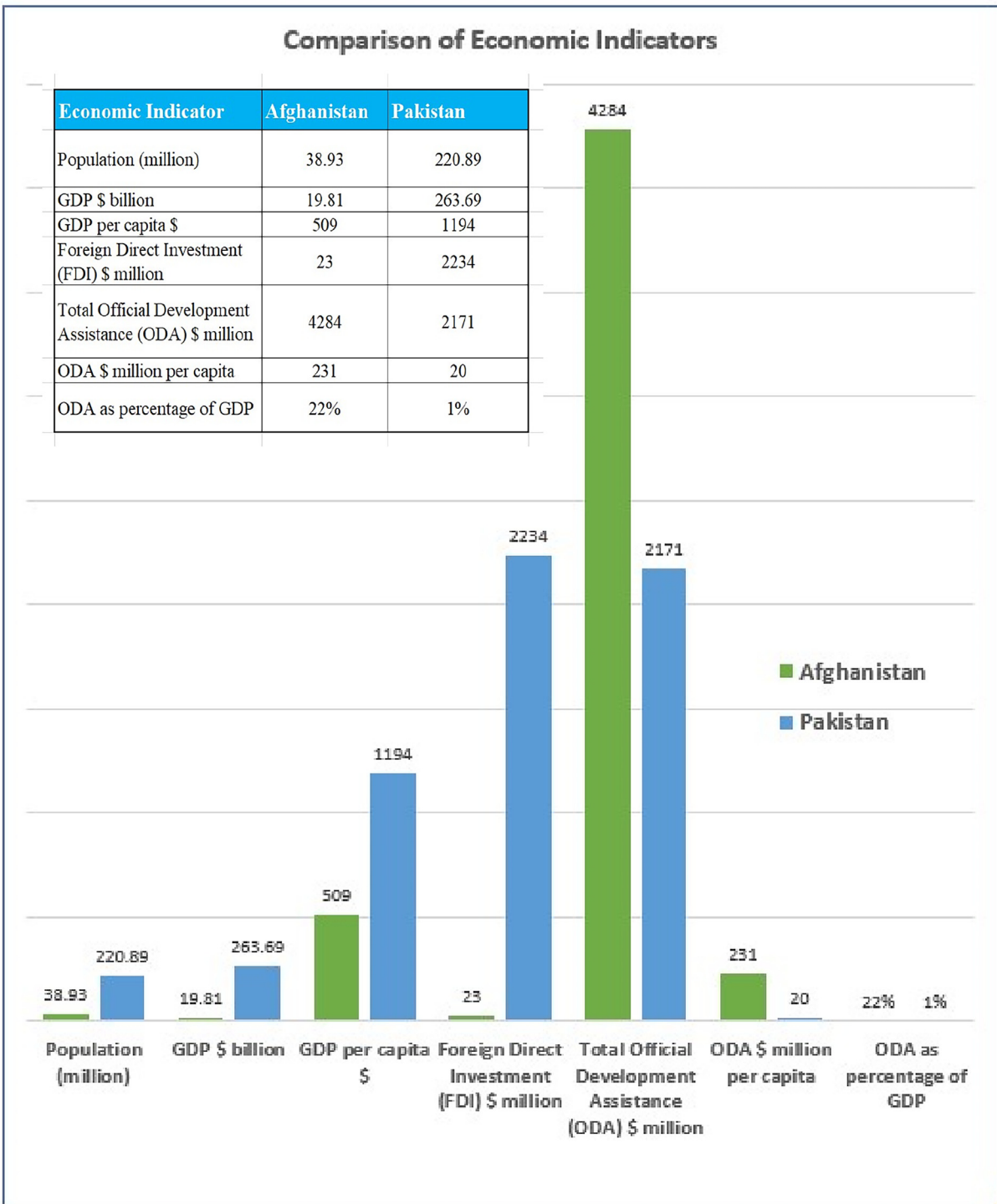


Fig. 2. Comparison of economic indicators between Afghanistan and Pakistan, Source: [31,32].

cooperation in an environment of acute power asymmetry may not be to its advantage.

While Pakistan is in much more advanced stage in its water resources development, Afghanistan is in the very early stages of planning for new storage facilities for irrigation and hydropower and rehabilitating the existing facilities. Afghanistan has been in war and conflict for the past four decades, while Pakistan has been relative stable politically and economically. The power asymmetry between the two countries also makes it difficult for the transboundary dialogue to move forward in a fair and just manner. Hence, there are concerns that there is no level playing field for the transboundary dialogue at the moment.

5.3. Political aspects

According to Julien [33], the central theme of hydro-politics is more about *politics* than *water*. Truly said, transboundary analysis of the KRB requires a broad and comprehensive political context of the two riparian states. Because of the multiplicity of sectors, factors and institutions, there is no one size fits all model that can be applied to all basins. KRB requires unique approach and roadmap. However, technical knowledge is a critical element of political analysis. Although detailed political assessment is fundamental to the subject of transboundary water, a sound technical assessment is vital for the process [34].

Afghanistan is ranked 9th out of 179 countries in the Fragile States Index 2021 by Fund for Peace, A US based think tank. It has a fragility score of 102.1 out of the maximum 120 This is based on the country's security, political, economic, social and multiple indicators [35]. Also, as per the World Bank's 2022 list of fragile states, Afghanistan is categorized as the most fragile state in the world [36].

As is typical of fragile states, outdated laws and regulations remain in force that are hardly compatible in resolving modern state-to-state issues leading to informal norms being frequently applied [37]. In such countries, like Afghanistan, what is implemented on the ground is often no match to what official policies dictate. Informal institutions sometime bypass formal decision-making bodies.

With Afghanistan's position as an upstream "later-developing" country, its intent to develop its largely underutilized water resources are justified. However, potential questions arise from downstream riparians as well as international donors hindering Afghanistan's smooth journey to develop its water resources. Thus, the need to have transboundary cooperation frameworks including on the Kabul River with Pakistan is understandable [1,30].

In the past, Afghan government has frequently argued that its "lack of essential capacity to negotiate" caused by long conflict significantly limits its ability to engage in dialogue with Pakistan on KRB. According to some Afghan academics and water experts, dialogue seems to be a better course of action and in the best national interest leading to improved relations with neighbors [1]. An environment of distrust between the two riparians further aggravates flow of accurate and reliable data and information, which is an essential pre-requisite and starting point for laying the groundwork for any type of transboundary water cooperation mechanism.

A survey by Jinnah Institute and funded by the Pakistani government identified water as one of the major security challenges for Pakistan [11]. Hence, engaging in water diplomacy with neighbors is more of a priority for Pakistan than it is for Afghanistan that enjoys the hydrographic superiority of being the upstream riparian. Yet, Afghanistan has also increasingly realized that in order to attract international community's much needed financing of its water infrastructure in the Kabul River Basin, transboundary cooperation with Pakistan is in its own interest [38].

5.4. Greater political will and interest by the international community

International experience shows that water conflicts ultimately get resolved even between hostile neighbors. The inter-governmental Mekong Committee, established in 1957 among Vietnam, Laos and Cambodia continued the flow of water resources data even during Vietnam War. Similarly, the survival of the Indus River Commission is another example of institutional integrity despite two major wars between Pakistan and India [39].

Till 2013, the dominant view within the Afghan government was unilateral resource capture strategy and the government had a sense of hesitancy with regards to transboundary water dialogue. However, a preliminary discussion of joint management and cooperation on Kunar River, which is tributary to Kabul River opens a window of opportunity for cooperation. Also, the Afghan government completed transboundary water policy in 2013, which is clear shift from government's previous approach [1].

In recent years, there were signs of political will on transboundary cooperation from Afghan government. Former President Ghani, while speaking at 4th National Water conference held March 8–9, 2017, stressed the importance of discussing water issues with Afghanistan's neighbors to help ensure stability and certainty in water resource management [40]. Also, at the "Water for Life" 2005–15 conference in Dushanbe, former Chief Executive Dr. Abdullah Abdullah noted that "water can and should become a resource for friendship, growth and economic integration" and added that "Afghanistan is now in a position to engage more constructively at the regional and bilateral levels to address win-win solutions with our friends and neighbors, based on international legal guidelines and prior experience, taking into account the legitimate interests of all stakeholders" [41].

Speaking to a conference Former President Hamid Karzai said "Afghanistan wished to have good relations with our neighbors. Whatever water rights our neighbors are entitled to will be given to them, however, Afghanistan also has the right to use water for its own development and construct dams" [42]. Afghanistan Water Law of 2009 defined transboundary river as the one that flows on common border between Afghanistan and a foreign country. By this definition, only Amu River qualified for being a transboundary river (flowing on common border with Tajikistan, Uzbekistan and Turkmenistan), while all other rivers were considered as being Afghanistan's internal rivers. However, the new Water Affairs Management Law of 2020 has re-defined the transboundary water as that which flows from the territory of Afghanistan into another country. This is an important shift in Afghan government policy toward transboundary water cooperation [43,44].

There is also a high level of interest from the international community and international financial institutions like World Bank, Asian Development Bank, United States Agency for International Development (USAID) and the European Union to pay attention to the water resources development of Afghanistan including transboundary water resources [45,46].

In 1973, Afghanistan and Iran signed an agreement on Helmand River that determined Iran's allocation from the Helmand River [47]. Musa Shafiq, the then Afghan Prime Minister who signed the treaty on Afghanistan's behalf, is highly celebrated by Afghans for this remarkable diplomatic achievement. This demonstrates Afghans' pro-cooperation mindset on shared water resources in spite of their reservations on deals with neighbors on national water resources [25,26].

5.5. Transboundary cooperation and economic integration

Water has quite often acted as a uniting than a dividing force for communities and nations through dispute and conflict resolution mechanisms. During the last 70 years, only 37 serious water con-

licts have been recorded while 295 transboundary agreements have been signed. Riparians have increasingly realized that cooperation on shared waters protects their economic interest more effectively than non-cooperation [28].

However, political will and national consensus especially in democratic governments are important prerequisite for successful cooperation in all stages of transboundary water management. Transboundary water cooperation often leads to increase in cross-border trade, regional stability and integration, food security and poverty alleviation [48]. KRB cooperation is expected to enhance trust and enhance Afghanistan's trade via Afghanistan Pakistan Transit Trade Agreement (APTTA) to many regions of the world. Also, trade with India via Pakistan offers much shorter and economic route significantly reducing costs by replacing longer alternative routes and air transportation. Despite APTTA, trade with India via Pakistan through Wagha Border has never been smooth and replete with obstacles often of political and security nature [49]. The benefit sharing framework proposed in this paper should propose among others an easy trade route for Afghanistan to India via Pakistan with reduced bureaucracy and increased incentives. Similarly, Afghanistan can reciprocate by facilitating Pakistan's trade with Central Asian states.

There are also existing and planned regional projects connecting Asia to South Asia via Afghanistan. These include electricity transmission project Central Asia South Asia (CASA-1000) and Turkmenistan-Afghanistan-Pakistan-India (TAPI) natural gas pipeline project. Both projects have already been inaugurated. These projects of regional dimension where Afghanistan is acting as a transit country for these mega regional infrastructure projects in the energy sector also raise optimism for transboundary water cooperation between co-riparians. [50,51].

6. Institutional and legal context

6.1. Knowledge and information constraints

Robust dialogue on KRB is hampered by several limiting factors including Afghan decision makers' lack of sufficient knowledge of the critical issues, future development initiatives and relevant international laws and smart international water management practices as applicable to KRB [1]. Furthermore, lack of hydro-metrological data hinders Afghanistan's active involvement in transboundary negotiations with co-riparians [52]. The other issue is related to the general knowledge gap on the Afghanistan side, which is indicative of acute imbalance of knowledge and research related to KRB conducted by Afghan experts. According to SCIMAGO Institution Ranking, Afghanistan is ranked 149 out of 240 countries with citable research documents of 1841 during the period 1996–2020. This is significantly lower than Pakistan, which is ranked 46 out of 240 with 197,242 citable research papers during the same period [53]. This is one of the many challenges on the part of Afghanistan resulting in disadvantage for the country at the negotiating table.

6.2. Institutional arrangements

Riparians cost less and benefit more through cooperation on shared water than confrontation although creating the right institutional framework to manage cooperation is often difficult to achieve [54,55].

On the Afghan side, several transboundary water-related entities were established including the Supreme Council of Water and Land, the Transboundary Water Commission (TWC) and transboundary division within Ministry of Energy and Water. However, there are no reports of any activism on the part of these entities.

The mere establishment of institutions without an active work plan may not be helpful [56]. Additionally, Afghan agencies are quite reluctant to share available Kabul River Data. Most international publication and reports are based on Afghanistan Watershed Atlas produced under a joint project of the United Nations Development Program (UNDP), Food and Agriculture Organization (FAO), and Afghanistan Information Management System (AIMS) [57]. Afghanistan seems to have gained enough institutional capacity, but such capacity only remains in documents. For example, TWC has not met even once since its establishment [56].

There are two main agencies responsible for leading the water resources sector in Pakistan, the Water and Power Development Authority (WAPDA) and Ministry of Water Resources (MoWR), both under the domain of the federal government. While MoWR is more policy oriented, WAPDA is more of an executing body [58,59]. For potential transboundary dialogue with Afghanistan, in addition to WAPDA and MoWR, other agencies like the Indus River Authority and Federal Flood Commission also get involved. But most importantly, Pakistan's foreign ministry has an important role to play.

Compared to Afghanistan, Pakistan has well established institutional framework with rich technical, information and knowledge resources. A transboundary dialogue between riparians with asymmetrical institutional capacities will add to the challenges of the overall process given Afghanistan's concerns regarding its institutional deficiencies [60]. Given this situation, Afghanistan must do its homework to enhance its institutional capacity before sitting for transboundary dialogue.

6.3. Legal framework

The main challenge with transboundary water quantities is the absence of internationally applicable rules for distribution of shared water resources or benefits thereof between and among riparians. The 1997 UN Convention also does not offer any guidelines in this regard although it offers qualitative rules of engagement for 'equitable and reasonable utilization' and 'no significant harm'. According to Odom & Wolf [6], it is virtually impossible to define quantitative rules for water resource that are mobile, spatially and temporally variable and disregard political boundaries. Currently, there is no bilateral mechanism between Afghanistan and Pakistan to provide a platform for discussion and consultation on transboundary issues for various stakeholders like academia, think tanks, research institutes, community groups, private sector and media organizations [52]. Although, maneuvering through the available international legal system to find feasible way to transboundary solution for Kabul River seems difficult, the UN 1997 Convention does provide a broader framework for opening avenues for cooperation.

7. Technical, engineering & hydrologic characteristics

7.1. Water resources data availability and exchange

Transboundary water management requires adequate and reliable hydrologic and water resources data to be exchanged by the concerned riparians. Yet, despite the proven need and even after signing formal agreements, exchange of data tends to be more complex and challenging in the case of transboundary basins [61]. One of the success factors for Mekong River cooperation has been an effective data exchange mechanism [62]. If Afghanistan and Pakistan will move forward on potential cooperation on KRB, effective data sharing will remain challenging given the lack of trust between the two neighbors.

On the Afghanistan's side, data availability is a major issue with decades of hydrological data gap, which is a pre-requisite for the transboundary dialogue. According to Duran Research and Analysis, data from various governmental agencies differed or contradicted each other by 30–40% [56]. Also, almost 127 hydrological stations rehabilitated through USAID and WB support are not fully functional and not providing accurate data to be used. Security constraints, lack of skilled personnel and insufficient operation and maintenance further limit smooth and reliable data collection. Compared to this, Pakistan has a fairly well-established water resources monitoring and forecasting institutions such as WAPDA. But although Pakistan has enough data, it is not willing to share data with Afghanistan [63].

Zeitoun and Mirumachi [64] believe exchange of data and information between riparians as one of the components of the larger institutional framework for transboundary water cooperation. In order for the negotiations to make progress, both countries must be willing to exchange whatever technical data is available on both sides. Also, a uniform method of measuring river flows should be institutionalized. Data and information sharing is vital during negotiating the transboundary cooperation as well as operationalization of the cooperation model.

7.2. Water use, scarcity and dependency

Transboundary governance requires collective action for the hydrologic and ecologic integrity of the basin as dictated by the natural hydrologic cycle. Isolated intervention in the shared basin by one nation state can potentially impact the other [65].

On Afghanistan side, the KRB is significantly underdeveloped. Overall, the rate of utilization of surface water resources is less than a quarter and the groundwater usage is less than one-third of the total available potential. On the other hand, Pakistan uses its water resources more intensively and extensively compared to Afghanistan. The overall usage of available surface water by Pakistan is in the range of 70 % while groundwater extraction is considered to have exceeded the annual recharge. The fast rate of groundwater depletion is also manifested by the fact that Pakistan is ranked second in the world in terms of groundwater abstraction for irrigation [1]. For the upper riparian Afghanistan, water resources management has always been a challenge as almost 90 % of them are shared with neighbors. Kabul River contributes almost 13 % to the Indus River Basin within Pakistan [1,66].

Afghanistan has extremely low storage capacity. It is less than 3 % of the total annually generated surface waters [1]. Compared to Afghanistan, Pakistan has a higher storage capacity, but availability is scarce. The per capita availability of renewable water in Pakistan could be as low as 1000 m³, which is considered significantly lower compared with the global average. Afghanistan has been trying hard to increase its national storage capacity for its hydropower and irrigation needs with focus mainly on hydropower from the Kabul River. The country suffers from acute electricity shortage with current household connections of only 28% [67].

7.3. Potential impacts of KRB development

Pakistan claims if Afghanistan proceeds with its intended plan of building 13 dams on Kabul River, it will reduce the flow into Pakistan by 15–20% [68]. Pakistan insists on “historic rights” and “prior use” as principles for future development [69]. However, no scientific evidence has been put forward to support the claim of flow reductions [30].

Absent a cooperation mechanism on Kabul River, Pakistan could potentially divert water from River Chitral, a tributary to Kabul River, affecting the natural flow regimes into Afghanistan.

However, given the rough terrain, such diversion could be technically difficult and neither financially nor economically feasible for Pakistan other than harming Afghanistan [70].

As mentioned earlier, Afghanistan's needs from Kabul River are mostly focused on non-consumptive use i.e., hydropower generation. Thus, withdrawals in case of future developments will be limited. As per the World Bank's Report, the combined effect of the six major planned dam projects including Gulbahar, Baghdara and Shahtoot in the Upper Kabul Basin and Gambiri, Kama and Kunar in the lower Basin will result in only 3 % of the overall flow reduction towards Pakistan, which is not considered significant contrary to the concerns raised by Pakistan [1]. As per World Bank (2013), development of water resources with limited potential for irrigation in the upper portion of the basin will have minimal impacts downstream on Pakistan [71].

8. Benefit sharing as a way forward

Benefit sharing is defined as “the process where riparian states cooperate in optimizing and equitably dividing the goods, products and services connected directly or indirectly to the watercourse or arising from the use of its waters” [72]. Globally, there are several successful examples of transboundary cooperation through benefit-sharing principle. For example, the governments of Senegal, Mauritania, Mali and Guinea were able to build hydropower plants on shared Senegal River with equitable benefits for all [73]. Through benefit-sharing, the riparians achieve the goals of water, energy and food (WEF) nexus resulting into regional cooperation. In this context the river basin is seen more of a resource basin and not just a water basin [74].

Sadoff and Grey [72] have categorized the benefits of cooperation on transboundary river into four types. We have applied these to the Kabul River as a benefit framework presented in Fig. 3.

Vinca et al. [75] demonstrated that bilateral and multilateral cooperation among states of the Indus Basin would reduce the overall cost of sustainable development by 9 %. Also, Kabul, Punjab and Sindh will witness reduced water stress from such cooperation. Thus, managing transboundary water resources in the Indus basin beyond country-centric thinking can deliver long-term benefits in addition to the immediate benefit of conflict resolution.

Flood and drought management, as part of the transboundary cooperation, is a potential opportunity for both Afghanistan and Pakistan. Storage dams on the upstream (Afghanistan) side can help mitigate both floods in times of high flow and provide water supplies in times of low flow. It can also benefit downstream Pakistan in both cases. It can protect downstream Pakistan from high flood volumes, but at the same time water can be released to help manage droughts. For example, when the Mekong River basin suffered from a severe drought in 2016, China agreed to release water to help Vietnam manage its water shortages [76].

Afghanistan's location offers a natural land bridge between Central and South Asia. On the occasion of Seventh Heart of Asia Conference at Baku, Azerbaijan in 2017, Former Afghan President Ashraf Ghani highlighted his country's potential for regional connectivity, cooperation and trade [40]. Transboundary cooperation is important component of regional cooperation.

Managing risks of water hazards is particularly complex in transboundary basins. Historical flood record shows that international river basins are more vulnerable to flood disasters. Yet, flood management is rarely a priority within the scope of transboundary agreements [77]. Establishment of early warning system could become a component under the potential cooperation framework to mitigate flood damages in downstream Pakistan. Similarly, joint response to drought management can be part of the cooperation.

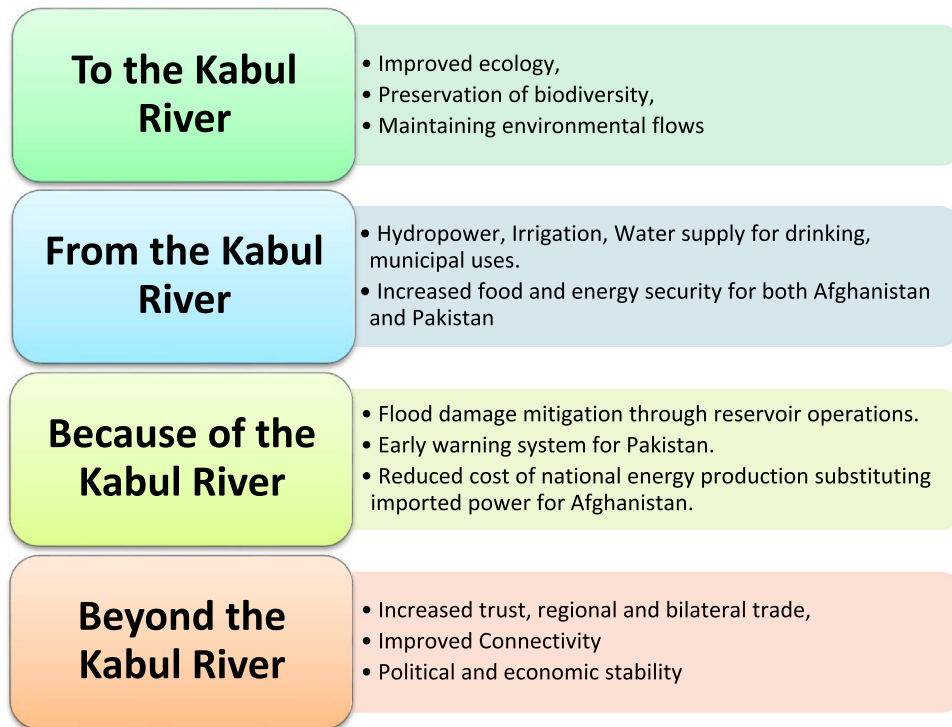


Fig. 3. Benefits framework of transboundary cooperation on Kabul River.

9. Results and discussions

9.1. Key findings

International water conflicts often take longer to be resolved. For example, Indus, Ganges and Jordan water treaties took 10, 30 and 40 years respectively to be signed [78]. Thus, there are no short cuts to the proposed Kabul River Treaty given all the political, institutional and hydrologic complexities. Sustainable water resources management within the national boundaries is more of a technical and institutional issue. However, when water resources transcend national boundaries, mere technical solutions do not work without hydro-political aspects being effectively addressed [79]. This paper has, therefore, looked upon the transboundary cooperation for KRB through multifaceted approach. IWT offers a characteristic example of transboundary water cooperation through the mediation of the World Bank. Afghanistan and Pakistan have the opportunity to learn from IWT to work out transboundary cooperation model on the Kabul River.

Potential adverse impacts of developing transboundary resources can be addressed through adequate legal framework, effective institutional arrangements and joint strategies for sharing benefits and associated costs [28]. Despite power asymmetry between Afghanistan and Pakistan and the latter's military and economic advantage over former, there is no reason for Afghanistan to be intimidated. Pakistan itself was not intimidated by India's more powerful position during the IWT negotiations [80]. It is also important to note that Afghanistan enjoys the geographic power being on the upstream riparian although in terms of material power it is at a disadvantage.

The proposed framework is based on the paradigm shift from traditional engineering-oriented water management practices focused on technological solutions to much broad-based approach covering political, socio-economic, environmental, biodiversity, ecosystem and climate change issues [81]. However, it is important

that in the early stages of transboundary negotiations, the focus of both Afghanistan and Pakistan should be technical matters and data sharing. Starting from purely political considerations may not be helpful.

The popular view in Pakistan is that Afghanistan and Pakistan should go for transboundary cooperation on Kabul River [67]. However, there is a long way before such consensus can be built within Afghanistan government, communities, general public, academia and political intelligentsia.

9.2. Negotiation process

Given the complex relations between Afghanistan and Pakistan and protracted conflict in Afghanistan, reaching a cooperation model for KRB shall be a challenging task. This paper proposes a framework of cooperation that is not rigid and static but more dynamic and flexible as the path to solution could be complex.

Fig. 4 shows a process-based approach showing logically sequenced steps from the start of dialogue till agreement on a cooperation model. The process, however, may not be linear and could involve multiple rounds of discussions with associated challenges and obstacles. Genuine political will from both parties is the key to the success of agreeing on basic principles and detailed modalities of cooperation. However, Afghanistan and Pakistan alone without mediation from a third party like the World Bank will be unable to move forward given the current geo-political tensions.

Referring to Fig. 4; Either Pakistan or Afghanistan or both can take initiative of the transboundary dialogue process or alternatively based on the World Bank's previous interest in the matter, it can offer to mediate to kick-start the dialogue. Fig. 4 also proposes potential participants for the dialogue. A detailed engineering analysis of the basin is a pre-requisite. This could be conducted through experts from both governments as well as third parties like the World Bank and the United Nations to prevent any potential bias.

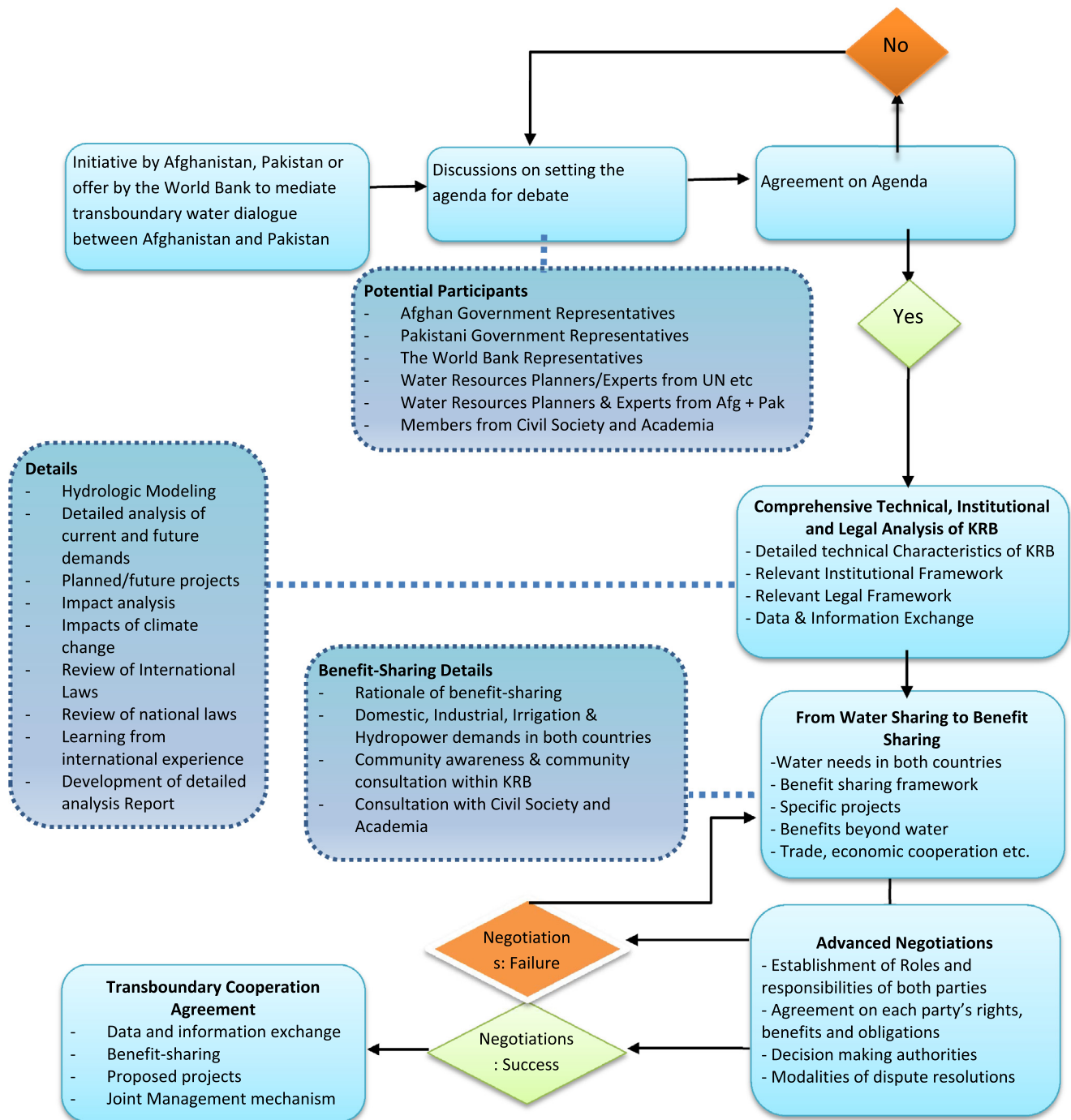


Fig. 4. Negotiation process.

In addition, the relevant institutions on the sides need to be thoroughly reviewed. The applicable national and internal water laws and legal instruments must be thoroughly reviewed to help determine the way forward on the cooperation mechanism considering the hydrographic and hydrologic characteristics of the basin.

As highlighted in this paper, a classic water-allocation based treaty is less popular in today's hydro-politics, the two sides will work to devise a strategy that does not divide water but benefits from the basin that can be equitably and fairly accrued by both riparians. These benefits will go beyond water and help promote

bilateral relations in terms of politics, economics and trade in addition to improving the ecology of the basin for environmental sustainability. Once a preliminary conceptual framework is developed on benefit-sharing, the two parties will enter into serious and detailed negotiations to determine exactly what needs to be done by each side in terms of practical measures. The timelines for all actionable items must be specified. The negotiations will also determine each party's rights, benefits and responsibilities on the agreed cooperation model. An effective dispute resolution will be an integral component of the cooperation mechanism.

9.3. Proposed cooperation model

Every shared basin is unique, having peculiar hydrology, historic uses and distinct geo-political relations between co-riparian states. Thus, in every situation, cooperation needs to be specifically defined. Effective cooperation can range from simple information sharing to a more integrated planning, development and management of the overall basin [15].

The proposed model is presented in Fig. 5. Transboundary cooperation is at the heart of overall benefit-sharing framework that some sources refer to as basket of benefits instead of benefit centered on just water. It is premised on sharing of benefits rather than sharing of water. Without transboundary framework, there will be business as usual characterized by high level of mistrust, hesitation of the two riparians to invest in KRB and higher transaction costs of non-cooperation incurred to both countries.

The model combines technical, institutional and water management elements that reinforce and complement each other (Fig. 5). Exchange of data and information between riparians is at the heart of any transboundary cooperation [61,82]. The proposed model will ensure the two riparians exchange accurate hydrologic data on KRB in a timely manner. This will be especially critical for drought and flood forecasting. As per recommendations of the 1966 Helsinki Rules, each riparian state within the international basin is required to share relevant information with other riparians as needed [83].

Furthermore, the UNWC also obligates the basin states to regularly exchange hydrologic and other environmental data and information on planned projects in the form of prior notification for any harmful impacts on the riparians [12]. It is noteworthy though those harms are traditionally thought to flow downstream, which is not true. Downstream riparian can harm the interests of

upstream states by building water infrastructure on shared waters without notifying the upstream state thus essentially foreclosing future uses by upstream states [84].

The benefit-sharing framework is supposed be implemented by both parties and any planned projects within the basin shall be covered under the framework for potential benefits and costs to both parties. The two parties will hold regular meetings as well as meeting warranted by unexpected events and circumstances. The cooperation model calls for the establishment of a joint commission for the KRB as is typical in many other international basins. The framework will specify all benefits from transboundary cooperation. Some of the benefits can be directly valued including hydropower, agricultural goods from increased irrigation coverage, increased trade. Other benefits including environmental and ecological services, savings from drought and flood mitigation measures can be indirectly quantified and valued. Each party's benefits can be listed and agreed upon as part of the benefit-sharing framework.

10. Conclusion

It is concluded that any potential cooperation on Kabul River has to be based on benefit sharing rather than water sharing. Transboundary cooperation between riparians is always hard to achieve and more so between Afghanistan and Pakistan on Kabul River. The two countries have had political tensions over disputed Durand Line, the de-facto border between the two countries which has not been recognized by Afghanistan as de-jure international border. Despite these challenges, the two countries need to realize that cooperation is better than the status quo, which does not sever the water interests of either. International financial institution like

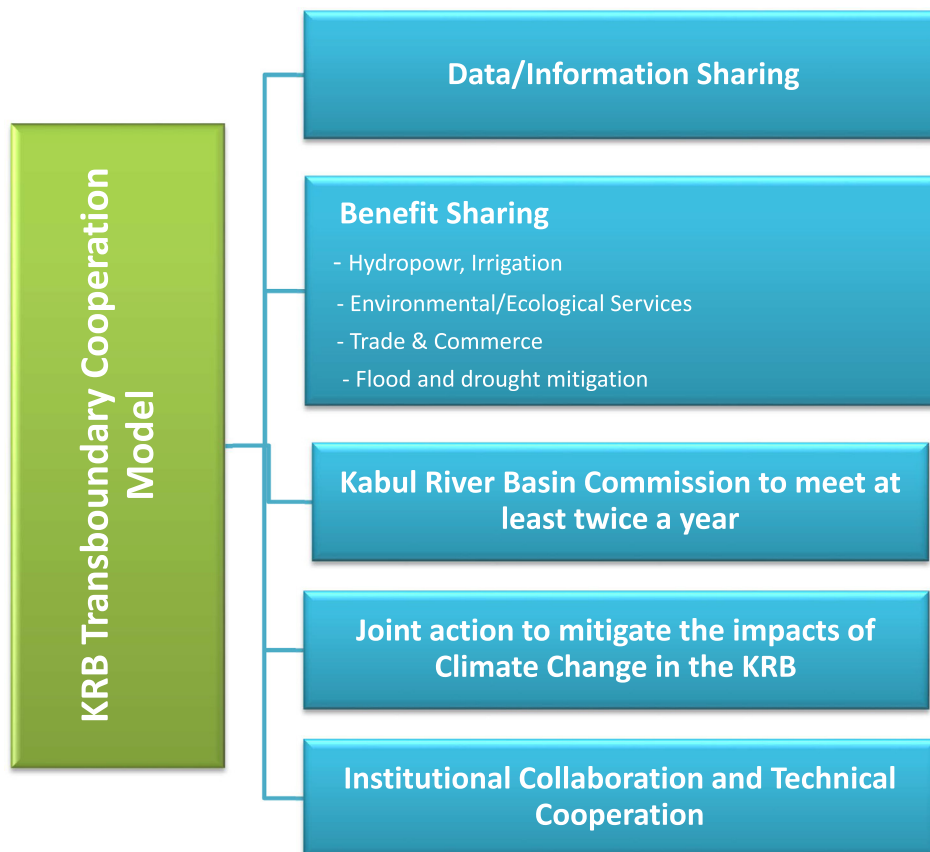


Fig. 5. Proposed KRB transboundary cooperation model.

the World Bank and others will be more reluctant to invest in KRB absent transboundary cooperation. (Provide reference in the results and discussion part, not here).

In the past, no serious efforts have been made by either side to reach some kind of cooperative agreement on Kabul River. Genuine efforts require a thorough technical and hydrologic analysis, data sharing mechanisms, legal analysis and political negotiations. The classic water sharing agreement may not work although the end result could be water allocation but based on comprehensive benefit-sharing principles. Such benefit sharing should form the basis considering the various needs of the two countries and in light of all applicable international legal instruments. It is worth-mentioning that benefit-sharing is in essence an equitable distribution of shared water resources.

It is also realized that reaching any conclusion may be extremely hard without an intermediary like the World Bank, which would potentially become financier of large-scale water infrastructure within the Kabul River Basin.

This paper has attempted to contribute a new path forward/approach for the policy and decision-makers in both countries considering both technical and non-technical, water-related and non-water related issues. It proposes a solution premised not purely on water needs or water rights claimed by the two riparians, but rather on wider dividends in political and economic spheres beyond water that can be reaped resulting from transboundary cooperation on Kabul River.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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