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Water conflict management and cooperation between Afghanistan and Pakistan

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ABSTRACT

Managing water resource systems usually involves conflicts. Water recognizes no borders, defining the global geopolitics of water conflicts, cooperation, negotiations, management, and resource development. Negotiations to develop mechanisms for two or more states to share an international watercourse involve complex networks of natural, social and political system (Islam and Susskind, 2013). The Kabul River Basin presents unique circumstances for developing joint agreements for its utilization, rendering moot unproductive discussions of the rights of upstream and downstream states based on principles of absolute territorial sovereignty or absolute territorial integrity (McCaffrey, 2007). This paper analyses the different stages of water conflict transformation between Afghanistan and Pakistan. It first examines historical disputes between the upstream and downstream riparians, revolving around contending rights claims, resulting in zero-sum confrontations with one party's loss as another's gain, possibly ending in confrontation. The paper then formulates a decision support tool, a mechanism for transforming conflict into cooperation, and concludes by introducing practical methods for identifying basin needs and sharing benefits, enabling riparians to negotiate a win-win process.

1. Introduction

As the global experience with shared waters has become more nuanced and sophisticated, a process is beginning to emerge that brings some order to the vast amount of information and disciplinary expertise necessary to move from conflict to cooperation (Delli Priscoli and Wolf, 2009).

Interest in water resources based conflict resolution has increased over the last decades (Dinar, 2004) and various quantitative and qualitative methods have been proposed for facilitating conflict resolution, including, but not limited to Interactive Computer-Assisted Negotiation Support system (ICANS) (Thiessen and Loucks, 1992; Thiessen et al., 1998), Graph Model for Conflict Resolution (GMCR) (Kilgour et al., 1996; Hipel et al., 1997), and Fuzzy Cognitive Maps (Giordano et al., 2005). Wolf (2002) presents some significant papers and case studies on the prevention and resolution of conflict (using descriptive methods) over water resources.

This paper analyzes Afghanistan and Pakistan's water conflict and the potential for cooperation, based on a multi-stage framework of conflict transformation. It first situates the historical disputes between the upstream and downstream riparians, which revolved around contending rights claims, resulting in zero-sum confrontations with one party's loss as another's gain, potentially ending in confrontation. The paper then formulates a mechanism for transforming conflict into cooperation. A decision support tool is derived to illustrate basin demands, possible investments, and benefits of river basin development for the decision makers. It concludes by introducing practical methods of identifying the basin needs and sharing benefits, enabling riparian states to negotiate on a win-win process.

The conflict transformation process typically develops through four stages. In the first stage of this path, called "Adversarial Stage," disputes center on political boundaries and what a country feels it deserves. In the second stage, called "Reflexive Stage," disputants move beyond political boundaries, so that the analyses are based on identification of whole basin needs. In the third stage, the "Integrative Stage," mutual benefits for both countries are identified and evaluated, and finally a conflict transformation mechanism including practical methods of identifying the basin needs and enlarging the basket of benefits are formulated. In the fourth, "Action" stage, the parties consider equitable division of the benefits (Rothman, 1989; David, et al., 2010).

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The overall objective of this paper is to formulate a practical solution to the transboundary water conflicts between Afghanistan and Pakistan. The specific objectives of the paper are to analyze different stages of water conflict transformation between Afghanistan and Pakistan and suggest the best possible benefits sharing methods for decision makers based on the principles of equitable and reasonable use. The results of this paper could help to change basin planners' perspectives on transboundary water issues from conflict to cooperation by demonstrating pathways for the avoidance of conflicts and benefits motivating cooperation.

1.1. Background

Afghanistan and Pakistan share at least nine rivers but have never signed any agreement on joint management of the shared watercourses. It should be considered that signing an agreement is not the only challenge; rather the real problem is to keep the agreements alive in letter and spirit (Matthew and Sturtewagen, 2010).

Kabul River, which later joins the Indus River, is one of the most important rivers and a potential source of hydropower for both countries. More than 7 million people in Afghanistan, equivalent to 23 percent of the Afghan population, live in the Kabul River Basin (KRB).

The main source of the Kabul River is from the glaciers and snow of the Hindu Kush mountains, which are a part of the Himalayas-Pamir (Vick, 2014). The river represents 26 percent of Afghanistan's water resources (Favre and Kamal, 2004; Yıldız, 2015).

On the Pakistani side of the basin, the river is a source for irrigation purposes in the remote and mountainous Khyber Pakhtunkhwa (KPK) province (Fig. 1.1).

In Pakistan, flood and drought tend to occur simultaneously, affecting a large part of the country by exacerbating the water – scarce situation and bringing significant adverse socio- economic impacts. (Hua Xie et al., 2013).

Data sharing for the river is considered important for Pakistan to apply early warning systems to prevent flood and drought damages.

Climate change has impacted the glaciers and snow melt that feed the Kabul, and resulted in exacerbation of a trend which also shows the shift of the river basin seasonal monsoons. The changed climate in recent years has resulted in dramatic floods, such as the one which occurred in 2010 and impacted more than 18 million people in Pakistan. (Ahmad and Fahd, 2014).

The Kabul River flows for 560 km inside Afghanistan before entering Pakistan (Matthew and Sturtewagen, 2010; Yıldız, 2015). The Kunar River is one of the main tributaries of KRB that flows into the eastern part of Afghanistan and the northwestern part of Pakistan. The total length of this river, which ends in the Indus River in Pakistan is 700 km (Ahmadullah and Dongshik, 2015). Importantly, in the KRB, Afghanistan and Pakistan are both upstream and downstream of each other (Vick, 2014). The Kunar River originates in Pakistan and then

Table 1.1
Common rivers of Kabul river basin.

MAIN RIVERS	MAJOR TRIBUTARIES	AVERAGE ANNUAL INFLOWS (MAF)
KHYBER PAKHTOONKHWA		
Kabul	Chitral/Konar	17.44
Khuram	Kaitu & Tochi	0.89
Gomal	Zhob & Kandar	0.79
BALOCHISTAN		
Abdul Wahab Stream	Turwa	0.0039
Kandar	Nagandi Oba, Ashiwat	0.0212
Kand	Tirkha	0.00293
Kadanai	Tashrabad, Aghbergai, Hasna Zemal, Maran, Warjaroba	0.0058
Pishin Lora/Bore Nallah		0.095
Kaisar	Gori	0.0175
Total:		**19.266**

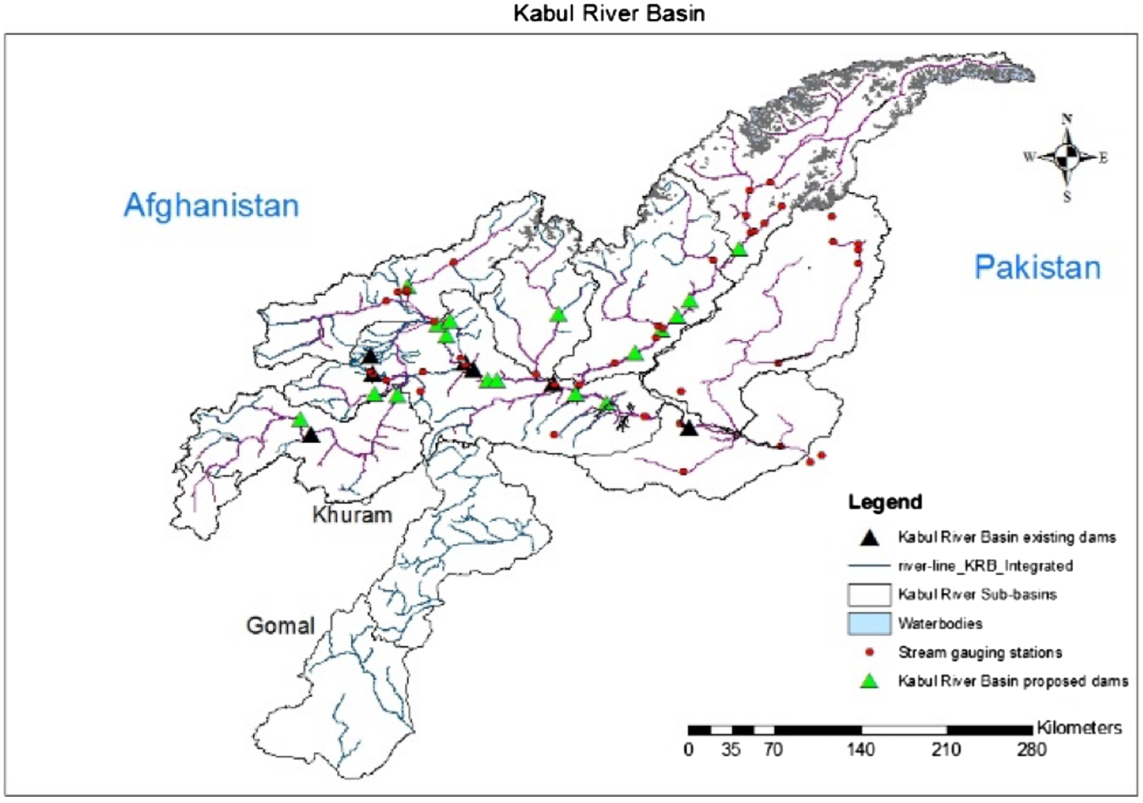


Fig. 1.1. Kabul River Basin.

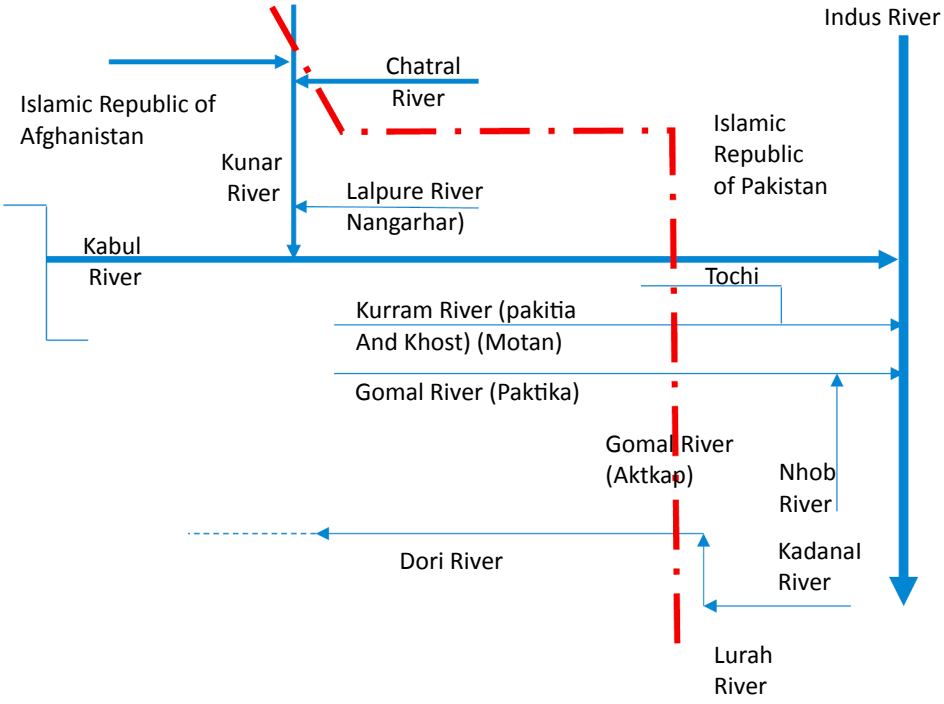


Fig. 1.2. Transboundary Rivers between Afghanistan and Pakistan.

joins the Kabul River closer to Jalalabad. Then it enters into Pakistan and joins the Indus River at Attock (Table 1.1).

Other cross border tributaries include the Khuram River, which originates from the mountains of Paktia province in Afghanistan and flows into the Khuram Agency of the Federally Administered Tribal Area in Pakistan.

Gomal River is the third major cross-border river, which originates in the mountains of Ghazni province of Afghanistan and enters South Waziristan Agency of Pakistan. With the financial assistance of USAID, Pakistan has constructed the Gomal Zam irrigation dam in the Agency.

There are also some seasonal rivers that flow into the rivers of Afghanistan's provinces of Kandahar, Zabul and Paktika and the Balochistan province of Pakistan, as shown in Fig. 1.2. (e.g. Lurah, Kadani, Waygal, etc.)

The three decades of war and civil unrest in Afghanistan has caused extensive poverty and has damaged the traditional social institutions. The entire traditional irrigation system which was managed by farmers has also been damaged. Only since 2002 have a few infrastructural developments that improve irrigation efficiency been undertaken.

According to the World Bank, in the KRB, "fifty-nine percent of the population of the basin in Afghanistan is rural and lives outside Kabul; more than 96 percent live in small villages and settlements primarily along the rivers in cultivable areas with access to water" (WB, 2010, 13).

Rehabilitation of the damaged irrigation systems and restoring the capital of rural communities is deemed one of the highest priorities in Afghanistan.

Yet the World Bank reports that "Despite some success, however, there has not been any investment in infrastructure that would:

(i) free farmers from the constraints of low volume and highly variable stream flow in the growing season;
(ii) reduce the impact of frequent drought and fickle rain and;
(iii) provide them a base from which they could integrate with the country's growing economy and breaking out of persistent poverty. (WB, 2010, 13–15)

Many local natural resources, including but not limited to water, soil, forest, and grazing areas, are considered the most vital factors for rural communities in Afghanistan. These resources are under pressure.

Various factors such as unregulated exploitation of local forest as a source of fuel, lack of proper heating alternatives in harsh winters, and lack of fuel for cooking purposes are driving widespread deforestation (WB, 2010).

Agricultural growth and economic development depend upon the availability of proper electricity supply. However, this vital infrastructure has been damaged badly during the three decades of war and conflicts in KRB (WB, 2010).

Lack of electrical energy and water supply are not just technical or economic problems, they also represent major social and political problems. The lack of energy in winter for lighting and heating causes major sufferings and social tensions. Additionally, lack of drinking and domestic water in rural, and especially in urban areas, is a major public health problem (WB, 2010).

One of the main objectives of the Afghanistan government since 2002 is to reduce poverty by developing the natural resources of the KRB. The government is actively moving forward with long-term investment strategies for large-scale management of water resources infrastructures in order to overcome the constraints of inadequate and unreliable water availability and frequent drought and provide a basis for sustainable economic growth (WB, 2010)

This commitment of the government of Afghanistan, however, has caused concerns to the downstream riparian (Matthew and Sturtewagen, 2010).

Meanwhile, Pakistan has also been building various water reservoirs and hydropower dams on the KRB without notifying Afghanistan (Hayat, 2017).

2. Materials and methods

2.1. Data

This study is based on a review of KRB water issues between Afghanistan and Pakistan. To analyze and explore the conflict situation,

secondary sources of data have been used. The data representing countries' rights, needs, and benefits have been collected from relevant ministries, UN agencies, World Bank, and Asian Development Bank. Relevant study reports, publications, and informative maps have also collected from various governmental and non-governmental organizations.

Nevertheless, the hostile political environment between Afghanistan and Pakistan poses significant limitations on the study. Collecting data regarding water issues related to both countries is extremely difficult due to the regnant distrust and political instabilities in the basin. Nonetheless, efforts have been made to obtain relevant information and present the perceptions of all major stakeholders in the basin.

2.2. Methodology

The methodology being undertaken for conflict transformation in KRB employs a combination of the work of Jay Rotham who initially described his stages as ARI – Adversarial, Reflexive, and Integrative (Rothman, 1989) – and the work of Sadoff and Grey (2002, 2005), evaluating the benefits of cooperation in the concept of benefit sharing in order to switch from sharing of water quantities to sharing of benefits.

Using this approach, the objective of first two sections of the paper is to identify issues concerning a common understanding among co-riparians. The third section will broadly undertake a general analysis of the scale of benefits. Globally, the water policy community possesses very little experience implementing a developed transboundary benefit sharing mechanism for an entire river basin. In this study, the Senegal River example is reviewed in order derive a set of mechanisms to overcome the political conflict and pursue the possibility to transform the conflict into cooperation and benefit sharing on transboundary waters between Afghanistan and Pakistan. Cooperation and benefit sharing in the Senegal River basin took place when the riparian countries found a suitable solution for their political conflicts, followed by a trilateral agreement to achieve collective political and economic benefits. (Geneva Water Hub, 2015).

Adopting the Senegal River example, similar activities, rather than a unilateral planned approach pursued individually by Afghanistan and Pakistan, are mainly analyzed herein. The conflict management mechanism proposed to mitigate the existing challenges is detailed in Fig. 2.1.

2.2.1. Stages of conflict transformation into cooperation

Water management is inherently conflict management. Water resources serve multiple purposes across various communities. Water resources vary in time and space. This situation often creates complexity among the societies who rely upon a shared source of water (Islam and Susskind, 2013). However, experience demonstrates that such water complexity can be addressed through coexistence and mutual understanding and various practices including legal and negotiations. Finding the amicable solution for water conflicts enables various communities and societies to achieve more effective and sustainable use of their resources (David et al., 2010; Blatter and Helen, 2001).

The international community is facing challenges regarding the prevention of disputes over water resources and the establishment of cooperative institutional mechanisms for water management. Yet collaborative water governance offers a path to avoid the waste, instability, risks to public health and ecosystem damages often entailed by water conflict, better meeting the needs of water users.

The four stages of transforming from conflict to cooperation are outlined below following (Wolf, 2010; Rothman, 1989, 1995, 1997):

Stage I: Initial State on Basins with Boundaries – Scale is interpersonal, with a focus on trust building, and analysis of parties, positions, and interests. Negotiations are often adversarial, with an emphasis on rights.

Stages II: Changing Perceptions on Basins without Boundaries – Scale is inter-sectoral, with a focus on skills building and analysis of the gap between from current and future states. Negotiations move to the reflexive stage, and parties define needs.

Stages III: Enhancing Benefits – Scale moves beyond the basin, with a focus on consensus building and analysis focuses on benefits of cooperation. Negotiations are integrative, where parties define benefits.

Stage IV: Putting It All Together for Institutional and Organizational Capacity and Sharing Benefits – Scale is international, with a focus on capacity building and analysis on institutional capacity. Negotiations are in the action stage, where equity is defied and institutionalized.

The generalized path described in Table 2.1 is structured around an understanding of each of the four stages through any of four perspectives (David et al., 2010).

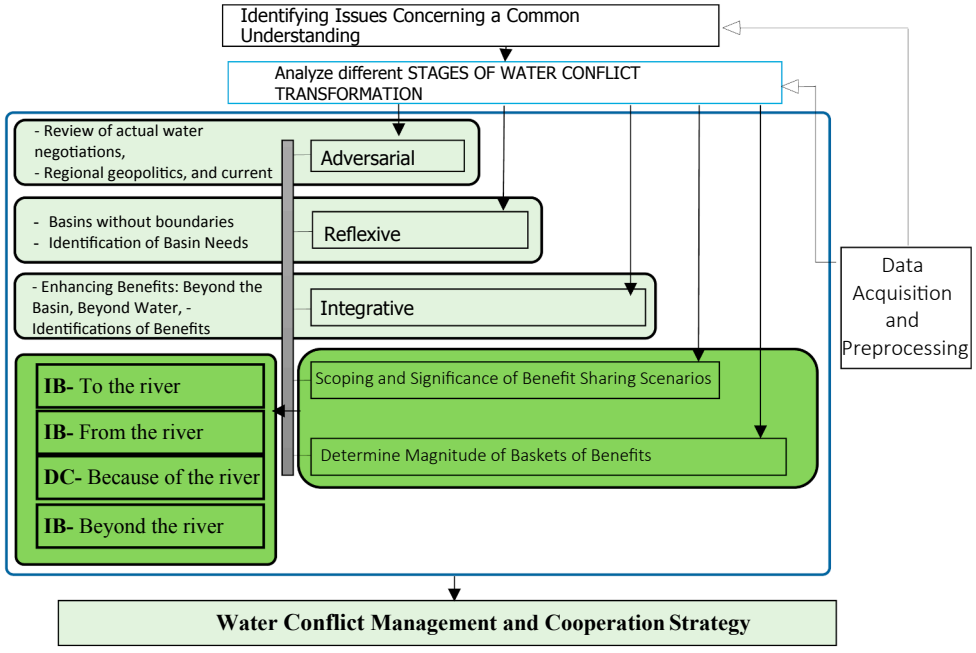


Fig. 2.1. Methodology framework.

Table 2.1
Stages of Water Conflict Transformation (David et al., 2010).

Negotiation Stages	Common Water Claims	Collaborative Skills	Geographic Scope
Adversarial	Rights	Trust-building	Nations
Reflexive	Needs	Skills-building	Watershed
Integrative	Benefits	Consensus-building	Benefit-sheds
Action	Equity	Capacity-building	Region

2.2.2. The concept of benefit sharing

Benefit sharing is the procedure by which riparians cooperate with each other in enhancing and equitably distributing the goods, products, and services linked directly or indirectly to the watercourse, or arising from the use of its waters.

The key objective of the benefit sharing is to shift from a logic of sharing of water quantities to a logic of sharing of benefits that the users might obtain from the water's use. Benefit sharing is proposed as a strategic approach to bypass the contentious subject of water rights to the common pool resource though *trans*-boundary waters. The concentration is on highlighting and prioritizing the values derived from water utilization and development, and sharing those benefits between the co-riparian states. The economic, environmental, social, and political benefits can create a cooperative and collaborative environment in transboundary river basins. The economic benefits can be described as power production and transmission, fisheries, agricultural development, and industry. The environmental benefits can be described as watershed management, water regulation, soil conservation, and flood control. The social capital benefits can be described as capacity building, training and skill sharing, while political benefits can be described as political stability, cooperation and integration.

All forms of available water should be included in benefit sharing scenarios. It means blue water (surface plus groundwater), green water (water stored in the soil), and grey water (wastewater that can be reusable after treatment) should be included. Likewise, benefit sharing should be framed across a 'basket of benefits' considering all benefits form common resources and joint investments, rather than on a project by project basis. (Sadoff and Grey, 2002, 2005).

As argued by Woodhouse and Philips (2009), "negotiating on a project by project basis can easily result in a stalemate – whereas the basket of benefits approach means opportunities can be modified and changed until an acceptable outcome is agreed by all". The costs which are required for cooperation are financial, institutional, political, and any costs of unilateral opportunities (benefits). The opportunities which can be modified or changed are categorized by Phillips et al. (2006) into three.

(i) Security;
(ii) Economic;
(iii) Environmental.

Security, economic, and environmental are the opportunities provided by *trans*-boundary cooperation. Trans-boundary cooperation is categorized in four types, each with its own benefits and challenges as mentioned in table below. (Phillips et al., 2008).

Table 2.2 categorizes the challenges and opportunities of the four types of cooperative benefits. The first type that is kinds of environment benefits will enable better management of ecosystems, providing benefits to the river, and underpinning all other benefits that can be derived. The second type of benefit, efficient, cooperative management and development of shared rivers can yield major benefits from the river (economic benefit). The third type which is called because of the

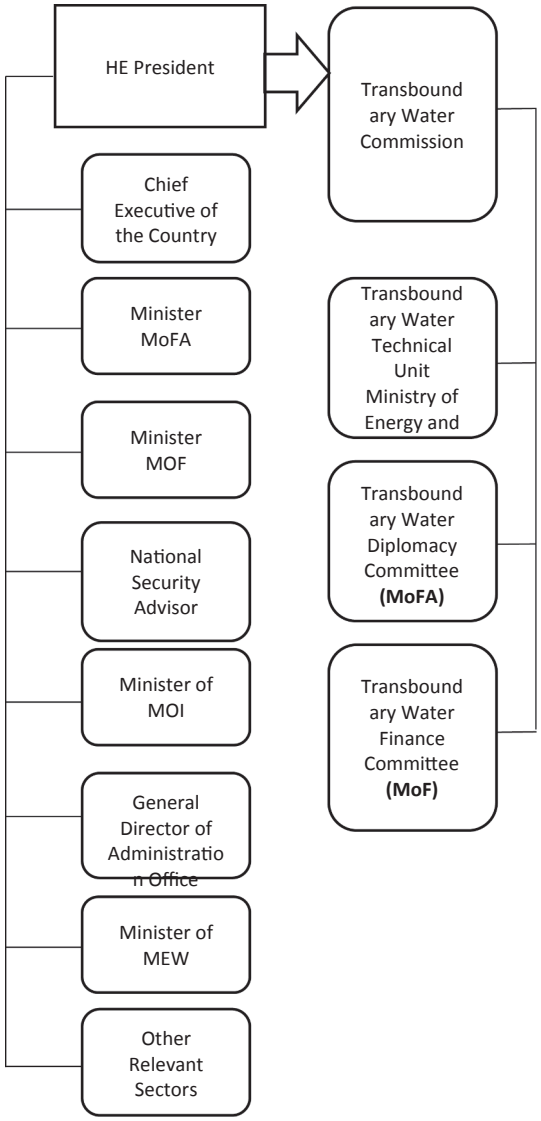


Fig. 3.1. Afghanistan Transboundary Water Commission (Yahya Hazem, 2017).

Table 2.2
Challenges and opportunities embedded in the aforementioned benefits Source: Sadoff and Grey (2002, 2005).

Types of cooperation	The challenge	The opportunities
Type 1: increasing benefits *to the river*	Limited Water Resource Management: Degraded water quality, watersheds, wetlands, and biodiversity	Improved water quality, river flow characteristics, soil conservation, biodiversity and overall sustainability
Type 2: increasing benefits *from the river*	Increasing demands for water, sub-optimal water resources management and development	Improved water resources management for hydropower and agricultural production, flood-drought management, environmental conservation and water quality
Type 3: reducing costs *because of the river*	Tense (+, −) regional relations and political economy impacts	Policy shift to cooperation & development from dispute; from food & energy self-sufficiency to security; reduced conflict risk & military expenditure (+/−)
Type 4: increasing benefits *beyond the river*	Regional fragmentation	Integration of regional infrastructure, markets and trade

river benefits, cooperation on an international river will result in the reduction of costs because of the river (political benefit), as tensions between co-riparian states will always be present, to a greater or lesser extent, and those tensions will generate costs. While costs because of the river are not always readily seen or quantified, they can be very real and substantial, and can compound other tensions leading to higher costs still. And finally, as international rivers can be catalytic agents, cooperation that yields benefits from the river and reduces costs because of the river can pave the way to much greater cooperation between states, even economic integration among states, generating benefits beyond the river (indirect economic benefit).

Table 2.2 shows challenges and opportunities embedded in the aforementioned benefit.

Various challenges such as degraded watersheds, increased demand for water, tense regional relations, and regional fragmentation can be overcome through cooperation over the transboundary water by basin states. Additionally, cooperation over transboundary water can also provide some opportunities such as improved water supply, soil conservation, more agricultural and power production, cooperation and integrated regional markets and cross border trades.

However, there has also been some studies which indicate the criticism of this approach (Pohl et al., 2014; Selby, 2013), and this is due to the social, geopolitical and environmental situations of the riparian states.

Collaborative management strategies can prepare proper foundations for sustainable river basin development. The main cornerstone for the sustainable river basin management is an integrated approach linking different aspects of political, institutional and technical issues. Trans-boundary collaborations of the character countries (riparian) are mainly related to their political, geographical, and cultural relations. This factor has led to the bad history of political and valuable relations of these countries. (Sadoff and Grey, 2005). Additionally, due to this factor these countries have also less cooperation than the others. The less cooperative countries may have a bad history of political and valuable relations (Sadoff and Grey, 2005). The establishment of an internationally acceptable legal agreement to share the common rivers may itself not bring a solution. Complex water disputes can only be solved by cooperation and compromises (Swain, 2004).

3. Analysis of different stages of conflict management in KRB

This section presents a conflict transformation mechanism for water disputes from zero-sum to positive-sum in the context of KRB. The stages are interconnected and mutually supporting, but need not necessarily be undertaken sequentially. However, they can be utilized as a path in order to develop the required tools for benefit sharing and conflict management.

3.1. Stage 1 – Initial state: basins with boundaries

In this stage, three major aspects of conflict management are evaluated; the legal institutional framework of the riparians, review of actual water negotiations in KRB, and issues causing distrust.

3.1.1. Legal institutional framework of the riparians

This section presents Afghanistan and Pakistan institutional framework for water management.

3.1.1.1. Afghanistan institutional framework in the water sector. The legal basis for water management in Afghanistan is the Water Law revised in 2009 based on the river basin approach. Lauded by the international community as an important step towards the development of a coherent water management strategy, the Water Law declares adherence to all international laws and regulations regarding domestic and transboundary waters. Article 8 (9) of the water law establishes that the management and planning of the transboundary waters between Afghanistan and its neighboring countries and changes of watercourses are the responsibility of the Ministry of Energy and Water (MEW), with agreements from the Ministry of Foreign Affairs (MoFA), Ministry of Interior (MoI), and the Ministry of Border and Tribal Affairs (MoBTA) (Water Law, 2009). In 2016 President Ghani declared the establishment of the Transboundary Waters Commission where different relevant ministries are involved in decision making. Fig. 3.1 shows the organizational chart of the Commission.

The terms of reference of the Transboundary Water Commission are as follows:

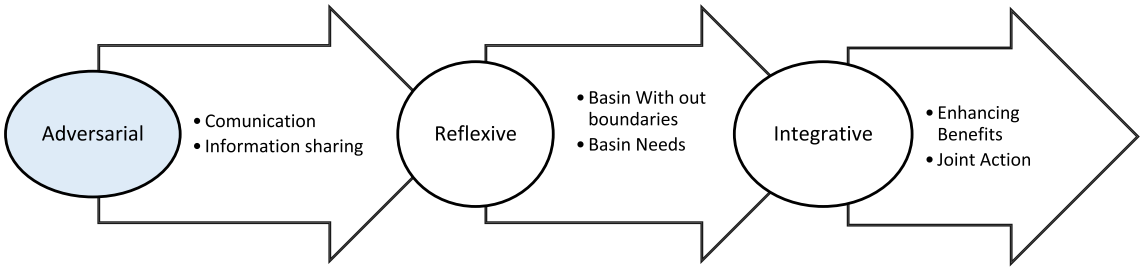
- Strengthening the coordination and cooperation among relevant stakeholders on transboundary issues
- Determination of inter-ministerial working groups to study the performance of concerned countries and to assign working groups for different transboundary tasks and issues
- Regional Cooperation – taking strategic decisions (Malyar, 2017).

Water resource distribution, management, development, and administration is the responsibility of the Supreme Council of Land & Water (SCoLW), while river basin councils (RBCs) and the National Environment Protection Agency (NEPA). Eight government ministries are involved in various aspects of water management. However, the Ministry of Energy and Water (MEW) has the key role in the management and development of water infrastructures, policies, and strategies (Malyar and Hearns, 2017; MEW, 2011).

Malyar (has examined the existing challenges facing stakeholders in the KRB. Most of these challenges were due to the lack of technical expertise in the water sector in general and transboundary waters in particular. This lack mainly reflects the extended war. and instability in Afghanistan, which affected all aspect of life in the country. including the water sector. The limited human capacity at the responsible institutions (MEW, MoFA, MoF (Ministry of finance), NEPA and others) is a challenge to negotiate a fair deal with Pakistan or any other co-riparian country (Malyar, 2017).

Furthermore, the absence of overall research on Afghanistan, and particularly on water resources is another issue. There have been only 604 citable works done by Afghans from 1996 till 2014 – the lowest in the region- compared to 78,219 by Pakistan and 278,388 by Iran (Sclmago Journal & Country Rank Website, 2016; Malyar, 2016).

Nevertheless, there has been improvement in many aspects of transboundary water management in Afghanistan since 2001, namely:



Finalization and endorsement of water law (2009);
Establishment of Transboundary Water Commission headed by the President;
Establishment of transboundary water technical unit in MEW;
Human capital development of relevant ministries' staff by means of capacity building with the support of international donors, especially the World Bank.

3.1.1.2. Helmand River treaty between Afghanistan and Iran, 1973. The Helmand River treaty is an agreement first discussed on 4 March 1857 between Afghanistan and Iran and concluded in 1973 (Mahmoudi, 2017).

Under the 1973 agreement Afghanistan must supply Iran with an average of 22 cubic meters of water per second (m^3/s), and includes an additional 4 m^3/s for "good will and brotherly relations". (Islam, 2011; Thomas and Warner, 2015; Mahmoudi, 2017).

This treaty was developed based on attempts to resolve existing water disputes between the two riparian states.

The allocation of additional 4 m^3/s extra water from Afghanistan side to Iran indicates that Afghanistan always had good cooperation will with its neighboring countries.

3.1.1.3. Pakistan institutional framework in water sector. Water management in Pakistan falls under the jurisdiction of the Water and Power Development Authority (WAPDA), a department within the Ministry of Water and Power.

WAPDA formulates plans for the construction of large water storage facilities and legal structures that governs water management in the Federally Administered Tribal Areas (FATA) bordering Afghanistan, whose rivers fall outside the jurisdiction of the Indus River Basin Authority. The management of the basins, however, is directly under the federal government via the Ministry of States, Frontiers and Regions (SAFRON) and its local branch, the FATA secretariat. Unlike the Indus River System Authority (IRSA) member provinces, the FATA irrigation department does not regularly provide data to the federal government.

3.1.1.4. Water related ministries in Pakistan. Table 3.1 presents a list of water related ministries in Pakistan along with their responsibilities:

3.1.1.5. WAPDA KPK Act, 1958.

- "WAPDA has a general duty to prepare comprehensive plans for the development and utilization of water, including the power to frame schemes for providing irrigation, water supply, drainage and recreational uses of water, flood control and inland navigation". (IBID, WAPDA Act, 1958)
- "WAPDA may also control underground water resources of any region in any province notified by the Government".

3.1.1.6. Water-related departments in KPK province. Table 3.2 presents list of KPK water sector departments along with their responsibilities:

3.1.1.7. KPK Integrated Water Resources Management Board Ordinance, 2002. The Preamble of the Act notes that "water is a finite and scarce resource which is essential for sustenance of life; has a number of competing demands; and that it is necessary to devise an integrated water resources management strategy and oversee its implementation that aims at maximizing sustainable economic, social, and environmental returns on the water resource development, its allocation among competing demands, its use by consumers, and disposal of post-use effluents." (IBID WAPDA Act, 1958)

3.1.1.8. KPK Integrated Water Resources Management Board responsibilities:.

1. to conduct or cause to conduct studies to accurately assess the various demands of various waters for consumptive or non-consumptive uses;
2. to allocate the resources for various consumptive uses, to specify mode of use of resources for various non-consumptive uses and to specify agencies empowered to issue licenses for use of water, within the allocations made;
3. to develop policies, rules and procedures so that water conservation is most efficient, wastages are minimized and demand is effectively managed and that this applies to all uses of water, including non-consumptive, and for all stages of the use cycle;
4. to develop policies and procedures, in accordance with the environmental protection standards, so that the water resources in all its forms and locations are protected from pollution and contamination of all such types that renders unfit water for any of its intended uses;
5. to initiate steps towards a governance structure in which water rights are effectively enforceable, and disputes resolution mechanism is effective, time responsive and accessible to all complainants; and
6. to specify the quality of water for various uses and of effluents and waste water resulting from any uses of water before allowing it to flow into public drainage system and to specify code of its disposal. (IBID, WAPDA Act, 1958)

3.1.1.9. Indus Water treaty: 1960. The Indus Water treaty was signed between India and Pakistan in 1960 and divides waters of Indus Basin.

- It allocates control of the three Eastern River tributaries to India.
- Pakistan is entitled to Western Rivers, subject to limited Indian usages.
- Establishes Indus Waters Commission to manage development of water infrastructure in accordance with the Treaty;
- Sets out a dispute resolution process for differences (Neutral Expert) and disputes (International Court of Arbitration)
- Does not to address climate challenges

3.1.2. Review of actual water talks in KRB

Talks on shared watercourses in KRB have been in progress since 1921, but with frequent interruptions. However, these talks have never been structured in a manner to bring mutual prosperity to both nations.

Table 3.1
Pakistan water related ministries.

No	Ministry/Division	Responsibilities
1	*Housing and Works Division*	*Physical planning and human settlements including water supply, sewerage and drainage*
2	*Water and Power Division*	*- Matters relating to the development of water and power resources in the country; - Indus Waters Treaty, 1960 and Indus Basin Works - Water and Power Development Authority (WAPDA) - Indus Rivers System Authority (IRSA); and - Pakistan Trans-border Water Organization*
3	*Climate Change Division*	*Policy formulation, coordination and reporting of human settlements including urban water supply, sewerage and drainage*
4	*Science and Technology Division*	*Pakistan Council for Research on Water Resources*

Table 3.2
KPK Water related department.

No	Department	Responsibilities
1	*Environment Department*	*Forest Watershed management and management and development of public waters*
2	*Irrigation Department*	*- River surveys;* *- Construction and maintenance of canals;* *- Storage of water and construction of water reservoirs* *- Flood control schemes; and* *- Administration of the Canal and Drainage Act, 1873*
3	*Local Government, Elections and Rural Development Department*	*Water supply and sewerage schemes of local governments*
4	*Public Health Engineering Department*	*- Drinking water supply schemes; and* *- The levy and collection of fees for supply of drinking water and sanitation and waste water disposal projects*

Table 3.3
Actual Water Talks.

Year	Countries	Actual Water Talks
1921	*Afghanistan*	*Agreement between British Empire and Afghanistan government on navigation rights on the Kabul River.*
1933 to 1934	*Afghanistan*	*Government and state government in Chitral signed an agreement on timber navigation rights on the Kunar River*
2003	*Pakistan*	*Pakistan formed a technical committee headed by the Chairman of Flood Commission to draft the provisions of a river treaty with Afghanistan*
2005	*Pakistan*	*A Pakistani delegation from WAPDA visited Khost province for discussions with the provincial government regarding the restoration of a hydro-electric plant on the Shamil/Kaitu River*
2006	*Afghanistan & Pakistan*	*World Bank intervention fails to secure a transboundary riparian agreement between Afghanistan and Pakistan*
2009	*Pakistan*	*Islamabad declaration mentions regional collaboration as key for peace, but no concrete steps towards a draft treaty have yet been taken*
2013	*Afghanistan & Pakistan*	*Afghan and Pakistani finance ministers discuss joint power project on Kabul River*
2014	*Afghanistan and Pakistan*	*The Afghanistan-Pakistan Joint Chamber of Commerce (APJCC) pledges to explore a joint power-sharing agreement on the Kabul River.*
2014	*Afghanistan and Pakistan*	*Representatives from the Afghan Ministry of Foreign Affairs and the Afghan Ministry of Energy and Water meet with their Pakistani counterparts in Dubai for two days of discussions on management of shared waters facilitated by the World Bank*
2014	*Afghanistan*	*Previous attempts and joint talks over water are reported to have stalled when Afghanistan raised issues of Durand Line, or Donors raised issues of regional security* (Vick, 2014)
2015	*Afghanistan, Pakistan & India*	*Afghan, Pakistani, and Indian water stakeholders, experts and engineers met at a regional climate change conference in Dubai organized by Global Water Partnership*
2015	*Afghanistan, Pakistan & China*	*Trilateral meeting between government representatives of China, Afghanistan, and Pakistan announce a proposed 1500 megawatt capacity joint-power sharing project somewhere near the border between the two countries.*

The main reasons that these talks have proven unproductive are lack of a compatible legal framework, non-endorsement of the 1997 UN Convention on international watercourses, problems affecting the relations of the counties beyond the river (e. g., security, migration, Durand-Line conflicts, transit issues, etc.), low scientific capacity on transboundary waters especially in Afghanistan, lack of respecting and considering international water laws especially by Pakistan, and lack of trust building commitment in Pakistan. Bearing these challenges in mind, common talks between both countries are explored/identified chronologically bellow: (Table 3.3)

Many donors are giving considerable attention to sustainable development of Afghanistan's water sector. Key donors for the water sector are regional states such as India, as well as donor countries like Denmark, Germany, Norway, Sweden, Japan, Canada, the United State of America, the United Kingdom, international organizations, like ADB, World Bank, European Commission, and Islamic Development Bank (IDB). International NGOS are also playing significant roles (Habib, 2014).

Despite so many tangible donors supports in the basin, processes of mutual cooperation are still in the adversarial stage due to lack of trust between the countries. The major conflicts that distance the countries from cooperation are the following:

- The disputes on the Durand Line which Pakistan wishes to set as the border but which Afghanistan has never accepted (Bijan and Frank, 2010);
- Support of Pakistan to armed oppositions in Afghanistan, mainly the Taliban, is the other main point of conflict between the countries (Thomas et al., 2016); and finally, unilateral infrastructure development in riparian states has caused distrusts between the countries.

3.2. Stage-2-Changing perceptions – basins without boundaries

In this *reflexive stage*, negotiations can shift from *rights* (what a country feels it deserves), to *needs* (what is actually required to fulfill its goals). Conceptually, it is to take the national boundaries out off the map and start to assess the needs of the watershed as a whole.

In this section, most essential needs of both Pakistan and Afghanistan from KRB are reviewed.

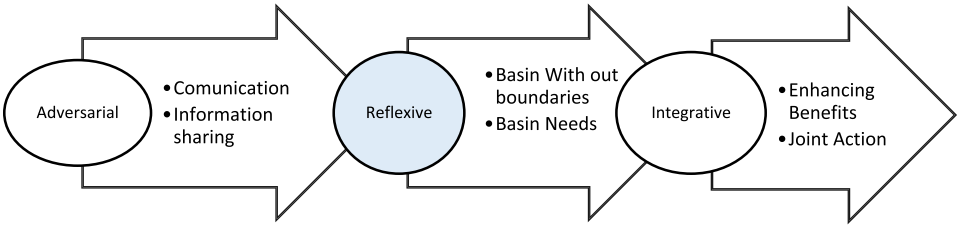


Table 3.4
Potential irrigated areas in Kabul river basin.

Sub Basin	Irrigated Area (Ha)		
	Intensive	Intermittent	Potential
Logar -Upper Kabul Sub Basin			
Logar River Watershed			
Logar River Valley above proposed Gat Dam Site	17,875	21,875	
Logar River Valley below proposed Gat Dam	2,700	7,300	
Upper Kabul River Watershed			
Upper Kabul, Maidan, Paghman	11,730	17,010	
East of Kabul			37,330
Panjshir Sub Basin			
Panjshir River (Kapisa)	17,040	1,000	4,000
Panjshir, Ghorband, Salang, Shatul	38,210	600	18,000
Barikaw	11,320	6,500	
Lower Kabul Sub Basin			
Laghman	18,935	2,043	
Konar	12,010	10,420	
Nangarhar	66,786	29,326	
Total	196,606	96,074	59,330

Sources: Montreal Engineering Company 1978, FAO 1965; follower Kabul, FAO1993, after Scheladia 2014, Vol. II.

3.2.1. Needs in Afghanistan side of the river basin

3.2.1.1. Need for water storage development. The main source of water in Afghanistan is the glaciers and snowmelts which are being stored in rugged terrains of the country during winter and spring seasons and flow into river valleys during the warm seasons. However, these vital resources are being impacted as a result of global warming and climate change (Shobair, 2013; Tayib and Keisuke, 2015; Shaukat et al., 2015).

The precipitation in Afghanistan primarily is in the form of snowfall and is very uneven across the country. Due to insufficient storage capacity in the river basins, a substantial fraction of the snowmelt that runs off in the beginning of the summer months is not harnessed for productive use. The melting of the snowpack will be accelerated by the increasing summer temperatures expected due to climate change, and will put further stress on groundwater resources for meeting the growing water needs in each sector (WB, 2010).

Based on MEW (2016) report, the available surface water in Afghanistan basins is 49 billion cubic meters, which indicates a potential storage of 1650 m3/capita/year. The current storage capacity in the country, however, is only 70 m3/capita/year (MEW, 2016). Previous MEW reports of 1961–1980 found the available surface water in the country to be 57 billion cubic meters. Compared to the existing potential of water there is a 14 percent decrease in the available water. The situation thus shows an extreme need in development of infrastructures for the purpose of increasing the per capita storage.

In order to manage the supply, the country needs to increase the number of its storage reservoirs as a part of infrastructural development.

3.2.1.2. Need for "Irrigated agriculture for food production". The existing and potential irrigated areas in the KRB are shown in Table 3.4. The three largest areas are:

a) The Shomali Plain in the central Panjshir River basin,
b) The large plain near the Lower Kabul River in Nangarhar, and;
c) Along the Logar River.

3.2.1.3. Serious need for ground water recharge. Ground water is the main source of domestic consumption in Kabul city. Population growth, increasing water demand and lack of water management in recent years resulted to diminishing the ground water; therefore, the Kabul city is experiencing a critical situation in water availability. (Shobair, 2013)

Table 3.5
Forecast of Required water productions for Kabul.

	2005	2010	2015	2020
Domestic bulk water requirement (Mm^3/yr)	23.2	51.2	77.7	
Commercial, administration, Industry (Mm^3/yr)	5.1	12.9	21.0	
Total Annual Demand (Mm^3/yr)	28.2	64.1	98.7	147.0
Losses as a percentage of demand	68%	40%	25%	25%
Total annual required production (Mm^3/yr)	47.5	89.7	123.4	183.8
Implied Average Rate of Consumption (liters per capita per day)	42.8	69.7	82.7	85.0

Source: Beller Consult, Kocks, and Stodtwerk Ettlingen 2014 Interim report; and mission estimates.

Additionally, Kabul's water table level has declined over the years due to lack of surface water recharge systems and over-extraction. Moreover, use of "soak ways" has led to pollution of the surface and groundwater. Currently natural recharge is inadequate compensate for current rates of abstraction. A potential solution is to artificially recharge the Kabul aquifers, since most of the snowmelt is not captured for productive use and flows onward to Pakistan (ADB, 2017).

Groundwater recharge for Logar II, Logar, Paghman, Upper Kabul, Lower Kabul, Jalal Abad, Gambiri, Kama, East Jala Abad, Parwan & Shekardareh, Tataranghzar, Achasaheb cities are considered necessary due to over-extraction of their ground water and drastic drawdown of their water table in the last few years (WB, 2010).

3.2.1.4. Need for urban domestic and industrial water supply. Based on the World Bank (2010) report, the second major issue that needs to be addressed in developing the KRB is rural and urban water supply. The Kabulwater supply requirement are widely dispersed, but will generally total in the aggregate about 1.5 percent or less of the total water available in the basin, without considering the Kunar River flows. (Table 3.5) (Fig. 3.1).

3.2.1.5. Need for energy development. Afghanistan's current energy production is less than the estimated demand from existing connected customers, and current unanswered demand is estimated to be more than twice the current energy availability. Based on World Bank (2010) report, with a mixed hydro-thermal electricity system, the Panjshir, Naglu, and Sarobi II cascade can meet the maximum projected energy demand in the KRB. A medium-term energy production plan would involve investments, beginning with Panjshir and adding Sarobi II as demand rises. In a scenario assuming hydropower is the only source of energy production in the basin, the storage option at Konar is required to meet the maximum demand. (Table 3.6).

The long-term sustainable supply of energy is vital to achieving the government's development goals. The Developed Options of Energy and Utility Industries are (Shatoot, Gulbahar, Baghdara A2, Baghdara D1, Surubi II Dam – Stage 1, Surubi II Dam – Stage 2, Shal, Konar A, Gambiri, Kama) (Fig. 3.2).

3.2.1.6. Environmental needs. There are two important environmental flow requirements in the basin. The first concern is the maintenance of

Table 3.6
High and low forecasts of Monthly Energy Demand in 2020 (Without Export from or Import to the basin).

Year	Range	Annual Hydropower energy Demand (GWh)- Base Estimate
2020	Min	1350.9
	Max	2180.0
2015	Min	1081.2
	Max	1993.0
2006	Min	672.5
		848.0

Source: Toosab and RCUWM 2006.

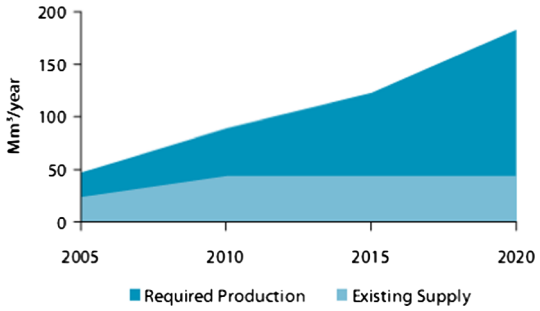


Fig. 3.2. Required KRB Water supply requirement.

the Kole Hashmat Khan Waterfowl Sanctuary, an important historical and cultural site and a major environmental resource directly adjacent to the Kabul city, which has long suffered from neglect, overharvesting of reeds, and encroachment by nearby farmers, and new housing development. It was an important resting and nesting site for migratory waterfowl until water levels dropped dramatically in recent years. To maintain the wetland hydrology, an allocation of stream flow from the lower Logar River will be sufficient to overcome the precipitation-evapotranspiration deficit that occurs from April to November. In an average year, the estimated total deficit is approximately 9467 cubic meters per hectare. Annual water requirements would be 1.89 million cubic meters per year for a 200-hectare wetland, and 9.47 million cubic meters per year for a 1000-hectare wetland (WB, 2010).

The second important environmental flow requirement is the need to maintain sufficient low flow in the Kabul River as it passes through the Kabul city. In recent years, this flow has reduced to an insignificant trickle in the low flow months. The consequence is that untreated wastewater and trash accumulates in the river channel during the summer months, causing noxious odors and health hazards.

3.2.1.7. Needs for flood and drought management. Flood and droughts are frequent in Afghanistan and in the KRB, generally resulting in high variability of both groundwater and stream flow. Rivers that drain the Hindu Kush mountain range are generally less variable because their flow depends much more on melting snow and glaciers, but annual snowfall is also notably variable (WB, 2010). In the year 2013, eastern Afghanistan and Pakistan experienced heavy rain that led to flash flooding. More than 180 people died as a result of the floods. Mountainous regions in eastern and southeastern Afghanistan were the main areas hit by floods. In the rural Surobi District 61 people were killed, and around 500 mudbrick homes were washed away across more than a dozen villages. In the provinces of Khost and Nangarhar, flooding destroyed 50 houses and thousands of hectares of farm land. Twenty-four deaths were reported in the area. In the province of Nuristan at least 60 homes were destroyed across three districts, but no casualties were reported. On 10 August 2013, at least 22 more people were killed in a flash flood near Kabul. That 14 August, the death toll rose above 90 in the country. (Monsoon Weather Situation Report, 2013)

3.2.2. Needs in Pakistan side of the river basin

3.2.2.1. Needs in flood management. Population growth, climate change, and a continuous degradation of ecosystem services in Pakistan have resulted in increased flood risks, which are further exacerbated by inadequate flood planning and management. Pakistan suffered from 21 major floods between 1950 and 2011—almost 1 flood every 3 years. These floods have killed a total of 8887 people, damaged or destroyed 109,822 villages, and caused economic losses amounting to $19 billion in different provinces. Among the severely affected provinces, in Khyber Pakhtunkhwa as many as 1100 people died due to overflows from the Kabul River, as well as flash floods in many tributaries within the river basin. On average, the annual flood damage from 1960 to 2011 was about 1% of the mean annual GDP. The devastating 2010 flood caused the highest damage of all in terms of economic costs: about $10 billion (ADB, 2013).

Based on (Sayama et al., 2012) report the flood peak of Kabul River, combined with the flood peak from the Swat River, has increased the total peak flow of the Kabul River at Warsak Dam. The high flow of the Kabul river severely damaged the town of Nowshera and further contributed to the flooding of the Indus River downstream from there.

Appropriate data sharing mechanisms, early warning systems, and flood management infrastructure in upstream areas are needed to effectively attenuate the flood peaks in the Kabul river basin .

3.2.2.2. Need for drought management. Pakistan is a country facing a severe water shortage. Water scarcity, as a natural hazard, intensifies the drought situation and creates significant adverse socio-economic impacts. The challenging nature of drought management in the country has increased the threats of water scarcity. During the drought events, preparedness for well-coordinated water resources planning is an essential matter (Hua Xie et al., 2013).

More than 190 children have died and 22,000 have been hospitalized in Tharparkar district in 2016 because of drought-related waterborne and viral diseases. The drought has devastated crops and livestock in the desert, home to 1 million people (Hua Xie et al., 2013).

Due to severe drought in Pakistan a huge population are in danger, and drought management is the only strategy that can prevent such disasters. (Hua Xie et al., 2013)

3.2.2.3. Need for Hydropower generation. Pakistan is a country where there is a significant need for hydropower electricity. Kabul River basin, shared between these riparian states, has the required potential to provide enough hydropower electricity for both sides of the border. But management of the hydropower resources of Kabul river basin will put great strain on bilateral issues between the Afghanistan and Pakistan.

Construction of reservoirs on Kabul River Basin can have an important impact on regulation of the water resources situation in Pakistan, including the water supply for the Pakistan irrigation system (Hassaan, 2018).

3.2.2.4. Need for treaty. Many analysts believe that Pakistan and Afghanistan need an agreement for transboundary water sharing (McCaffrey, 2007). The government in Afghanistan has been building capacity in this regard, and many recommend that both Islamabad and Kabul should undertake measures to shore up confidence and prevent disagreements over the Kabul River. With Afghanistan's other security challenges looming large, however, many observers also judge that water would not be included on the bilateral agenda for some time (Ahmad and Fahd, 2014).

3.2.2.5. Agricultural need. Agriculture is the backbone of Pakistan's economy. It accounts for about 25 percent of the Gross Domestic Product. Agriculture and agro-based products account for 75 percent of the country's total export earnings (Briscoe and Qamar, 2005).

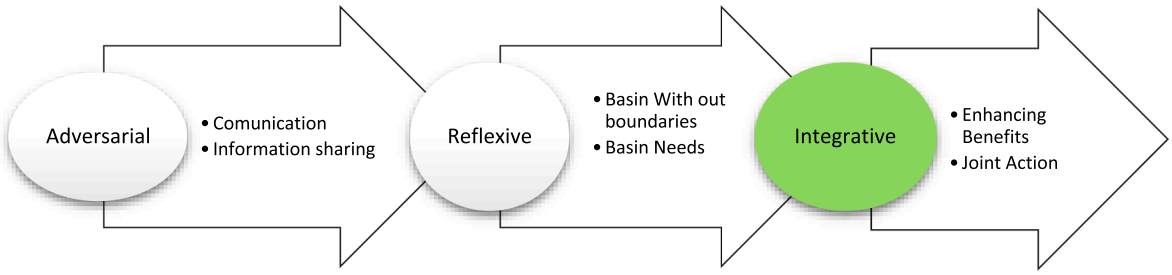
A basic point of departure is that there is abundant evidence that irrigated agriculture in Pakistan is not efficient. Pakistan has had a bumper wheat crop: overall production was 22 million tons, 10 percent higher than the government's target. These data suggest that irrigation is obviously vital for high and stable levels of crop production, and that a lot more efficiency ('cropper drop') can be squeezed out of the system (Briscoe and Qamar, 2005).

Because Pakistan's economy substantially depends upon the agricultural production of this country, there is a strong need to enhance agricultural efficiency. One important constraint on agricultural production is lack of water. The Kabul River Basin, as a main tributary of Indus River Basin entering Pakistan has the potential to provide a portion of Pakistan's water requirements (Briscoe and Qamar, 2005).

3.2.2.6. Population growth. Pakistan currently ranks sixth among the world's countries with the largest populations. Pakistan's National Population Council says the population is expected to rise from 173 million at present to 240 million by 2030. Dr. Zulfiqar A. Bhutta, Chairman of the Department of Pediatrics and Child Health at Aga Khan University Medical center in Karachi, argues that not enough is being done to bring down the birth rate (Jaisu, 2010).

Dr. Zeba A. Sattar explains, "We will have to deal with a huge number of additional people in Pakistan, whereas already our water resources, housing, and everything is really hard pressed." It is hard to imagine how Pakistan can address its daunting development challenges from education to electricity generation, as well as solve its numerous political conflicts and militancy, if it continues to pay scant attention to the crucial issue of population growth. (Jaisu, 2010).

3.3. Stage 3 enhancing benefits-scale moves beyond the basin



Cooperation may have positive outcomes for Afghanistan and Pakistan if these countries, within a frame work, do a bilateral agreement such as the one like the Senegal transboundary cooperation. The Senegal River basin is a good example which has experienced developed benefit sharing mechanism. Senegal river basin which is located in Mali, Senegal, and Nigeria represents an example of water use and transboundary cooperation on an international watercourse in order to produce energy, provide drinking water, and sufficient water for irrigation for its riparian states. Cooperation and benefit sharing in the Senegal river basin took place when countries came with a suitable solution for their political conflicts and they came to a trilateral agreement to get more political and economic benefits (Geneva Water Hub, 2015).

The traditional approach of project-by-project basis negotiations is very likely to result in stalemate. This approach is proved to be more likely a win-lose rather than an equitable win-win process.

Recently, "The Basket of Benefits" (BOB) approach is being practiced globally to provide a more equitable and systematic means to negotiate on the use of water resources. Rather than a project-by-project basis, in the Basket of Benefits approach a wide range of potential activities concerning different countries and sectors are identified and considered as a whole when negotiating. The basket of benefits approach identifies the opportunities that are acceptable for all stakeholders and the outcomes are their expected benefits (Sadoff and Grey, 2002).

3.3.1. Mutual needs of riparian

3.3.1.1. Need for trade. Pakistan is Afghanistan's largest trading partner, while Afghanistan is Pakistan's second largest export market after China.

Both Pakistan and Afghanistan face significant challenges in their respective security, political, and economic realms over the coming years. The drawdown of NATO forces from Afghanistan has dealt a negative shock to both economies, particularly in the transportation sector.

While an agreement was signed in 2010 to strengthen trade relations and facilitate Afghan transit trade through Pakistan, implementation has been mixed, with many on both sides of the border complaining of continued barriers to exchange.

Peaceful economic cooperation between Afghanistan and Pakistan and improved trade and transit facilities could help connect South Asia with Central Asia.

Both nations need to improve trade facilitation through streamlined payments settlement and improved insurance mechanisms, use of bonded carriers, visa issuance, trade financing, tax collection, and documentation.

A preferential trade agreement between the two countries that would give more market access to Afghan goods in the Pakistani market and address the issue of smuggling is the need of the day (Hussain, 2015).

3.3.1.2. Need for Integration of regional Infrastructure. Current regional infrastructure opportunities between Afghanistan and Pakistan are listed below:

- **CASA 1000** – Central Asia-South Asia is a US $ 953 Million project currently under construction that will allow for the export of surplus hydroelectricity from Tajikistan and Kyrgyzstan to Pakistan and Afghanistan. Groundbreaking for the project took place in May 2016 in Tajikistan in a ceremony attended by the Kyrgyz, Tajik, and Pakistani Prime Ministers. The project initially also included transfer of electricity to Afghanistan, however the country abandoned its share of electricity due to dearth of demand, hence Pakistan will receive 1300 megawatts of electricity. (Bishkek Kyrgyz Republic, 2011, CASA_1000 Webpage, 2018)
- **TAPI** –Turkmenistan – Afghanistan – Pakistan – India Natural Gas pipeline projects are ongoing to develop cross border infrastructure.
- Silk Way is another regional project on which talks have begun, but no action has taken place. Silk way is an open trade road which connect eastern and western parts of Asia, any goods traded from this part would cross Afghanistan. (Briscoe and Qamar, 2005)
- **TUTAP** – The Afghanistan Energy Supply Improvement Investment Program is a proposed electric power transmission link intended to supply Afghanistan with power from other central Asian countries, as well as interconnecting the ten separate power grids within Afghanistan. It is unofficially known as TUTAP, which stands for the names of the countries involved: Turkmenistan, Uzbekistan, Tajikistan, Afghanistan and Pakistan. The project was approved by the Asian Development Bank on 15 December 2015. (Asian Development Bank, 2017)
- **CPEC** – (China, Pakistan Economic Corridor) is a collection of infrastructure projects that are currently under the construction throughout Pakistan.
- **The Afghanistan–Pakistan Transit Trade** Agreement of 2010 provided Pakistan access to Central Asia via Afghanistan. These crossings complement the CPEC project to provide Central Asian states access to Pakistan's deep water ports by completely bypassing Afghanistan. (Pantucci, 2016)

3.3.1.3. Need for security. Afghans believe that the majority of the

insecurities in Afghanistan result from Pakistan's interventions. Questions concerning the Durand Line, infrastructure development, and economic growth are the three major issues where Afghans think that Pakistan doesn't want to achieve peaceful resolutions, and thus resorts to violent incidents. To take authentic steps towards mutual cooperation in mitigating conflicts on transboundary waters, a secure Afghanistan is absolutely required in the region. (Malyar and Hearns, 2017)

3.3.1.4. Need for third party investment support. Afghanistan and Pakistan are vulnerable to a number of natural hazards, including earthquakes, flooding, drought, landslides and avalanches.

Pakistan suffered cumulative flood damage of $20.0 billion from 1950 to 2010, and spent over $1.2 billion to mitigate the effect of the floods during this period. A large amount of this spending was borrowed from the Asian Development Bank and the World Bank. There was also bilateral financial and in-kind support. (Shaukat et al., 2015; Mustafa et al., 2013).

The Federal Government of Pakistan is now looking at various risk financing options, including operationalizing the National Disaster Management Fund with the support of development partners in Pakistan. The World Bank will also look to support other sovereign-level risk financing instruments and develop linkages with the private sector, such as the insurance industry, to develop risk transfer mechanisms. (WB, 2015)

Following the mixed experience and outcomes of National Development Plan (NDP), the Bank adopted an interim strategy until a new (country water resources assistance strategy) CWARAS is agreed with the government. This interim strategy has identified areas for partnership, and mutual agreement with the government and provinces on the need to complement the reform agenda with Investments Infrastructure. (Briscoe and Qamar, 2005)

In Afghanistan flooding is the most frequent natural hazard historically, causing average annual damage estimated at $54 million; large flood episodes can cause over $500 million in damage. Droughts have affected 6.5 million people since 2000; an extreme drought could cause an estimated $3 billion in agricultural losses, and lead to severe food shortages across the country. The Afghanistan National Disaster Management Agency with the help of the World Bank has produced a comprehensive multi-hazard risk assessment at the national level, including in depth assessments for selected geographic areas (Ahmad and Fahd, 2014).

3.3.1.5. Need for climate change mitigation and adaptation. The Kabul River Basin has a semi-arid climate where evaporation rates are high relative to annual total precipitation (Mack et al., 2013) and which is characterized by cold winters, with maximum precipitation (mostly snow) from November to May, and warm to very hot summers with little or no precipitation during rest of the months.

Climate change, as a global phenomenon in Kabul River Basin, has potentially contributed to major environmental changes like melting and shrinking of glaciers as well as shifts in the precipitation patterns. Changing climate in the Kabul River Basin is expected to significantly increase the withdrawal of water for crop irrigation due to the potential decrease in rainfall and increase in evapotranspiration because of higher air temperature.

The changing climate in the Kabul River basin during the last two decades, has depleted fresh water resources of Pakistan (Nafees et al., 2016).

Any reduction in the inflow of the Kabul River due to climate change will severely affect Pakistan's and Afghanistan's existing and future water usages, and may lead to economic deterioration, higher food prices, and a shift in rural-urban population.

Irrigated agriculture, the backbone of Pakistan's economy, is largely dependent on the water of transboundary rivers. Increasing population, decreasing water flows due to climate change, and excessive silting of storage reservoirs are resulting in declining per capita water availability in Pakistan from 5650 cubic meters (m^3) in 1951 to 1000 m^3 in 2012 (Winston et al., 2013).

Analysis based on hydrology and water quality detection indicates a continuously increasing dependency of the riparian states on Kabul River due to climate change, and also highlights the future water scarcity for both countries as a result of future developments in Kabul River Basin. Reduction in the annual quantity of Kabul River water inside Pakistan will impose a serious problem to the agricultural economy and social dislocation.

Coupled with climate change, water scarcity can lead to deteriorating relations between Pakistan and Afghanistan. Both countries need to revise their water management strategies concerning transboundary rivers in managing climate change. Negotiation on adoptation to climate change would help both the countries to benefit from the valuable resource of the Kabul River. It will be harder to negotiate a treaty at the time when the crisis of water has occurred, as the two sides may not find sufficient space to manage the situation. (Yu et al, 2013)

4. Conceptualization of conflict transformation

Findings from analysis of stages of conflict transformation reveal the unilateral act of the riparian in KRB. This may arise more problems to the river basin in terms of security, economy and environment.

A sound and wise strategy achieving the same objective may eliminate the chances of acrimony and mistrust between Afghanistan and Pakistan. So, this paper proposes a decision support tool for decision makers, conflict transformation mechanism and an initial strategic framework that may be effective for disputes settlement rather than accelerating disputes and further acrimonies to a stage where there might be not any resolution.

4.1. Decision support tool, conceptual model for decision makers

There are many water balance models available in the literatures which can comprehensively analyze the water demand, supply from river flows, and river basin management. Since decision makers for transboundary water management are from diverse professional and disciplinary backgrounds, the sophisticated results obtained from such models can be complicated to understand without specialized training. Therefore, the existence of a model which can show a big picture of supply, demand, profit, and investment for a decision maker is considered necessary. Additionally, the selected model must easily generate multiple plans by applying alternative weighting scalars for criteria of equitable and reasonable use. The model we present as a decision support tool elucidates this in a simple form. The decision support tool is a conceptual support model for decision makers of riparian states which help them to easily understand the general view of supply, demand and economic aspects of water use in a river basin. This conceptual model represents the relationship between the current water need of riparian states and their future demand, and elucidates for the decision makers the amount of optimum demand or the optimum profit in their states. The conceptual model can help determine effective water demand in each of the riparian states, and outlines some criteria for decision makers to better manage water shortage in their states. The conceptual model, using a viable practical frame work, illustrates a protocol which will lead to the efficient solution plans in the riparian states.

The conceptual model is composed of variables. Yearly water demand and supply are the two main variables which influence both the amount of available water in the riparian states and the stress of water deficit.

The variables of conceptual model are listed below.

Max demand

Max demand is the yearly demand represented in km3. Max demand is considered as 100% of yearly predicted withdraw of the water by

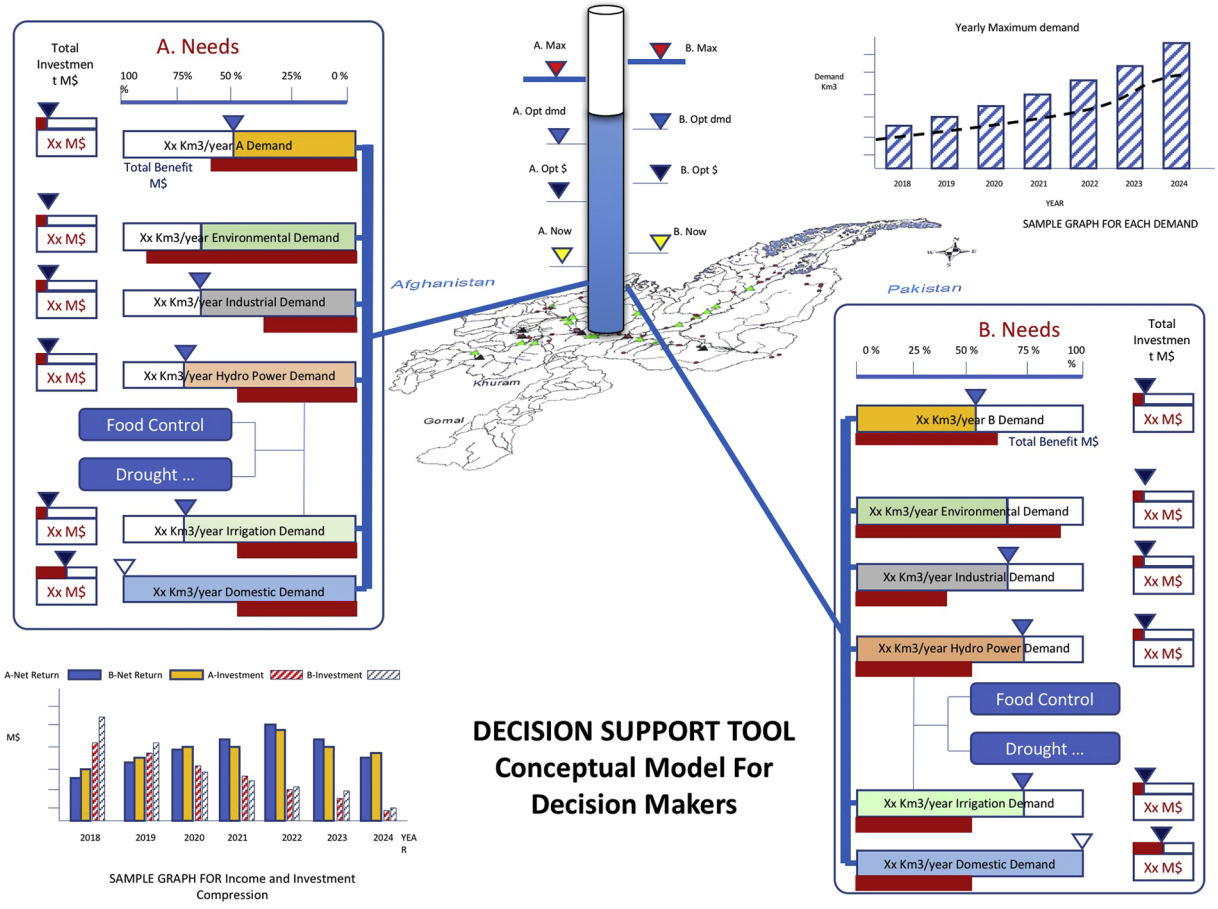


Fig. 4.1. Sample of conceptual frame work.

each of the riparian states.

Max dem (km3) and (%): maximum water demand in each sector
Ir.: Yearly Irrigation Water Demand
D.: Yearly Domestic Water Demand
HP: Hydro power water Demand
En. Environmental Water Demand
A.: Represents Country A
B.: Represents Country B
A Max. is the yearly maximum available water for the country A riparian.
B Max. is the yearly maximum available water for the country B riparian.
Total Available Water: The yearly blue water which is available in River basin (Fig. 4.1).

Max demand is the yearly demand represented in km^3. Max demand is considered as 100% of yearly predicted withdraw of the water by each of the riparian states.

The following figure shows a section of conceptual frame work which illustrates or indicates the relationship between the optimum demand and max demand of a riparian state with the amount of the benefit that is obtained by the riparian. The percentage represents the amount of water demand and benefits taken from the river basins, and has a direct relationship with the weighting scalar of equitable and reasonable use factors. The weighting of equity and efficiency use factors can be defined based on the following:

a) estimation of optimum water demand of riparian states
b) estimation of optimum benefits of riparian states
c) mutual agreements of decision makers of riparian states

A scalar is expressed as a weighted sum of the various objectives and associates a relative weight to each objective function. The trade off or the marginal rate of transformation of various objective functions is reflected by relative weight. The weights are varied systematically; a wide range of plans must be obtained based on the variation of the weight in each case.

The solution obtained for a set of weights provides a set of superior or efficient solution plans. Before the best weight is selected, the preferences of decision makers have to be prioritized, to represent the interests and preferences of the beneficiaries. Determination of the set of relative weights is a complex exercise and requires a study of economics, social and developmental priorities.

Each change in weighting of equity and efficiency factors differentiates the amount of each demand and finally, the summation of all demands shall meet the amount of supply available for each riparian state.

Opt. dem.: Represents the cumulative summation of all demands considering the estimated weights which shall meet the amount of supply available for each riparian state.

Optimum $: represents optimum benefit that each country can receive

Optimum Demand is calculated using an optimization formula, in which the constraints are supply, value of water, and the other countries' demand.

Optimum $ is also calculated using an optimization formula, where the constrains are supply, value of water, other countries' demand.

The total water available (supply) to be allocated for the yearly demands are limited to (Q) (River discharge), and the total available

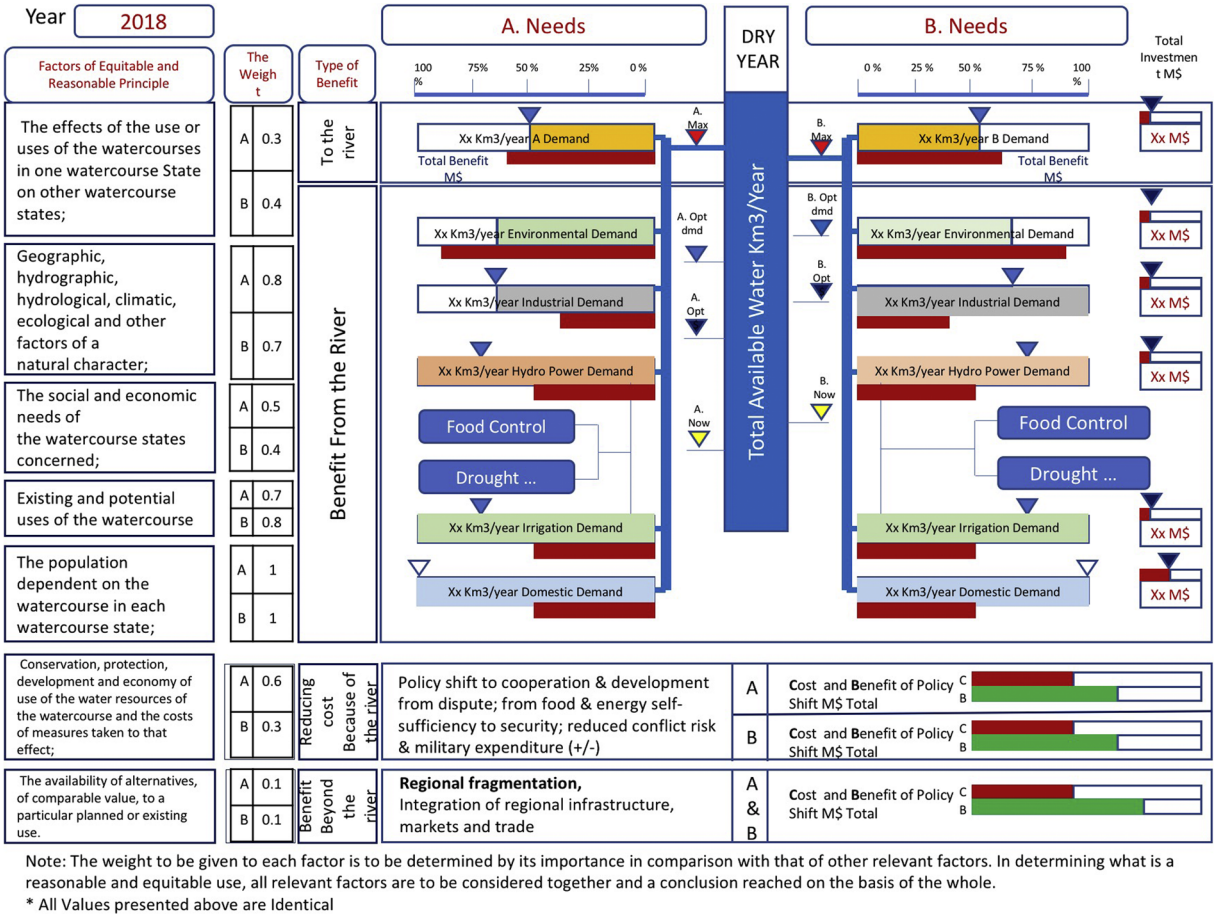


Fig. 4.2. Conceptual Framework with the weighting scalar of equitable and reasonable use factors.

investment budget is limited to (A) (budget). Considering that an increase in each unit of budget requires an amount w_j for relevant demand (J = 1,2…., n), and that the return profit from allocating x_j units of water to demand j is P_j (x_j), we may write the optimization problem as:

$$\max \sum_{j=1}^{n} R_j X_j$$

Subject to

$$\sum_{j=1}^{n} X_j < Q \ (water\ availability\ constraint), \quad and$$

$$\sum_{j=1}^{n} \frac{X_j}{W_j} \leqslant A \ (Budget\ availability\ constraint)$$

where x_j/w_j is the investment allocated to demand j, with non-negativity of variables included, Consider the water availability at stage J is S_j and investment availability is I_j, The backward recursion may be written as

$$Fj(Sj, Ij) = max[Rj(xj) + fj + 1(Sj - xj, Lj - xj/wj)]0 < xj < Sj$$

$Xj/wj < Lj$Fj

$(Sj, Ij) = max\ [\ Rj(xj) + fj + 1\ (Sj - xj, Lj - xj/wj)]$

$0 < xj < Sj$

$Xj/wj < Lj$

This recursive equation should be solved for all values of Sj and Ij satisfying $0 < Sj < Q$ *and* $0 < Lj < A$

When considering weights, below function can be used

Maximize $z = w1Z1 + w2Z2 + \ldots + wp\ Zp$

Subject to $gi\ (x)\ bi\ I = 1,2, \ldots, m$

The relative weights, wj, reflect the trade-off or the marginal rate of transformation of pairs of objective functions. These weights are varied systematically and solutions are obtained for each set of values. The solution obtained for a given set of weights gives one generated set of superior or efficient solutions or plans. By varying the weights in each case, a wide range of plans is obtained for further analysis before the best one is selected.

Weights imply value judgments. For a given set of weights, however, it is easy to infer the relative values of the various objectives considered in the analysis (Fig. 4.2).

4.2. Conflict management mechanism

For a long time, Pakistan has been trying to initiate transboundary cooperation with Afghanistan on water issues. Unfortunately, these attempts have never been successful due to the distrust towards Pakistan and limited professional and institutional capacity in Afghanistan.

Security issues represent the main reason for Afghan distrust of Pakistan. As mentioned in the above sections, Pakistan's support of armed oppositions (Price, 2014), forced deportation of war migrants, and intermittent blockage of transit routes are the major grievances from Afghanistan. Nonetheless, in the past one and half decades Afghanistan has repeatedly engaged Pakistan on the peace and security building process, but these efforts have largely failed.

Unfortunately, the failure in the process of trust building has also influenced the process of transboundary cooperation between these two countries. Limited professional and institutional capacity in the water sector in Afghanistan is the other major obstacle to cooperation facing

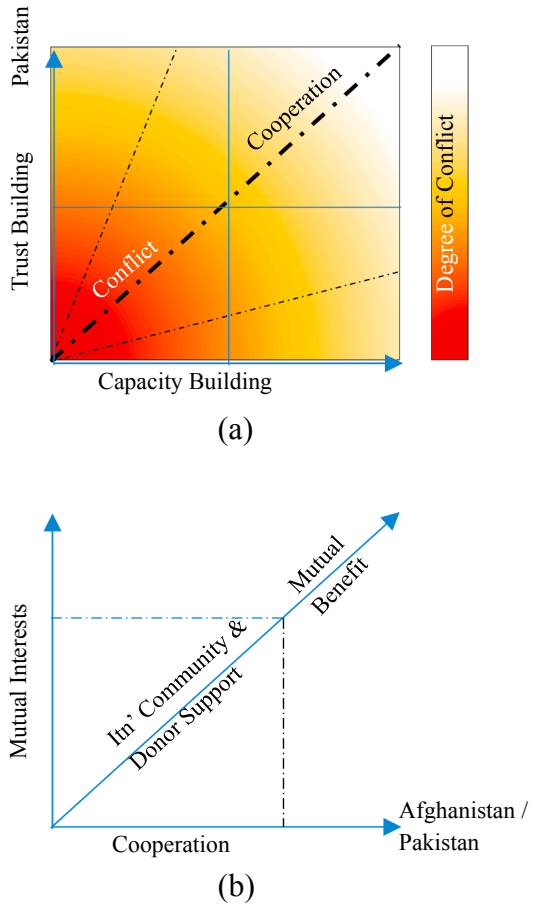


Fig. 4.3. Mechanism to overcome transboundary water conflicts and promote cooperation. (a) Process of transforming conflict to cooperation, and; (b) Process of increasing mutual benefits and achieving higher donor supports.

the two KRB riparians.

The attempts towards institutional strengthening of the water sector in Afghanistan shows that the political will to enhance the capacity of water sector strongly exists. Since 2001, the country has developed a National Development Strategy Framework, Water Law, Water Sector Strategy, Climate Change Adaptation Strategy, Transboundary Water Commission, Supreme Council of Land and Water, Transboundary Water Technical Unit, Transboundary Water Policy (awaits ratification) and many other relevant legislative documents. However, despite of all these tangible achievements, the human and institutional capacity of the country is not in a situation to meet the needs within and outside of its borders.

Through analysis of the stages of conflict transformation in the context of Afghanistan and Pakistan, a mechanism to overcome transboundary water conflicts and promote cooperation in this regard is conceptualized and presented below in Fig. 4.3.

The degree of conflict vs. cooperation is directly proportional to trust building with Pakistan and institutional and human capacity building in Afghanistan. The findings from analysis of the stages of conflict transformation show that the lower the trust in Pakistan the higher the degree of conflict in the river basin; the same is also true with institutional and human capacity building in Afghanistan.

The first step towards transboundary water cooperation is that the countries authentically start overcoming these challenges. Successful accomplishment of this step assures building of a cooperative atmosphere in the basin.

The second step requires the countries to start talks on and beyond the basin needs. The outcome from this step will be a memorandum of understanding on data sharing in terms of security, economy and the environment.

Table 4.1
Step 1. of conflict Transformation.

Step 1. Start of Conflict Transformation		
Afghanistan's Action • Institutional Building • *Human Capital Building*	**Pakistan's Action** Trust Building on • *Security* • *Trade* • *Migration* • *Regional development*	Expected Result Start of Cooperation • *Data Shearing* • *Joint Commission Capacity Building* • *Joint Commission*

Fig. 4.3(a) shows the process of transforming conflict to cooperation through overcoming the challenges of distrust and capacity building in Pakistan and Afghanistan, respectively. In Fig. 4.3(b) the process of increasing mutual benefits and achieving higher donor supports through identifying more mutual interests and acting more cooperatively is illustrated.

The third step recommends that the countries identify mutual interests and enlarge the basket of benefits. The outcome from this step will be benefit sharing in terms of environmental, economic, political, and indirect economic results.

Based on review of past experiences and success stories in developing countries, the role of the international community to facilitate the whole process and help transform conflict to cooperation, is highly important. In addition, the role of the international community to act as a third party to mediate the processes of negotiation and benefit sharing is also helpful. It would also be appropriate here to mention that the involvement of donor community in both states' development in the last decades, in addition of their positive impacts, has created some complexity among the riparian states.

Although the role of the donor community itself in both Afghanistan and Pakistan is often fragmented, the records of donor activities over the last decades prove that the donor community has achieved greater success when coordinating initiatives in the two countries rather than engaging each separately.

4.3. Step by step transformation process

Tables 4.1–4.4 step-by-step transformation process framework is derived based on principles of equitable and reasonable use and conflict management procedures targeted to address the actual reasons behind the existing conflicts between Afghanistan and Pakistan. The implementation of this framework is expected to lead the countries to overcome the current disputes in the basin.

Currently the countries are not prepared to start talks on water needs in the basin. Implementation of the first step, "Start of Conflict Transformation," of this framework can potentially prepare the countries to start talks based on their water needs.

The second step in the transformation process, "Common Understanding and Identifying the Basin Needs," is formulated based on principles of equitable and reasonable use in international water law. Implementation of the factors addressed in this step gives the countries a more accurate picture of the basin in terms of water resource management, socio-economic development potential, and ecosystem development potential.

The third step, "Mutual Benefits Scenarios," addresses the practical guidance to identify the mutual interests of the countries.

The last step, "Enlarging Baskets of Benefits," in this framework means that the riparians have already identified the to-the-river, from-the-river and because-of-the-river benefits. In this step, the countries can further talk on the benefits that are beyond the river such as regional cooperation, transportation, migration, security, etc.

Table 4.2
Step 2. Identification of Basin Needs.

Step 2. Common Understanding and Identifying the Basin needs				
Geographical coverage of the framework	Environmental coverage of the framework	Population in the basin	Economical Coverage of the Framework	Coverage of the comparative efficiency of use in the frame work
• *Whole river basin (Dose Khuram and Gomal and other cross border rivers shall be included?)*	• *Identification of environmental goods and Services*	• *Present and projected population*	• *Population dependent on these economic activities*	• *Present and future consumptive use*
Hydrological coverage of the framework	• *Identification of Water requirement to maintain ecosystem functioning*	• *Population within the watercourse catchment area and dependent on the water of the watercourse*	• *Share of GDP, tax revenues, employment, foreign exchange earnings*	• *Non-consumptive use*
• *Extent of drainage basin*	• *Identification of the population directly dependent on the ecosystem*	• *Growth and migration of population*	**Coverage of the Impacts in the Frame work**	**Coverage of the alternatives to the use of the Watercourse in the frame work**
• *Agreement on Hydrological boundaries*	**Social Coverage of the framework**	• *Livestock*	• *Impacts of existing and potential uses*	• *Alternative source of water for existing or planned uses*
• *Identification of the water which will be included in the analysis (Surface Water, Groundwater)*	• *Human development index*	• *Existing uses, Potential uses, and Extent of "Vital human needs"*	• *Beneficial and adverse impacts*	• *Alternatives to using water (which provide similar benefits)*
• *Analysis of water availability, Water quality,*	• *Customary uses*		• *Transboundary and national Impacts*	**Other Required Factors** as considered necessary shall be included in the frame work
• Potential climate change impacts	• Gender uses		• Impacts on water quantity, quality• Social and economic impacts	

Table 4.3
Step 3. Mutual Benefits Scenarios.

Step 3. Mutual benefits Scenarios				
Geographical Sharing Context	Means of transboundary sharing	Categories of benefits are to be included in the Analysis		
• *Identification of a mechanism to share the benefit between sub-basins*	• *Identification of the criteria which will be used to identify a benefit as being shared*	• *Economic* ***Benefits*** (e.g., *Hydro- power, Agriculture, industry, mining, tourism, fisheries, etc.).* ***Social Capital Benefits*** *(Capacity building, skill sharing, etc.)*	• *Environmental* ***Benefits*** *(watershed management, environmental flows, wetland conservation, flood control, habitat protection, etc.)*	• *Political* ***Benefits*** *(Cooperation, Meeting SDGs, domestic and rural water supply, etc.*

Table 4.4
Step 4. Enlarging Baskets of Benefits.

Step 4. Enlarging the Baskets of Benefits			
• *Type **1**: Environmental "Increasing Benefits" – To the river*	• *Type **2**: Economic "Increasing Benefits – From the river*	• *Type **3**: Political – "Decreasing Costs" – Because of the river*	• *Type **4**: Indirect Economic "Increasing Benefits" – Beyond the river*

5. Conclusion and Recommendation

The Kabul River Basin exhibits the unusual riparian circumstance that both countries (Afghanistan and Pakistan) are both down and upstream of one another, deterring each from arguing for absolute sovereignty over water on their territory, as this traditional upstream position would then function to their detriment in the downstream position. This characteristic of the KRB is an opportunity for the riparian states to negotiate and cooperate. Nonetheless, distrust and capacity weaknesses have created a complex situation in the basin in terms of mutual utilization.

The findings of this paper reveal that the countries will not reach the state of cooperation over the water resources of the basin unless the distrust and capacity weakness challenges are overcome. Furthermore, the project-by-project approach to negotiations are deadlocked in the basin and, therefore, it is required to shift from such a traditional approach towards enlargement of the basket of benefits. The emphasis, thus, should be on benefit sharing rather than physical water sharing. Another important finding of this paper is that Afghanistan has shown tangible political efforts and willingness to alleviate the ongoing disputes and improve mutual cooperation.

This paper has formulated a step-by-step conflict transformation process framework, which may transform the existing conflicts to sustainable cooperation. The framework is formulated in a manner to move the topic of talks from rights to benefits. This framework can be widely used as a decision-making tool for potentially resolving both technical as well as political issues.

Finally, the role of the international community as facilitators and mediators for the transformation process is vital. In the absence of donor support, there may not be a willingness to successfully implement the formulated framework of transformation.

This paper could be further developed in future. For the purpose of this study, water demand data from Pakistan could not be gathered. Thus, it is highly recommended that the needs on both sides of the basin be identified and analyzed for benefit sharing and enlarging the basket of benefits.

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