Evaluation of River Basin Councils in Kazakhstan: the case of Aspara River

by

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ABSTRACT

In the 21st century, there are many challenges with water resources in the world. To battle these challenges, Kazakhstan introduced the hydrographic (river) basin management approach in 2004 by establishing River Basin Organisations (RBOs) to coordinate water uses on a basin level. In order to engage local stakeholders, the River Basin Councils (RBCs) were developed on the national level; the National Policy Dialogues (NPDs) on water issues were launched, as well. As a result, the water management process became more inclusive, participatory and responsive. There are eight district basin management areas in Kazakhstan, which are Aral-Syr Darya, Balkhash-Alakol, Irtysh, Ural-Caspian, Ishim, Nura-Sarysu, Tobol-Torgai and Chu-Talas-Assa. One of the projects that is being implemented on the territory of Kazakhstan in 2019 is USAID's project in Aspara sub-basin. Aspara sub-basin is a part of the larger Chu-Talas-Assa basin. This project was developed as a part of the USAID project "Partnership of Stakeholders in Joint Policy Development: Promoting Cross-Border Cooperation on Small Watersheds in Central Asia". This project aims to promote cross-border cooperation of Central Asian countries (particularly between Kazakhstan and Kyrgyzstan) through the introduction of the principles of RBO in small river basins. Aspara river basin project has been carried out in the coastal villages of the Zhambyl region of the Republic of Kazakhstan and coastal villages of the Chu region of the Kyrgyz Republic.

The essential aspect of this project was to establish councils not only on the larger basin level but also on the sub-basin level like in Aspara. This research aims to assess the effectiveness of river basin management and particularly the value of river basin councils on Aspara and draw inference for basin management nationwide. For this reason, relevant basin indicators have been selected through a literature review to assess the operational status of the River Basin Councils both in Kazakhstan and in Kyrgyzstan that has been established through USAID projects in both countries. This research adopted a qualitative approach. Semi-structured interviews were conducted with the key stakeholders from both Kazakhstani and Kyrgyzstani sides. Research findings appraised the effectiveness of RBCs in the Aspara sub-basin by further identifying the potential for the introduction of river basin councils in bigger transboundary basins in Kazakhstan.

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1. INTRODUCTION

Management and usage of freshwater sources in Kazakhstan from early times have been linked with energy and food provision and supply (FAO, 2012). The water-energy concept (WEF nexus) was introduced in Kazakhstan since the Soviet period (Karatayev et al., 2017). According to this concept, upstream countries of the USSR, which are Kyrgyzstan and Tajikistan provided water for irrigation to downstream countries as Uzbekistan, Turkmenistan, and Kazakhstan in the summertime. In return, these downstream countries supplied upstream countries with grains and fossil fuels in winter seasons. However, the environmental aspects of this type of natural resource management were usually neglected at that time. Desiccation of the Aral Sea probably is the most famous example of ignorance of environmental impacts (Xenarios et al, 2018).

After gaining independence in 1991 and the collapse of WEF, Kazakhstan was obliged to solve major challenges on water use management, which mostly were transboundary. Kazakhstan, depending on the use and type of water supply systems, inherited water management system based on Soviet time «irrigation districts» and «water-use regions» systems (Pak & Wegerich, 2014). As a result, some USSR districts were supplied with groundwater, large pumping stations discharged water from rivers in some other areas, while others use a combination of ground and surface waters (Thurman, 2011).

Generally, in Kazakhstan, water management was applied through technocratic top-down administration (Pak & Wegerich, 2014). However, centralized management often led to inefficiencies in fulfilling the water demands on the local level. To overcome this challenge, Kazakhstan introduced the river basin management approach (RBM) in 2004, by establishing River Basin Organizations (RBOs) to facilitate and coordinate water usage on a basin level (UNDP, 2008). The introduction of the River Basin Councils (RBCs) and National Policy Dialogues (NPDs) at the national level enhanced the engagement of local stakeholders. The idea of the government was to make water management more participatory, inclusive and responsive by engaging main stakeholders, water users and relevant policymakers (UNDP, 2007).

RBOs request to offer feasible and pragmatic solutions for better coordination of water uses in each basin (UNDP, 2008). However, because of numerous reasons, this task seems to be extremely difficult for Kazakhstan. First, more than 50% of surface waters in Kazakhstan

are transboundary in nature, having to share them with neighboring countries as Russia, China, Uzbekistan and Kyrgyzstan (FAO, 2012). Kazakhstan is downstream county; therefore, there is a limited possibility to control the quantity and quality of coming waters. Moreover, water basins in Kazakhstan are extensively used for hydropower generation, oil, gas exploration, processing, natural resources mining, and irrigation for agriculture (FAO, 2010). Finally, the main local stakeholders are mostly unengaged in meetings and consultations since they have a belief that decisions are made through the top-down centralized bureaucratic approach, and their input would not make a significant difference (UNDP, 2007).

Since there were no researches conducted to access the effectiveness of RBC in Kazakhstan and international studies are rare and very limited, the aim of this research is to assess its effectiveness on the Aspara River and draw some inference for the basin management in Kazakhstan. Questionnaire to assess the operational status of the River Basin Councils both in Kazakhstan and in Kyrgyzstan, have been composed through an in-depth literature review of the world widely used and country-specific indicators. This research adopted a qualitative approach: semi-structured interviews were conducted with the key stakeholders from both Kazakhstani and Kyrgyzstani members of SBC (eleven from the Kazakhstani side and four from the Kyrgyzstani side). All conducted interviews were recorded, transcribed and then exported into the NVIVO program. It is qualitative data analysis software, which helped to organize, analyze and find insights in a large amount of information collected during interviews. The results of the research appraised the effectiveness of the RBO and RBCs on Aspara by further identifying the potential for improvement on river basin management plans in Kazakhstan.

2. LITERATURE REVIEW

2.1 Water situation in Kazakhstan

There are approximately 39 000 rivers and streams in Kazakhstan, 7000 of which are over 10 km in length (FAO, 2012). Kazakhstani surface water resources are highly unevenly distributed and are characterized by serious seasonal and perennial dynamics (Karatayev et al, 2017). Uneven distribution of water in Kazakhstan represents a significant challenge since water quantity does not match with water demand for the country's social and economic development. The Chu-Talas-Assa (ST) and Tobol Torgai (TT) river basins cover around 35% of the country's arable land, where 21% of total country's populations live but account for only 3% of country's total water reserves (Karatayev et al, 2017). The western and southwestern regions of Kazakhstan (Kyzylorda, Atyrau and particularly Mangystau region) which are oil-producing regions have significant water deficits (FAO, 2012). Contrary to it, three river basins, Aral-Syrdarya (SD), Irtysh (IR) and Balkhash-Alakol (BA) contain almost 75% of all country's water resources (Karatayev et al., 2017).

Geographically, Kazakhstan territory is divided into eight water resource basins: Balkhash-Alakol (BA), Ural-Caspian (UA), Aral-Syrdarya (SD), Irtysh (IR), Ishim (IS), Nura-Sarysu (NS), Chu-Talas-Assa (ST) and Tobol-Torgai (TT) (Karatayev et al, 2017).

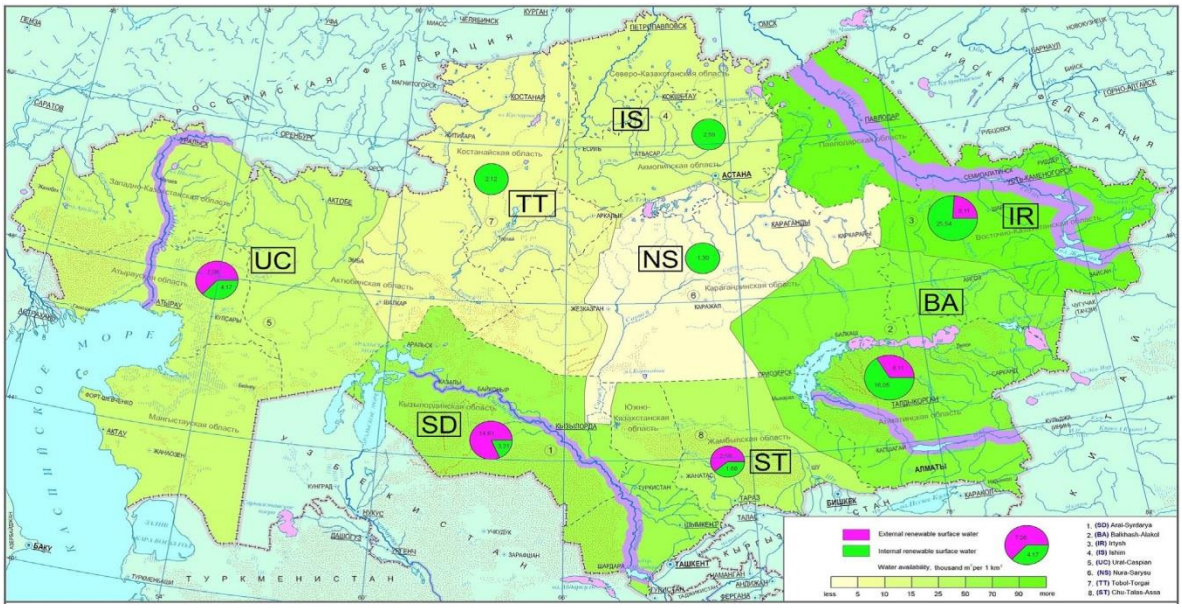

Figure 1. River Basins in Kazakhstan and renewable (external and internal) freshwater sources. *Source: KRIG, 2013.*

1. The Ural-Caspian river basin within Kazakhstan borders occupies 415 000 km^2 (FAO, 2012). This basin includes the Russian Federation and West Kazakhstan, Atyrau and part of Aktobe oblasts. The key water source of the basin is the Ural River, which begins on the territory of the Russian Federation.

2. The Balkhash-Alakol basin occupies 413 000 km^2, 353 000 km^2 of which lies on the territory of Kazakhstan, particularly in Almaty and some parts of Karagandy, East Kazakhstan and Jambyl oblasts (FAO, 2012). Basin generally occupies a vast area in southeast Kazakhstan, a minor part of Kyrgyzstan, and some parts of China. There are five rivers (Ayaguz, Lepsy, Karatal, Ili, and Aksu), which come from the mountain areas of Tarbagatai, Cenghis tau and Tien Shan and flows into Balkhash Lake.

3. The Syr Darya basin area is about 345 000 km^2, and it lies on the territory of Kyzylorda and South Kazakhstan provinces (FAO, 2012). The main Syr Darya originates from Fergana Valley in Uzbekistan at the intersection of Karadarya and Naryn rivers, outside Kazakhstan. The total river length from origination to Aral Sea is 2212 km, from which 1627 km within Kazakhstan borders (FAO, 2012). The largest inflows within Kazakhstan flows from southern west slopes of Karatau Ridge are Arys, Badam, Keles, Bugun, and Boroldai.

4. The Irtysh basin occupies an area of 316 500 km^2 and located in Pavlodar province and East Kazakhstan region (FAO, 2012). Irtysh River begins in China on western slopes of Mongolian Altai and until it enters Lake Zaisan in Kazakhstan is called the Black Irtysh. After flowing on the territory of northeast Kazakhstan, it joins Ob River in the Russian Federation. The total length of Irtysh River is 4,280 km, 618 km of which pass through the territory of China, 1698 km pass through the territory of Kazakhstan, and 1964 km pass through the territory of Russia. This basin considered the most prosperous and secure from the position of water resources (FAO, 2012).

5. The Ishim (Yesil in Kazakh) river basin occupies 245 000 km^2, and occupies North Kazakhstan and Akmola oblasts. The river originates in springs in the Niaz mountains in Karagandy oblast and 2450 km long, 1717 km of which lies on the territory of Kazakhstan (FAO, 2012). The most significant inflows to Ishim are Zhabai, Tersakkan, Iman-Burluk, Koluton and Akan-burluk rivers. Ishim basin is the least prosperous and secure about availability of water resources, since its groundwater resources account only 4 percent of

the basin's waters, which is the lowest in Kazakhstan (FAO, 2012). Surface runoff of the Ishim River is used to provide water for gardens irrigation in Kokshetau, Astana, Petropavlovsk regions.

6. The Chu (Shu in Kazakh)-Talas-Assa basin has a total area of 64 300 km^2, including Kyrgyzstan's part, and is formed mainly from three rivers Chu, Talas and Assa. There are many small rivers in river basins: 140 in Chu river basin, 64 in Assa river basin and 20 in Talas river basin (FAO, 2012). The flow of Kurkureu-su (the main inflow of Assa), Chu and Talas is totally formed on the territory of Kyrgyzstan.

7. The Nura-Sarysu basin consists of Karasor and Tengiz lakes, and Sarysu and Nura rivers, (FAO, 2012). The Nura represents the longest river in the basin is 978 km long, originates in the Kyzyltas Mountains and flows into the Tengiz Lake. Sherubainura, Akbastau and Ulkenkundyzy are the primary tributaries of the Nura River. The 761 km long Sarysu River originates in two branches of of Zhaksysarysu and flows into Telekol Lake in Kyzylorda oblast (FAO, 2012). The principal tributaries of the Sarysu River are Kensaz and Karakengir. The basin's water resource level was increased due to construction of the Satpayev canal.

8. The Tobol-Torgai basin includes the rivers Irgiz, Tobol and Torgai (FAO, 2012). It is Kazakhstan's poorest basin in terms of water resources. The Tobol River with its left-bank inflows Ayat, Sytasty, and Ui originates from the Ural Mountains. The annual flow of rivers fluctuates considerably and characterized by alternating low water and high water years. The time scale of high water and low water periods varies from 8 to 10 and 6 to 20 years respectively (FAO, 2012).

Moreover, it should be noted that according to Karatayev et al (2017) the average comprehensive volume of all renewable freshwaters in Kazakhstan accounts 100.6 km^3 per year, 55.94 km^3 of which forms on its territory. It means that remaining 44.64 km^3 of renewable freshwater resources flows to Kazakhstan from neighboring Russia (7.6 km^3), China (19.2 km^3), Uzbekistan (14.7 km^3) and Kyrgyzstan (3.1 km^3) (FAO, 2012). However, total inflow of transboundary waters to Kazakhstan decreased by 25% from 59.1 km3 in 1998 to 44.64 km3 in 2014 (Karatayev et al., 2017). Moreover, according to estimation by 2030 total inflow of transboundary water would decrease to even 31.6 km3.

Therefore, referring to Karatayev et al. (2017) uncontrolled use of water resources by upstream countries considered as major threat to water security in Kazakhstan in future.

River Basin	BA	IR	SD	UC	ST	IS	NS	TT
Main rivers*	Ili	Irtysh	Syr Darya	Ural	Chu, Talas, Assa	Ishim	Nura and Sarysu	Tobol, Torgai and Irgiz
Main water bodies* (lakes, reservoirs)	Balkhash, Alakol; Kapchagai reservoir	Zaisan, Bukhtarma, Oskemen and Shulba reservoirs	Aral Sea; Shardara reservoir	Caspian Sea			Tengiz and Karasor, Telekol	Kushmurun, Sarykopa, Aksuat, Sarymoyin
Area* in (km^2)	353,000	316,500	345,000	415,000	64,300	245,000	139,700	214,000
Administrative regions*	Almaty region Karagandy and East Kazakhstan	East Kazakhstan, Pavlodar	Turkistan, Kyzylorda, Shymkent	West Kazakhstan and Atyrau, part of Aktobe	Part of Jambyl	Akmola, North Kazakhstan, Nur-Sultan	Karaganda	Kostanay and Aktobe
Population By 1 February 2019**	4,039,757	2,132,147	3,793,564	2,158,185	980,000*	2,375,107	1,000000*	1,050,000*
Water reserves * (km^3)	149.4	43.8	37.9	28	6.11	5.34	4.59	2.9
Multiyear average surface water flow* (km^3/year)**	28	36.4	17.5	16	4.71	2.52	1.3	2.11
Inflow from adjacent countries* (km^3/year)**	11.8	9.5	15.3	10.5	3.47	-	82 from IR Basin	0.34
Surface flow formed within the basin* (km^3/year)**	16.2	26.9	2.14	5.47	124	2.52	1.3	1.78
Water potential**, (km^3)**	25.18	30.41	22.29	12.39	4.24	2.77	1.37	1.94
Water consumption*** (km^3)**	3.91	3.88	11.13	2.97	2.9	0.46	1.29	0.09

Table 1. River Basin Features in Kazakhstan. *Source: *UNDP, 2004; ** NSA, 2019; *** MoA RK, 2018; **** Karatayev, 2017.*

2.2 Water management in Kazakhstan

The River Basin Councils (RBC) were introduced according to Article 45 of the Water Code of the Republic of Kazakhstan and became the main tools on stakeholder engagement and participation on a basin level (Baubekova et al, 2019). According to UNDP (2008), The main idea of RBC is to become a consultative and advisory organization that deals with such issues as use and protection of water sources, effective water distribution and allocation, water quality; and suggest and propose recommendations for river basin management organizations (UNDP, 2008). The RBC sanction state bodies, representatives of water users (farmers and agrarians), professionals and others to review and oversight the progress of implementation of basin agreements and basin organizations operation, and participate in the joint development of recommendations for their participants (IWAC,2019). Generally, the role of RBC is to provide the required institutional framework for the implementation of integrated water resources management (UNDP, 2008).

Members of RBC can be all main stakeholders of water management such as representatives of local executive bodies (Akimats), departments of governmental agencies (agencies, committees), water users as agrarians and farmers, NGOs and others. Operation of each RBC chaired and led by the head of the relevant basin authority (UNDP, 2008).

The work of the basin is organized in a way of meetings, which are held at least twice a year. The first RBCs in Kazakhstan were created in 2005 in Balkhash-Alakol and Nur-Sarysu river basins (Baubekova et al, 2019). In three years from 2005 to 2007, all eight RBCc were established within the framework of the UNDP project «National Plan for IWRM and Water Conservation for Kazakhstan» (Mukhtarov 2013; Meyer and Lundy 2014).

The RBCs operate as a consultative and advisory body to RBOs. RBCs should inform the public about its operation and activities through the publication of materials, media outlets and public hearings (UNDP, 2008). It should be noted that the positive contribution of RBC in decision-making is already highlighted in some of the basins.

However, the operation of RBC is still lacking the capacity to promote significant changes at the local level, except for some cases as in Chu-Talas ad Balkhash-Alakol basins (Baubekova et al, 2019). To solve this problem, in 2010 the Regional Environmental Center for Central Asia (CAREC) tried to approach key stakeholders with the aid of smaller river basins, taking into account the experience of similar cases in the region and globally (USAID-CAREC, 2018). The

main idea is to arrange stakeholders in sub-basin councils (SBCs), identify main water-related issues on the local level, and then communicate them further to a basin level.

According to Yakubov (2019), the first two SBCs, which were established on the territory of Kazakhstan, are Ugam-Kenes sub-catchment in the upstream of the Kazakhstani part of the Syrdarya in 2011 and Little Aral sub-catchment in the downstream of Aral-Syrdarya basin in 2012. Next SBC was established in Arys sub-catchment in 2015. After that, SBCs were introduced on transboundary small rivers during 2013-2015, one of which is shared between Kazakhstan and Kyrgyzstan (Aspara River) and one by Kazakhstan and Uzbekistan (Ugam River) (Yakubov, 2019).

CAREC started to promote SBC as a part of the USAID funded "Smart Waters project" in 2015 (USAID-CAREC, 2018). As a result, the Smart waters project was extended to six more Central Asian small transboundary rivers including Kurkureu River, which is shared by Kazakhstan and Kyrgyzstan.

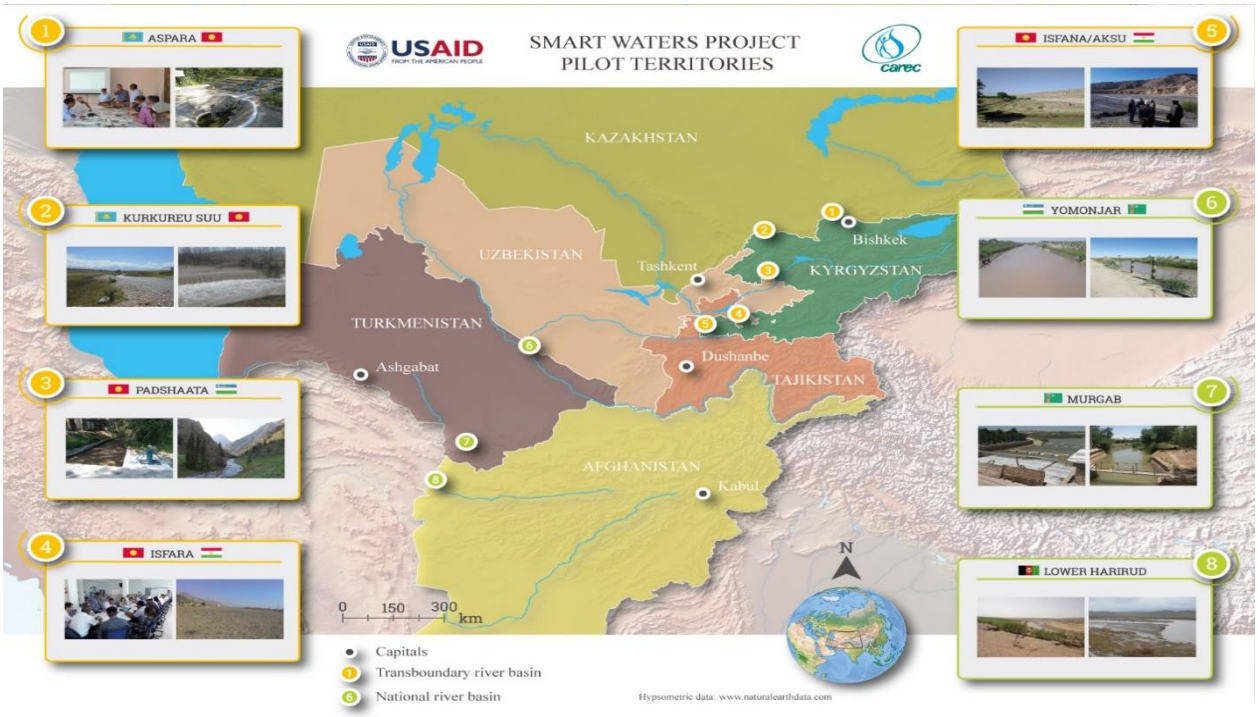

Figure 2. Transboundary Rivers where CAREC facilitated establishment of SBCs. *Source: USAID-CAREC, 2018.*

New established SBCs formalized with the aid of jointly signed protocol where basic roles, functions, membership arrangement, and selection of head, and other required procedures are clearly defined. The interim results of the Smart Water projects clearly show that sub-basin

councils have the potential to become a bridge between key stakeholders and the big inter-state river basin organizations (Baubekova et. al, 2019).

3. RESEARCH AND METHODOLOGY

3.1 Case study descriptive: Aspara River sub-basin council

The Aspara River is located in the Panfilov district of Chu oblast of Kyrgyzstan and the Merke district of Zhambyl oblast of Kazakhstan. The river belongs to the Chu river basin, originates on the Kyrgyz ridge in the region of Kazakh-Kyrgyz state border in the mountains of the Western Tian Shan, and then in high water years flows into Kyragaty River on the territory of Kazakhstan. Most of the river's catchment area located in high mountains (at an altitude from 500 to 4300 m above sea level) in an inaccessible and sparsely populated area (USAID, 2015). The total length of the Aspara River is 108 km, the river basin area is 1318 km^2, 876 km^2 of which belongs to Kazakhstan territory and the remaining 442 km^2 to Kyrgyzstan territory. The width of the Aspara River in some places reaches 7 meters, the depth is 0.5-1 meter, and the speed of the water flow in the river varies between 0.5-0.8 m/s (USAID, 2015). The main direction of agriculture in the basin considered grain growing. Currently, in both Kazakhstan and Kyrgyzstan, considerable areas of irrigated land are not developed (USAID, 2015). The reason for this is the lack of water resources.

Figure 3. Water distribution unit on Aspara River *Source: USAID, 2015.*

The allocation of the Aspara river runoff during vegetation period is established by «Regulation on the allocation of the Talas, Kurkureu-Su and Aspara rivers between the Kazakh SSR and Kyrgyz SSR» dated February 5, 1948, according to which 62% of the Aspara river flow is allocated to Kazakhstan while remaining 38% is allocated to Kyrgyzstan (USAID, 2015). Sometimes and particularly in dry years, there have been some disputes on the issue of river flow allocation between Kazakh and Kyrgyz sides, since it is the main arterial of land irrigation for agriculture.

Figure 4. Scheme of runoff water allocation automatic monitoring system of the Aspara River. *Source: USAID, 2015*

In 2012, to promote transboundary cooperation of Central Asian countries through the introduction of the principles of integrated water resources management on small river basins, USAID initiated a project called "stakeholder partnership in joint policy development: promoting transboundary cooperation on small watersheds in Central Asia" (USAID, 2015). Three small transboundary rivers of Central Asia, which are Isfara, Ugam, and Aspara, were selected for this upper mentioned pilot project. In the future, it is planned to use the main project's findings from these upper mentioned three small rivers as a model of cooperation for big transboundary rivers (USAID, 2015).

3.2 Research methods

This research was conducted with the aid of qualitative methods, consisting of observations, semi-structured interviews, and field notes. A semi-structured interview method had been used because this type of interview comes together with open-ended questions and self-generated questions, which appear in the process of dialogue or conversation between interviewer and interviewee/s. This type of interview was selected since it allows the researcher to capture people's perceptions, context and interpretation of the situation. Besides, semi-structured interviews allow respondents to express their feelings and ideas freely.

Primary data for the research were collected with the aid of a questionnaire developed based on context-specific indicators. There are many indicators possibly applicable to river basin management and this number is rapidly increasing with the developments in science. Most of the time, the biggest challenge is to narrow them to a minimal set.

Various guidelines can be used to select an appropriate set of indicators. In general, the selection process should find the balance between scientifically strong and qualitative indicators, which are used worldwide, and indicators that shape the values and priorities of the particular basin (Roger et al., 2015). Therefore, applying already used indicators framework and adding some context-specific indicators depending on issues and priorities of a particular basin - in our case the Aspara river basin - following indicators framework has been obtained (table below).

Indicator	Description	Reason	Reference
Climate change	A change in regional or global climate patterns	Due to climate change observed in the Central Asian region, the area of snowfields in the Aspara River basin decreased significantly over the last decade	Bertlude et. al, 2017
Irrigation water availability	The amount of irrigation water available	Currently, on the Kazakhstani part of the Aspara river basin 1.2 thousand hectares of the total irrigated area has not been developed. The reason for this is the lack of water resources, particularly in drought seasons.	Bertlude et. al, 2017
Coordinated decision-making	Application of coordination procedures between and within organs and basin	Transboundary cooperation in the Aspara Basin is developing within the framework of the Chu-Talas Commission. It makes all the decisions by consensus.	Hooper, 2006

	organizations; decision-making based on consensus		
Water quality	The required chemical and physical water quality to meet drinking and ecosystem water norms and standards	Local residents as good assess the quality of water in the Aspara River. However, it should be noted that regular monitoring of water quality in the river is not carried out.	Shilling et al, 2013
Ecosystem and biodiversity	The variety of living and nonliving organisms in a particular place or in the world	Growth of population and the increase of human related activities inevitably lead to an increase of impact on the environment of the region. Which in own case cause ecosystem and biological diversity degradation in the Aspara basin.	Bertlude et. al, 2017
Water availability	The amount of fresh water available per person	The amount of fresh drinking water remains a problem for a region. Therefore, villages' residents are forced to reduce farming activities such as sowing crops and livestock raising.	Canadian Water Sustainability Index, 2007
Infrastructure & development	Development of infrastructure for water resources management	Local authorities see the construction of the dam as a solution for the water supply problem in the region. Currently, they plan to construct a 100 meters high dam in the Aspara river basin.	UN-water reports, 2012
Stakeholder engagement/ participation	The process when stakeholders have access to information and can be involved in the decision-making process	There is no active public participation in public life. There are no non-governmental organizations. However, there is a sense of mutual assistance and participation in collective activities.	UN-water reports, 2012
Human capacity	The human capacity of local residents to manage water resources properly and address regional water issues	Human potential in the region is not high. Residents with education migrated to large populated regions.	Canadian Water Sustainability Index, 2007
Demographics	Statistical data relating to the population and particular groups within it	Currently, the region's population mostly consists of older people.	Bertlude et. al, 2017

Water pollution sources	The causes and sources of environmental pollution	Evidence of water pollution by sewage and household waste.	Bertlude et. al, 2017
Management & cooperation	The process of handling or managing things or people and working together for the same purpose	Absence of water quantity and water quality joint observation point which leads to complications of interstate relationship.	Bertlude et. al, 2017
Water stress	The amount of water removed from the ecosystem	River basin is heavily subjected to water withdrawals for irrigation and household needs.	Canadian Water Sustainability Index, 2007
Employment	Number of people having a regular job	Residents of coastal villages are mostly unemployed. The main source of income is non-recurring one-time services such as work as a loader and work on the fields. Most of the population has a single source of income - state benefits.	Bertlude et. al, 2017
Flood risk & management	Product of the vulnerability to flooding multiplied by the total value of assets at risk of flooding, and process to reduce losses caused by flooding while taking into account benefits from floods	There is a permanent risk of emergency situations due to the possible rupture of ground dams. Source of the threat is a lack of required monitoring of hydrological status of water objects and their unsatisfactory technical conditions.	Bertlude et. al, 2017
Social Benefits and equity	The social, health, and equity benefits obtained through well-managed and effective water system	The region is characterized by the decreasing quality of life, unattractive places of settlements, and growing migration rates from the region	Shilling et al, 2013
Access to water	Economic accessibility to water and sanitation services	According to USAID report region has very low water tariffs for industrial and agricultural enterprises	Iribarnegaray & Seghezzo, 2012
Funding sources & mechanisms	Evidence of ongoing financial support for water resource management	Aspara river basin lacks financial sources for implementation of water saving programs	UN-water reports, 2012

Public awareness & access to information	Situation when each individual able to seek, receive and share information; better public understanding of environmental concepts and issues	According to the USAID report, there is a lack of attention from the individuals in charge of making decisions and others to the problem of water drainage	Bertlude et. al, 2017
Land use & land use change	Use of land in an effort to promote more desirable social and economic outcomes and its changes	Recently local authorities force farmers to plant sugar beets instead of fodder crops.	Bertlude et. al, 2017
Agriculture	Cultivating plants and livestock	Last years, the Aspara river basin agriculture has faced significant difficulties due to low harvests caused by unstable water supply and incomplete loading of the sugar beet plant. However, the Aspara River basin has enormous potential in the production of fruits and vegetables, livestock products and their processing	Bertlude et. al, 2017
Irrigation system	Application of controlled amounts of water to plants and crops at needed intervals	According to the USAID report, quality of irrigation system is the highest priority problem of the region.	Bertlude et. al, 2017
Water supply	The water supply quality during seasonal variations and vegetation season	The region has a sugar factory, built according to the state program. However, due to the problems with water supply, the program cannot reach its full implementation and high harvest.	Canadian Water Sustainability Index, 2007
Organizational design	Presence of domestic policies and international agreements regarding River basin management. Application of organizational design that meets the needs of the basin and avoids separation and	One of the strengths of the Aspara river basin is the existence of interstate agreements on water allocation. Moreover, there is support from government and local authorities aimed at providing the population and the economic complex with the required amount of water.	Hooper, 2006

	fragmentation		
Land degradation	Any undesirable and harmful effects or disturbance to the land	One of the problems of the Aspara river basin is landscape degradation particularly degradation of irrigated land and foothill meadows and pastures.	Bertlude et. al, 2017

Table 2. Indicators selected for questionnaire design

3.3 Questionnaire design

The questionnaire for the interview was organized into three parts, which are: 1) socio-economic background of the Aspara, 2) operational status of RBOs and RBM in Aspara, 3) perceived outcomes and aspirations for future. Each part consisted of sections. The socio-economic background of the Aspara consisted of personal attributes of respondent and sub-basin attributes. The operational status of RBOs and RBM in the Aspara also consisted of two sections, RBM and RBO operation and water situation in the region in the past versus the present. The last part, perceived outcomes, and aspirations for the future had one section: Contribution of local water, environment, economic situation & future aspirations. The general structure of the questionnaire is represented in Figure 6 below.

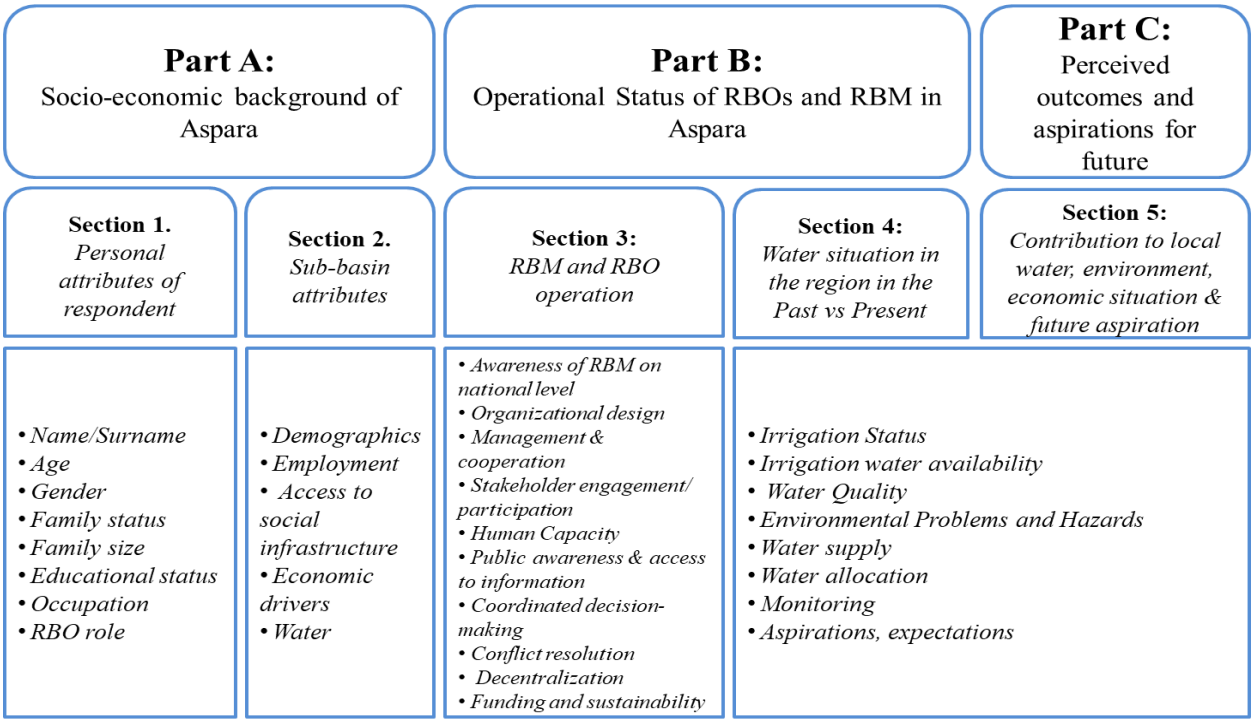

Figure 5. Questionnaire design.

Overall, the questionnaire was designed to proceed from general questions about personal attributes of the interviewee and general situation in a basin to more specific questions about RBM and RBO operation, then finally to an assessment of water situation in region and role of RBC in solving and enhancing the water situation in the region. All the questions can be seen in Table 1.

The questionnaire consisted of 39 questions and took on average 30 minutes for interviewing each respondent. Each interview was recorded and then transcribed. Pilot testing of the designed questionnaire has been tested on MPA student Abylaikhan Dauletalin.

Interviews have been conducted with both Kazakhstani and Kyrgyzstani members of SBC. 4 from Kyrgyzstani side and 11 from Kazakhstani side - 15 in total, which is quite good since both Kazakhstani and Kyrgyzstani RBCs together, consist from 28 members. It should also be noted that face-to-face interviews have been conducted with almost all key stakeholders who are representatives of local administration, agrarians, scholars, the agency are responsible for forecasting synoptic situation and weather conditions «Kazhydromet», and national water agency «Kazvodhoz». The reason to apply purposive sampling and interview key stakeholders from different sectors was to ensure diversity and plurality of views in our study.

Interviews have been conducted in 3 places, namely Taraz (administrative center of Jambyl Region in Kazakhstan), Merke (district center of Jambyl Region in Kazakhstan) and Chaldovar (administrative center of Panfilov district in Kyrgyzstan).

Figure 6. Interview with SBC members from Kazakhstan

Figure 7. Interview with SBC members from Kyrgyzstan

Central Asia Regional Economic Cooperation (CAREC) has suggested the main stakeholders, which have been interviewed, since representatives from CAREC work in the region and know all the important stakeholders involved in RBCs. The data analysis section consisted of

identification, coding and pattern categorization in collected and transcribed data. Coding consisted of grouping and breaking data into parts and components, and then connecting themes and ideas. It was done with the aid of NVIVO - qualitative data analysis software, which helped us find insights in a large amount of information collected during interviews. Detailed results of the interview could be found in the results section and paper annex.

4. RESEARCH FINDINGS

In Section 2, interviewees were asked to tell about their feelings towards the demographic, employment trends, and improvement of access to the social infrastructure. In addition to that, we asked questions regarding the economic drivers of the region and the role of the water. They had to not only provide a simple answer but also give the reasons why do they think so. Every interviewee agreed that water was the basis of everything. It plays the key, strategic and main role in economic and social development. Also, most of them point to the pity situation when not every village of the basin had access to tap water. They were grateful that with the help of donors and decisions of RBC, two villages got the opportunity of having access to tap water.

Figure 8. NVIVO results for role of the water in the region. *Source: NVIVO software results.*

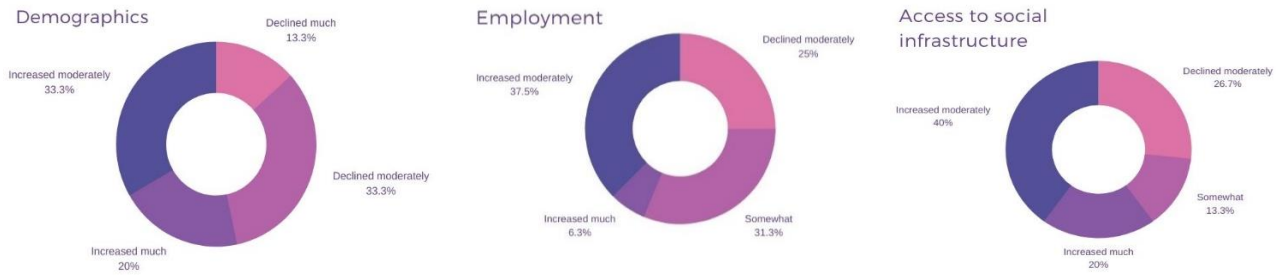

Figure 9. Pie charts of findings of Section 2. *Source: NVIVO software results.*

According to indicators in this section, we see that respondents divided into two sides because of their origin. This section revealed and showed differences in the macro (country) level. Demographic trends in the two countries are different. From the Kazakhstani side, there was a moderate decrease, most probably of the shortage of jobs. The main reason for that farming is

very power-intensive, needs to work hard and it is not permanent. In addition to that, youth leave for studying in the big cities and only some of them come back to villages. From the Kyrgyzstani side, there is an increase in population because of the internal immigration from the south, especially from the Osh region. Another reason is the special government program of relocating ethnic Kyrgyz people from Tajikistan to the north of Kyrgyzstan. Interviewees told that there was no official unemployment because almost everybody was self-employed who were mostly in agriculture and livestock. In addition, almost 10 % of the population in the region is working in the government sector. After comparing the answers of respondents, we can say that employment remained steady. From the Kyrgyzstani side, according to the President's Decree of 22 February 1994 - "On Measures to Promote Land and Agrarian Reforms in the Kyrgyz Republic", the government allocated five hectares of land for each citizen who was born before 1996 (Rios, 2006). There were private dentist clinics, which was very popular not only among Kyrgyz but also among Kazakhstani, and some Kazakhstanis crossed the border just to repair their teeth. According to one respondent, there was a problem with attracting youngsters to farming. He claimed that there was a deficit in skilled workers, especially in combine operators. The level of access to social infrastructure is also different between the two sides. From the Kyrgyz side, there is a moderate increase in access to the social infrastructure as different schools and hospitals, paramedic-midwife stations have newly opened in recent years. However, representatives of both sides claim that the quality of the provided service cannot be compared with a city.

Figure 10. Answers of interviewees to the question regarding main economic drivers of the region. *Source: NVIVO software results.*

We were asking 4 main economic drivers of this sub-basin Aspara: Crop farming, livestock, services, and fishing. Among them, the most important were crop farming and livestock. The most cultivated were cereals, sugar beets and corn. There was no problem with the demand for products. There are sugars factories from both sides, which are ready to buy all the sugar beets produced. There has been a trend of developing the service sector in recent years. There was some fishing culture during Soviet times, but there was only one factory of growing trout fish by the time of this research. Farmers also showed their interest in cultivating more, but the main deterrent factors were the availability of water and a limited number of skilled workers. They pointed out that with the help of SBC, the problem of availability of water was resolved. Nevertheless, they are also using in farming new innovative methods such as drip irrigation in order to save water. One of the farmers got a scholarship from the donor USAID for a drop irrigation project in 2017.

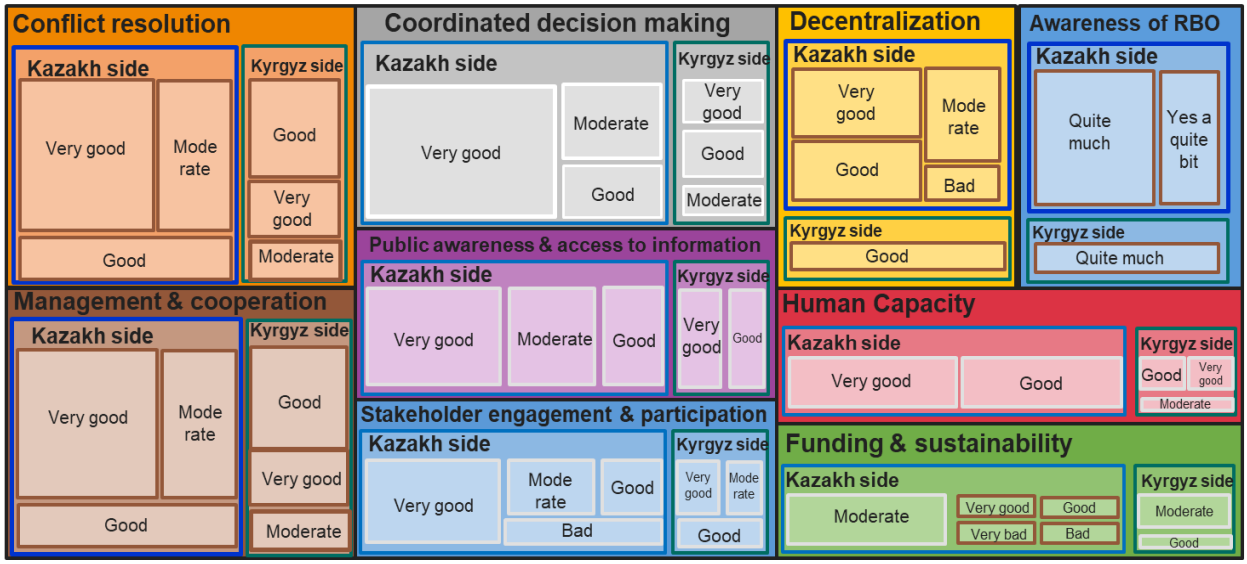

Figure 11. NVIVO results of Section 3 of interviews. *Source: NVIVO software results.*

Section 3 of our interviews consisted of 13 questions. All questions were related with national and transboundary levels which are awareness of RBM, organizational design of RBCs, management & cooperation, stakeholder engagement and participation to the meetings of RBC, level of human capacity, public awareness & access to the information, coordinated decision-

making, conflict resolution, the level of decentralized decision making and the last question was about funding and sustainability of RBCs.

All of our interviewees were aware of River-basin management on the national level. Answers were split between “yes quite a bit” and “quite much”. Almost all interviewees knew at least something about the organizational design of RBCs: nine experts answered to this question as “quite much” and three of the respondents could not answer the question.

All respondents are describing the situation with management and cooperation in RBCs on the national and transboundary levels as a good. Six respondents claim that on both levels, the situation is very good. Every expert is sure that the human capacity of members is high enough to implement RBM on the sub-basin of the Aspara River. In addition to that, the status of stakeholder engagement and participation level is described as very good. The level of decision-making coordination is described as the “very good” from both national and transboundary perspectives. Therefore, the level of conflict resolution after implementing RBM at Aspara River is characterized as “very good” and “good” except for one interviewee. 13 out of 15 interviewees described public awareness and access to information level as “good” and “very good”. One respondent had answer “moderate” and one could not answer the question. Overall, the level of decentralization is good. Eleven respondents claim that the status of decentralization is “good” and “very good”. Four interviewees characterize it as “moderate”. The most challenging question was about funding and sustainability. Six interviewees described it as “moderate”. Three respondents characterized as “very good”. The answers of the rest 6 were divided into 3: “very bad”, “bad” and “good”. Two farmers from Kazakhstan who did not get any support from the government and any donor’s money described the situation as ‘very bad’. They were blaming too much paperwork as the main factor of problems with funding. Two scientists claim that funding is at a moderate level because they think that Kazakhstan could do better because it has opportunities to give more. From a scientific point of view, they think Kazakhstan will face even bigger problems in the future if it cannot cover the present needs.

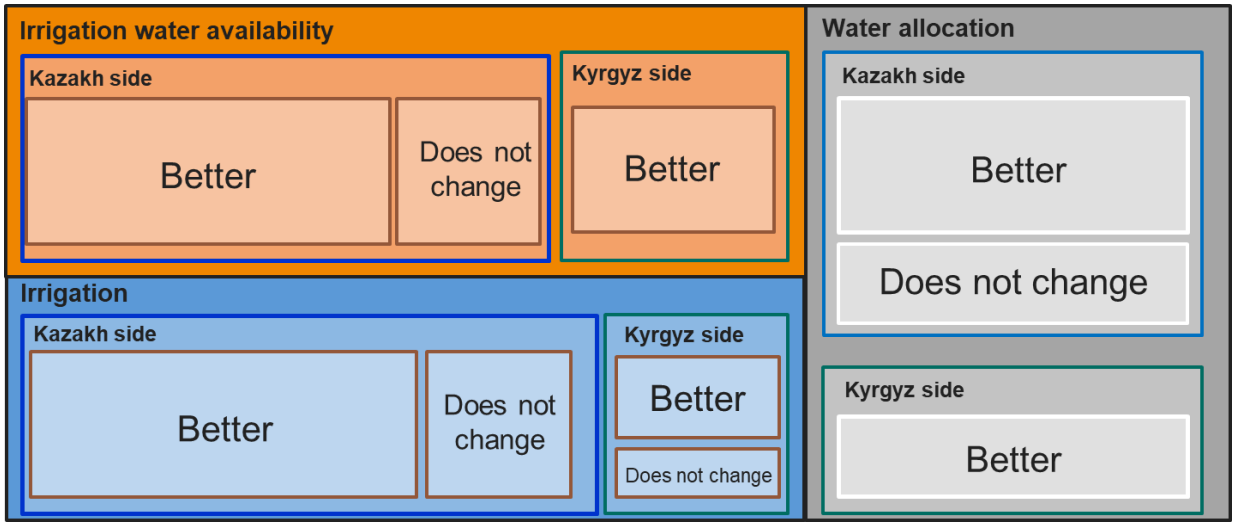

Figure 12. Indicators influenced <u>more</u> by introduction of SBC. *Source: NVIVO software results.*

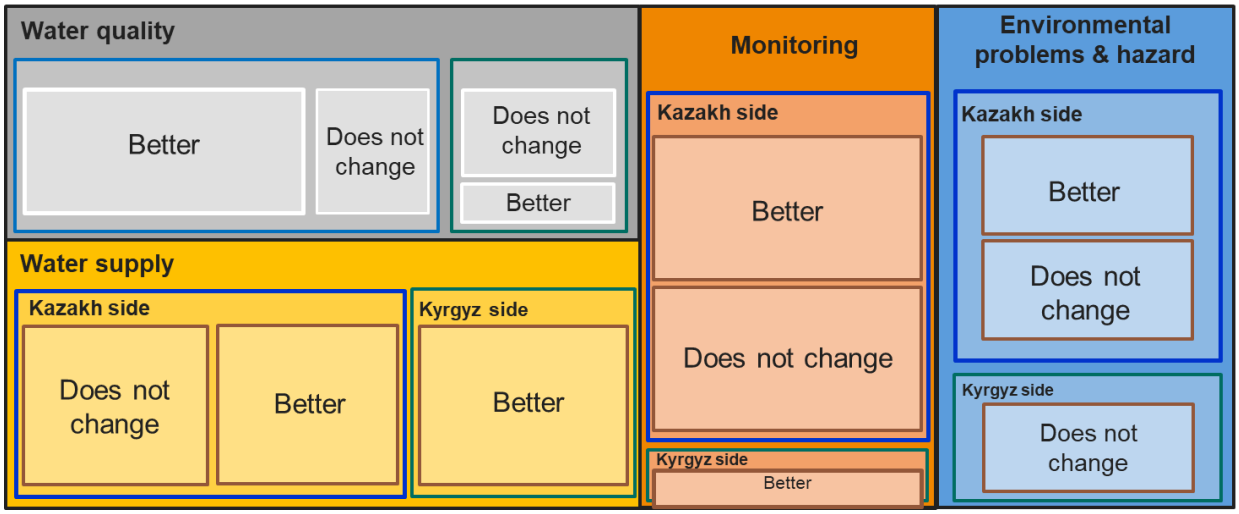

Figure 13. Indicators influenced <u>less</u> by introduction of SBC. *Source: NVIVO software results.*

Section 4 of interviews was about describing situations with irrigation status, irrigation water availability, water quality, environmental problems &hazards, water supply, water allocation and monitoring of water. In addition to that, interviewees had to compare the situation before and after implementing RBM at the sub-basin RBC of Aspara River. In addition to that, they gave detailed feedback on why they thought so.

Present status of water irrigation is described as comparatively better than it was before, and 12 out of 15 respondents told that implementing of RBM had “yes quite a bit” and “quite much” effect. However, two respondents said that it did not have any impact on the irrigation status.

Because of low skills in this area, one respondent could not answer the question. The majority as "good" in comparison with the past situation describes the availability of irrigation water. The next question asked about water quality. The majority told that the quality of water of Aspara River was always at least 'good' because it is mountainous water and there are no industrial plants nearby. Most of them say that it could be polluted because of the human factor and livestock passing the river. In addition to that, RBC could not change the situation because this question was out of their scope and control. The next question of the interview was about environmental problems and hazard related issues *(e.g. groundwater use – waterlogging, high water tables, etc., floods, droughts, soil erosion, diseases, etc.)*. Overall, the present situation is better than before, but the majority said that there were not so many environmental problems even before the introduction of the RBC. Almost the same situation is with drinking water supply. Donors helped two villages with providing water: Cholok-Aryk in Kyrgyzstan and Granitogorsk in Kazakhstan. The majority of respondents are highlighting the importance of RBC to solve problems with water allocation and monitoring processes. Most of the respondents accept the fact that with the introduction of RBC the situation is better nowadays. There were many problems between neighbor countries. It is shown with experts responded mostly "Quite much" and "Yes quite a bit" when asked to compare the past and the present.

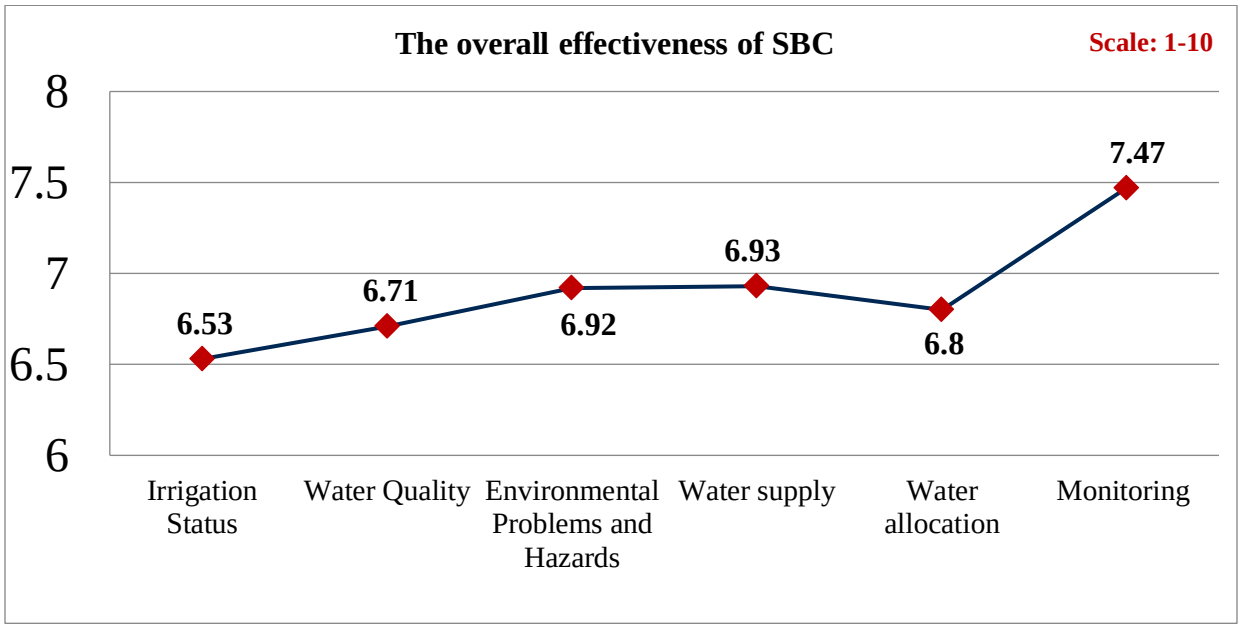

Figure 14. The overall effectiveness of SBC on a scale of 1 to 10. *Source: NVIVO software results.*

In section 5, interviewees graded from 0 to 10 the level of change and influence which was brought by RBC to the Aspara Sub-basin – 0 is the lowest and 10 is the highest score. All respondents graded according to their feeling and professional knowledge. In addition to that, they had to tell us their own aspirations and expectations towards the future of RBC.

The results of grading show that the level of influence of RBC in solving particular issues is quite high. According to respondents, the highest influence was in the monitoring of water level on the Aspara River. Moreover, the level of influence on the environmental problems and hazards was almost 7 out of 10. There was no indicator, which was lower than 6.5 points. It could be even higher for 1 point, but 2 respondents (farmers) had extreme answers and graded influence of RBC as 0 to all indicators. Additionally, respondents shared their expectations and aspirations from RBC. Most of them believe that if RBC continues its job it will have success. Some drawbacks, which it has, will be improved after getting some experience. The next common expectation was about giving not only an advisory function but also a legal status to the SBC. In addition to that, six respondents are pointing out that RBC must not only rely on donor's money but also get financial support from the local administration.

Additionally, we have coded answers for 22 questions when respondents had to give exact determination to the answers where 1 is lowest and 5 is the highest. This was done in order to see who is more positive and negative. There are in total of 110 points. The average score of the total results was 87.4 points. Only one respondent graded it higher than 100. Six and five interviewees gave answers 90-99 and 80-89 respectively. Three people graded it lower than 79. The majority of the most optimistic respondents are from local administration and national water agency representatives. Among the comparatively pessimistic group are farmers and scientists. The average score of Kyrgyz members of RBO is 94 out of 110. In addition, the Kazakhstani experts' score is lower for 9 points and 85 overall.

5. DISCUSSION

General overview

Analyzing the answers of respondents, we can understand that the overall attitude towards SBC is well. The results show that members of SBC are optimistic about SBC operation and they mentioned that previously there were some conflicts related to water, but the situation changed with the establishment of SBCs. Pessimistic responses have been obtained from the farmers who are considered as main stakeholders since their job and welfare directly related to quantity and access to water. Moreover, it should be noted that during the interview with farmers it seemed that they perceive SBC as part of the government. Therefore, they attributed all unsolved issues of government to SBC. Also, it should be mentioned that according to personal attributes they are less educated among all respondents.

Occupation

As it was mentioned in the findings part the most optimistic members of SBC are mainly from local administration and national water agency. Probably, the reason for it is a fact that civil servants are usually trying not to criticize the government and try to be in good relationship with donors under which program of SBCs are being introduced. Scientists are less optimistic because they understand water-related situations better and know that SBC is limited, have a particular aim and cannot solve all problems. The most pessimistic stakeholders of the SBCs are farmers. Probably, it is because water shortage and water-related unsolved problems mainly influence them and significantly affect their welfare.

Conflict of interests

Research findings show us that on average Kyrgyzstani members of SBC are more optimistic about SBC operation and influence on solving water problems in the region than Kazakhstani members of SBC. The reason for this is quite unclear, that all Kyrgyz respondents told that water allocation, which is 68 to 32, is unfair since it has been signed 70 years ago and took into account only the economic perspective of the Soviet Union. Since Kazakhstan and Kyrgyzstan are currently separate sovereign countries, this agreement should be revised to allocate water equally. Moreover, they claimed that automatized water metering systems usually do not work for a long period due to some incidents like a thunderstorm. However, it should be also mentioned that the Kazakhstani side did not mention anything about it, and they claimed that the system works perfectly. It should be mentioned that perhaps Kyrgyzstani members are optimistic

and do not raise this problem of not working with an automatized system, because recent years were high water periods, and the problem may arise in the future during low water years. One respondent told us that these incidents with automatized systems are not coincident and for Kazakhs, it is better to keep the system broken in order to take more water.

Brotherhood relation

It should be noted that traditionally Kazakh and Kyrgyz nations consider each other as brothers. Moreover, some of the respondents claimed that the situation in Aspara is good because they have relatives on both sides of the borders and interethnic marriages are widespread. Therefore, they can solve all the problems, since they are neighbors, speak the same language, and have similar traditions and way of life. Perhaps, because of these distinguishing features, a similar approach cannot be applied to other transboundary basins, particularly with China, since both nations have different religions and speak different languages. Moreover, the water allocation agreement between Kazakhstan and Kyrgyzstan was signed during the period of being one country, while the agreement with China was bilateral between USSR and Communist China.

Public awareness

Another important feature that should be highlighted is public awareness and access to information about SBC operation. It has been noted that Kazakhstani member of SBC does not put much attention to it, and some members claimed that results of the meetings, recommendations made by SBC or even the place of the meeting are not accessible to everyone. In comparison, each Kyrgyzstani member highlighted the importance of discussing and sharing information with the public and residents of the villages. Moreover, according to one of them, they are distributing flyers with the written decisions made by RBC, and publish everything on a designated website. It may be the case that people in Kyrgyzstan demand SBC members to be more accountable and open to the public.

6. CHALLENGES AND RESPONSES.

Challenges and our responses to the challenges of this study are the following:

1. *Limited knowledge on the initial status*

One of the main limitations of this research is the fact that we do not know the situation from the beginning. USAID began implementing this project since 2012. Therefore, research findings could be more valuable and complex if we would know the progress of RBO's operation since the beginning until the present.

2. *Particular case on transboundary context*

According to interviewed people from Kazakh side, Aspara case is specific, because it is the only river in the oblast and probably in Kazakhstan, where the water metering station installed on the territory of Kazakhstan (since Kazakhstani part of the river is higher). Therefore, in the Aspara there were not any serious conflicts with neighboring Kyrgyzstan since water is allocated and controlled by the Kazakhstani side.

3. *Limited amount of respondents*

Kazakhstani and Kyrgyzstani SBC consist of 28 people in total, but due to different reasons, we could interview only 15 of them. Reasons for interviewing only this quantity of respondents are the following: some members of RBO were out of the region, some were ill, and some agrarians, especially from the Kyrgyzstani side, were too busy collecting their harvest. Finally, the list respondents for interview were provided by CAREC.

4. *Unequal representation between Kazakhstan and Kyrgyzstan*

Probably results could favor Kazakhstan since only four members of the Kyrgyzstani side were interviewed, contrary to 11 members from the Kazakhstani side.

5. *Gender inequality*

All 15 respondents are male. However, it should be noted that SBC consist of men only, so this feature is out of the scope of research. In addition, it should be taken into account that water-related jobs and farming are labor-intensive, and they are not attractive to women most of the time.

6. *Limited time and finance*

We had limited time and money could only spend three days in the Merke region doing our interviews with main stakeholders.

7. CONCLUSION AND POLICY RECOMMENDATIONS

Based on the results of the conducted survey several policy recommendations have been formulated:

1) Introduce more sub-basin councils in other transboundary rivers

Most importantly, findings of the conducted survey despite having some caveats demonstrated that the pilot introduction of SBC in Aspara River was successful. It is seen from the response about the level of contribution of SBC on such important indicators as irrigation status, water quality, environmental problems and hazards, water supply, water allocation and monitoring. The average result is 6.9 out of 10. Moreover, as it was mentioned earlier almost all interviewees are positive about the establishment of SBCs in particular sub-basin.

2) Use of the automatized systems of water allocation

As a finding of our research shows, the introduction of the automatized system of water allocation solved most of the issues and helped to raise significantly the level of water allocation control. There are fewer conflicts and tensions between neighboring countries. Most of our interviewees were pointing the importance of using new technologies. In addition to that, efficiency and economic effectiveness of water usage and productivity of farmers are increased.

3) Giving SBC more accredited legal status

Some of the respondents claimed that the significant limitation of SBC is the fact that it is only a consultative body, rather than a decision-maker. Particularly, pessimistic farmers claimed that SBC just give recommendations and do nothing else, and the government simply ignores what they propose. The operation of SBC could be enhanced by giving it more serious organizational status, such as a separate independent legal entity.

4) Enhance the building of human capacity

All of the respondents assess human capacity in SBCs as very high, since each of the members is professional and has many years of practical experience in the water-related field. However, most of the interviewees also claimed that most of the members of SBCs are above middle age, and no one can replace them in the near future. According to them, the reason for this is a fact that nowadays the government does not pay much attention to water-related professions and merge numerous water-related specialties in one called “water business”. In addition to that, water-related jobs are not highly paid and young people do not want to work in rural areas.

5) Shift to water-saving technologies

According to most of the respondents, there is enough water, but the issue is in the smart usage of this water. Some of the regional farmers installed drop irrigation, and according to one of the farmers, water savings increased by 20 times. Therefore, it seems very reasonable to shift to water-saving technologies since the amount of water is limited, while irrigated areas are increasing each year.

6) Improve infrastructure

Some of the respondents told that the main irrigation canals are not so bad since they are on governmental balance. However, internal (farmers) irrigation canals are in very bad condition, so much water is lost before it reaches farmers' fields. Farmers try to repair them by own forces, but it is very costly and they cannot afford it without help from the government. Therefore, KPI of irrigation canals could be increased significantly, and a lot of water saved with the improvement of infrastructure. Moreover, it should be highlighted that all upper mentioned recommendations are derived from the comments of respondents, which are the main stakeholders and members of RBC.

To sum up all, the main aim of our research was to appraise the effectiveness of river management in Kazakhstan by assessing the operation of recently established SBC on transboundary Aspara River. Research findings demonstrate the effectiveness of SBC as an instrument to facilitate the engagement of local stakeholders and solve water-related issues on the basin level. However, despite SBC effectiveness, there is a space for further improvement. First of all, many respondents claim that the operation of SBC could be more fruitful with the obtainment of more accredited and independent legal status. Secondly, both Kazakhstan and Kyrgyzstan should improve old irrigation infrastructure, promote the application of water-saving technologies since in the coming years Central Asia could face significant water shortage. Thirdly, the introduction of automatized systems of water allocation on the Aspara River demonstrated its effectiveness in resolving water-related conflicts and tensions between neighboring countries. Another important aspect to consider is human capacity. According to many interviewees, members of the sub-basin council are professionals and have many years of practical experience, but most of them are at least in their middle ages. Therefore, the government should promote water-related specialties to avoid a lack of water experts in the

future. Finally, research findings demonstrate that sub-basin councils with some caveats should be established on other bigger transboundary rivers.

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ANNEXES

ANNEX 1. INTERVIEW QUESTIONS.

Part A: Socio-economic background of Aspara

Section 1: Personal attributes of respondent	
Name/Surname	
Age	a) ≤30 b) 31-40 c) 41-50 d) 51-60 e) ≥60
Gender	a) Male b) Female
Family status	a) Single b) Married
Family size	a) ≤ 3 b) 4-6 c) 7-9 d) ≥ 10
Educational status	a) No formal schooling b) Elementary graduate c) High school level d) College graduate e) Post graduate
Occupation	a) International water agency b) Local citizen c) Agrarian d) Local administration e) National water agency f) Scholar g) Press h) Other
RBO role	a) Head b) Member
Section 2: Sub-Basin attributes	
Demographics	Describe demographic trend in the region the last 5-10 years *Declined much* ___ *Declined moderately* ___ *Remained steady* ___ *Increased much* ____ *Increased moderately* __ *Provide reason*____
Employment	Describe employment trend in the region? *Declined much* ___ *Declined moderately* __ *Remained steady* ___ *Increased much* ____ *Increased moderately* __ *Provide reason*____

Access to social infrastructure	Describe public access to health, education and leisure centers in last couple of years? *Declined much ___* *Declined moderately ___* *Remained steady ___* *Increased much ____* *Increased moderately __* *Provide reason____*
Economic drivers	What are the main economic drivers in your sub basin? ***Crop farming**:* *Very much___Much____Moderately___Little___Very little___* *Explain:* ***Livestock**: Very much___Much____Moderately___Little___Very little___* *Explain:* ***Services:** Very much___Much____Moderately___Little___Very little___* *Explain:* ***Fishing**: Very much___Much____Moderately___Little___Very little___* *Explain:* *Others:*
Water	What is the role of water in economic development of the region?

Part B: Operational status of RBOs and RBM in Aspara

Section 3: RBM And RBO Operation	
Awareness of RBM on national level	Are you aware of any RBM processes and/or institutions/organizations (RBOs-RBCs etc.) in your country at the national level? *Not at all__Very little__Somewhat__Yes quite a bit___Quite Much___* *Explain:*
Organizational design	How do RBOs and RBCs operate in the region? i.e. under which international agreements and national water policies?
Management & cooperation	How is the management and cooperation situation in RBCs in Aspara? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
Management & cooperation transboundary	Please describe transboundary situation of RBCs at national level and Aspara particularly? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
Stakeholder engagement/ participation	Please describe status of stakeholder engagement/participation with Aspara RBCs? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
Human Capacity	What is the level of people's capacity to implement RBM on Aspara? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*

Public awareness & access to information	What is the level of public awareness and access to information on Aspara sub-basin of river? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
Coordinated decision-making at national level	What is the level of coordinated decision making on national level in Aspara sub-basin? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
Coordinated decision-making at transboundary level	What is the level of coordinated decision making on tranboundary level in Aspara sub-basin? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
Conflict resolution at national level	What is the status of conflict avoidance on national level at Aspara sub-basin? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
Conflict resolution at transboundary level	What is the status of conflict avoidance on transboundary level at Aspara sub-basin? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
Decentralization	What is the status of decentralization on decision making for water issues in Aspara sub basin? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
Funding and sustainability	What is the status of funding sources and financing mechanism to support IWRM in Aspara river basin? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
Section 4: Water situation in the region in the past versus present	
Irrigation Status	**Present**
	What is the status of irrigation system management on Aspara river basin? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
	Past
	What was the status of irrigation system management on Aspara river basin in the past before introduction of sub-basin councils? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
	Past vs Present
	Did situation change in this regard with introduction of sub basin councils? *Not at all__Very little__Somewhat__Yes quite a bit___Quite Much___* *Explain:*
Irrigation water	**Present**

availability	Are there any problems with irrigation water availability? If yes, what is the reason and how severe is the problem?
	Past
	What was the situation with irrigation water availability before introduction of sub basin councils?
	Past vs Present
	Did situation change in this regard with introduction of sub basin councils? *Not at all__Very little__Somewhat__Yes quite a bit___Quite Much___* *Explain:*
Water Quality	**Present**
	What is the status of pollution control in Aspara river basin? What are the main sources of pollution? Can you elaborate more on that? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
	Past
	What was the status of pollution control in Aspara river basin before introduction of sub basin councils? What were the main sources of pollution? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
	Past vs Present
	Did situation change in this regard with introduction of sub basin councils? *Not at all__Very little__Somewhat__Yes quite a bit___Quite Much___* *Explain:*
Environmental Problems and Hazards	**Present**
	What is the status of water and environmental-hazard related issues and any system in place to manage those? (e.g. groundwater use – waterlogging, high water tables etc., floods, droughts, soil erosion, diseases etc.) *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
	Past
	What was the status of water and environmental-hazard related issues and any system in place to manage those before introduction of sub basin councils? *Very bad__Bad__Moderate___Good___Very Good___* *Explain:*
	Past vs Present
	Did situation change in this regard with introduction of sub basin councils? *Not at all__Very little__Somewhat__Yes quite a bit___Quite Much___* *Explain:*
Water supply	**Present**

	Are there any problems with drinking water availability? *Many__A few__Not many___Little___Very little __* *Explain:*
	Past
	Were there any issues with water allocation between the Kazakhstani and Kyrgyzstani villages before introduction of sub basin councils? *Many__A few__Not many___Little___Very little __* *Explain:*
	Past vs Present
	Did situation change in this regard with introduction of sub basin councils? *Not at all__Very little__Somewhat__Yes quite a bit___Quite Much___* *Explain:*
Water allocation	**Present**
	Are there any issues with water allocation between the Kazakhstani and Kyrgyzstani villages? *Many__A few__Not many___Little___Very little __* *Explain:*
	Past
	Were there any issues with water allocation between the Kazakhstani and Kyrgyzstani villages before introduction of sub basin councils? *Many__A few__Not many___Little___Very little __* *Explain:*
	Past vs Present
	Did situation change in this regard with introduction of sub basin councils? *Not at all__Very little__Somewhat__Yes quite a bit___Quite Much___* *Explain:*
Monitoring	**Present**
	What is the status of monitoring of water availability on Aspara river basin? *Very Bad__bad__Moderate___Good___Very Good___* *Explain:*
	Past
	What was the status of monitoring of water availability on Aspara river basin before introduction of sub basin councils? *Very Bad__bad__Moderate___Good___Very Good___* *Explain:*
	Past vs Present
	Did situation change in this regard with introduction of sub basin councils? *Not at all__Very little__Somewhat__Yes quite a bit___Quite Much___* *Explain:*

Part C: Perceived outcomes and aspirations for future

Section 5: Contribution to local water, environment, economic situation & future aspiration

Contribution	Example
Irrigation Status	Contribution of RBCs on Irrigation (Scale 1-10). Then Open-End Question on How
Water Quality	Contribution of RBCs on water quality (Scale 1-10). Then Open-End Question on How
Environmental Problems and Hazards	Contribution of RBCs on environmental problems and hazards (Scale 1-10). Then Open-End Question on How
Water supply	Contribution of RBCs on water supply (Scale 1-10). Then Open-End Question on How
Water allocation	Contribution of RBCs on water allocation (Scale 1-10). Then Open-End Question on How
Monitoring	Contribution of RBCs on monitoring (Scale 1-10). Then Open-End Question on How
Aspirations, expectations	How RBM on Aspara will be developed in 5-10 years' time, predictions and expectations

ANNEX 2. NVIVO Coding for the primary data.
Interview coding results by sections.

Section 1

Name	Files	Referenc
Age	13	14
51-60	5	5
41-50	4	4
31-40	2	2
≥60	2	2
≤30	1	1
Educational status	13	14
College graduate	9	10
High school level	2	2
Post graduate	2	2
No formal schooling	0	0
Elementary graduate	0	0
Occupation	12	13
Local administration	4	4
Scholar	4	4
Agrarian	2	2
National water agency	2	2
International water agency	1	1
Local citizen	0	0
Press	0	0
Other	0	0

Section 2

Name	Files	References
Economic drivers	12	59
Fishing	12	16
Farming	12	15
Service	12	14
Livestock	12	13
Demographics	12	19
Increased	8	10
Decreased	5	6
Remained steady	1	1
Employment	12	16
Increased	6	7
Remained steady	5	5
Decreased	2	3
Access to social infrastructure	11	14
Increased	9	9
Decreased	2	3
Remained steady	1	1
Role of Water	11	12

Section 3

Name	Files	References
Conflict resolution	4	9
Moderate	3	4
Very good	2	3
Good	2	2
Very bad	0	0
Bad	0	0
Management & cooperation	4	7
Very good	3	4
Good	2	3
Very bad	0	0
Bad	0	0
Moderate	0	0
Coordinated decision-making	4	7
Very good	4	5
Moderate	2	2
Very bad	0	0
Bad	0	0
Good	0	0
Stakeholder engagement and participation	4	6
Very good	4	4
Bad	1	1
Moderate	1	1
Very bad	0	0
Good	0	0
Public awareness & access to information	4	6
Very good	3	5
Good	1	1
Very bad	0	0
Bad	0	0
Moderate	0	0
Decentralization	4	6
Very good	2	3
Good	2	2
Moderate	1	1
Very bad	0	0
Bad	0	0
Awareness of RBM on national level	4	5
Quite much	4	5
Very little	0	0
Not at all	0	0
Somewhat	0	0
Yes a quite bit	0	0
Human capacity	4	5
Very good	2	3
Good	2	2
Very bad	0	0
Bad	0	0
Moderate	0	0
Funding and sustainability	4	5
Moderate	3	3
Good	1	1
Very good	1	1
Very bad	0	0
Bad	0	0

Section 4

Name	Files	References
Irrigation	8	13
Kazakh side	5	9
Better	4	7
Worse	0	0
Does not change	1	2
Kyrgyz side	3	4
Does not change	1	1
Better	2	3
Worse	0	0
Irrigation water availability	8	13
Kazakh side	5	7
Does not change	2	2
Worse	0	0
Better	3	5
Kyrgyz side	3	6
Does not change	0	0
Better	3	6
Worse	0	0
Water quality	8	14
Kazakh side	5	10
Does not change	2	3
Worse	0	0
Better	3	7
Kyrgyz side	3	4
Does not change	2	3
Better	1	1
Worse	0	0
Environmental problems and hazards	8	10
Kazakh side	5	7
Does not change	2	3
Worse	0	0
Better	3	4
Kyrgyz side	3	3
Does not change	3	3
Better	0	0
Worse	0	0
Water supply	8	12
Kazakh side	5	8
Does not change	3	4
Worse	0	0
Better	2	4
Kyrgyz side	3	4
Does not change	0	0
Better	3	4
Worse	0	0
Water allocation	7	12
Kazakh side	5	8
Does not change	1	2
Worse	0	0
Better	4	6
Kyrgyz side	2	4
Does not change	0	0
Better	2	4
Worse	0	0
Monitoring	6	10
Kazakh side	5	9
Does not change	2	4
Worse	0	0
Better	3	5
Kyrgyz side	1	1
Does not change	0	0
Better	1	1
Worse	0	0