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Degree of Master of Science

Kazakhstan's National Priorities and Political and Institutional Response to the Water-Energy-Climate-Food Nexus: the Effects on the Ili-Balkhash Basin

Zhanel KARINA

July, 2011

Budapest

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ABSTRACT OF THESIS submitted by:

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Kazakhstan is paving its own development pathway. Its priorities are affected by national interests as well as by the interplay of political and economic factors on the regional and global scales. Meanwhile, Kazakhstan is facing such interconnected challenges as water availability, energy access, climate change impacts and food security on both national and local levels. National priorities and policy responses to these challenges as well as other external factors affect the Ili-Balkhash basin, which is the natural capital of high economic and social importance in Kazakhstan. For ensuring sustainable development it is crucial for Kazakhstan to provide an adequate response to the water-energy-climate-food nexus.

This thesis evaluates Kazakhstan's political and institutional response to the nexus and explores its implications on the Ili-Balkhash basin through a comprehensive analysis of the political and institutional settings and a causal-chain analysis, identifying root causes of the problems in the basin. To achieve this objective, national strategic documents and interviews with representatives from different institutions were analyzed. The analysis of the political setting identified national priorities and their consideration of the nexus components. The analysis of the institutional setting identified the main actors in the fields of water, energy, climate and food. According to the analyses, the components of the nexus are not equally addressed, where water has the least attention. It causes current problems on the basin level, which can become more urgent given that the negative combination of internal and external factors takes place. Recommendations on the mitigation of the internal factors are provided.

Keywords: water-energy-climate-food nexus, political and institutional response, national priorities, Kazakhstan, Ili-Balkhash basin

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List of Abbreviations

ADB	Asian Development Bank
AIT	Asian Institute of Technology
BTPP	Balkhash Thermo Power Plant
BWA	Basin Water Authorities
CAR	Central Asian Republics
CAREC	Regional Environmental Center for Central Asia
CCCC	Climate Change Coordination Centre
CRM	Climate risk management
CWR	Committee of Water Resources
EEA	European Environment Agency
ENRC	Eurasian Natural Resources Corporation PLC
EPI	Environmental Policy Integration
GEF	Global Environment Facility
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GWP	Global Water Partnership
IAASTD	International assessment of agricultural knowledge, science and technology for development
IBB	Ili-Balkhash basin
INBO	International Network of Basin Organizations
IRBM	Integrated River Basin Management
IWRM	Integrated Water Resources Management
JSC	joint-stock company
KazNIIIEK	Kazakh Research Institute of Ecology and Climate
KBCSD	Kazakhstan Business Council for Sustainable Development
KHPP	Kapshagay haydropower plant
kWh	kilowatt hour
MEA	Multilateral Environmental Agreement
MEP	Ministry of Environmental Protection
MHPP	Moynak hydropower plant
MINT	Ministry of Industry and New Technologies
MoA	Ministry of Agriculture
NECSD	National Environment Centre of Sustainable Development
OECD	Organisation for Economic Co-operation and Development
PRC	The People's Republic of China
RES	Renewable energy sources
SDC	Sustainable Development Council of Kazakhstan
SRE	Republican state-owned enterprises
TACIS	Technical Assistance for Commonwealth of Independent States
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USSR	Union of Soviet Socialist Republics
WECF	Water-Energy-Climate-Food nexus
MoOG	Ministry of Oil and Gas
WUA	Water User Associations

1. Introduction

1.1 Background

The issue of a water-energy-climate-food (WECF) nexus has been recently put on the global agenda at the annual meeting of the World Economic Forum in January 2011, when a book "*Water security: the water-food-energy-climate nexus*" was launched, underlining the concerns about meeting growing water, energy and food demands under the conditions of population growth, economic growth, urbanization and climate change (Waughray and Workman 2011). Water, energy, climate and food issues are being realized to be closely interconnected and there is an urgent need of integrated policies to address this nexus on the global and national levels. Kazakhstan, a new independent Central Asian state, also faces these challenges and needs to provide an adequate response to them. Currently its responses to the water, energy, climate and food challenges are being shaped by its own national interests and international obligations. Both climate change policy and integrated water resource management, promoted by the global community as the main integration frameworks, are developing in Kazakhstan. The national priorities are also being set. In addition, national policy is influenced by the character of cooperation and geopolitical games on the regional scene. Being interconnected to the neighboring countries by transboundary rivers, infrastructure and economic flows, Kazakhstan is building its national policy, which also reflects its response to regional issues. Such issues as close interdependencies with the Central Asian states after the collapse of the Soviet Union and the conflicts with them over water as well as to China's increasing role in the region and the problems of transboundary water cooperation also shape the development path of the country.

For ensuring sustainable development it is crucial for Kazakhstan that environmental concerns are integrated into the legal, political and institutional settings of the country, that water, energy, climate and food issues are equally addressed, and that there is effective cooperation across sectors, boundaries and levels. However, currently there is no comprehensive analysis of these necessary conditions for securing sustainable development of Kazakhstan. Meanwhile, such analysis is important for understanding the reasons of local problems, which add to national and global challenges. There is already an example of the Aral Sea in the region, where water crisis on the local level became a global issue due to the disbalance of priorities during the Soviet era. The transboundary Ili-Balkhash basin, the focal point of the great economic and social importance in Kazakhstan, also faces serious complex problems. Moreover, the lake Balkhash is projected to

face the fate of the Aral Sea given the increase of water intake in the People's Republic of China (UNECE 2007) and the basin's high vulnerability to climate change (Esserkepova 2009). However, Kazakhstan itself is a large ineffective water consumer with growing water, energy and food demands. As the national strategic development plans appear to increase the demands even more, the existing negative effects on the basin will become more urgent unless environmental concerns are introduced into the national priorities and there is an adequate response to the WECF nexus in the political and institutional settings.

1.2 Research questions and objectives

The overall goal of this research is *to explore the effects of Kazakhstan's national priorities and political and institutional response to the WECF nexus on the local level, the Ili-Balkhash basin in particular.* The research was driven by the irrepressible interest to find answers to the following questions:

1. What are WECF and political challenges for Kazakhstan and what factors shape national priorities and policy responses to these challenges?
2. What are current national priorities and do they facilitate an adequate political and institutional response to the WECF nexus?
3. What are existing problems related to WECF in the Ili-Balkhash basin and what are their root causes?
4. What are possible implications of the current national policy on the local level and how the address to the WECF nexus on the national and local levels can be improved for ensuring sustainable development in Kazakhstan?

In order to answer these questions the following objectives were created:

- *Analyze* prerequisites for the emerging WECF nexus on the global, regional, national and local levels and *identify* WECF and political challenges for Kazakhstan.
- *Analyze* political and institutional settings of Kazakhstan: *identify* national priorities and *evaluate* the capacity to provide an adequate response to the WECF nexus.
- *Explore* the existing problems of the Ili-Balkhash basin, *identify* their root causes and *present* possible future consequences of the realization of national plans on the basin
- *Discuss* findings and their implications, *indicate* possible development paths for the Ili-Balkhash basin and *develop* recommendations for addressing WECF nexus on the national and local levels

1.3 Contribution

This research may be of interest for several reasons. Firstly, WECF nexus is a brand new research area and political and institutional responses of certain countries to address the nexus have not been investigated yet. Secondly, in Kazakhstan, in particular, there is no comprehensive analysis of political and institutional settings in terms of identification of the current national priorities and the evaluation of incorporation of environmental concerns, internationally accepted IWRM and climate policy frameworks and responses to the WECF nexus. Thirdly, the analysis of the root causes of existing local problems and possible implications of national plans on the Ili-Balkhash basin is important in order to address WECF nexus in the basin and prevent an environmental catastrophe similar to the Aral Sea. The results of the research can be interesting for the national policy and decision makers who analyze the effectiveness of cooperation within the institutional system and local implications of national strategies. It also may be of interest for international community for identification of the implementation gaps and compliance of national priorities and internationally suggested policy and institutional frameworks with local realities and needs.

1.4 Methodology

The present research was approached by the combination of complementary methods of data collection and analysis. The data collected for the analysis include both primary and secondary sources and present qualitative interviews, up-to-date literature on the issue and national policy documents. A case study approach, focusing on the Ili-Balkhash basin, was chosen in order to provide deep and comprehensive exploration of the problem by zooming into the local level and showing different dimensions of the problem, implications of the national policies on the basin and interconnections with the national and regional scenes. The data analysis was based on the qualitative analysis of interview data, the gap-analysis of national strategic documents and the causal-chain analysis connecting problems on the local level with other dimensions. A comprehensive research design and analytical and methodological frameworks used for the research are presented in the next chapter.

1.5 Scope and limitations

This study presents a first step in analyzing political and institutional settings in Kazakhstan in terms of their ability to provide an adequate response to the WECF nexus and to incorporate environmental concerns into national development path and priorities. The research also analyzes the interconnections throughout different levels and shows the implications of national priorities

on the local level. Thus, the scope of the study varies mainly from the national to the local level. The geographical scope of the case study is Kazakhstan's part of the Ili-Balkhash basin. The study did not intend to focus on the legal setting and other river basins due to the time limitations and deliberate limitation to the case study. In general, it was impossible to explore all dimensions and implications of the WECF nexus in Kazakhstan due to its complexity. Apart from this, limited timeframe, lack of studies on the environmental policy integration and analysis of political and institutional settings in Kazakhstan and limitations connected with the qualitative research are among limitations of the research. Despite all attempts to collect as many interviews as possible, only 12 interviews were taken within the given timeframe. However, these interviews are representative as they reflect opinions of all important actors in the area of water, energy, climate and food, who represent different groups of the Government, international organizations, science and NGO.

1.6 Structure

The thesis is divided into six chapters and starts with the introduction. The second chapter outlines the analytical and methodological framework of the study. The third chapter is an important component of the analytical framework introducing prerequisites for the emerging WECF nexus on the global, regional, national and local levels. It presents a comprehensive synthesis of up-to-date information gained from different literature sources and introduces the main components of national and local scene for further research analysis. The fourth chapter is focused on Kazakhstan and presents a comprehensive analysis of the incorporation of WECF nexus into its political and institutional frameworks. It identifies national priorities and the capacity of the political and institutional settings to address the WECF nexus through the analysis of horizontal and vertical dimensions of the political framework and the institutional framework. It also introduces one part of the results of the interview analysis. The fifth chapter zooms into the local basin level and presents another part of the themes identified in the qualitative interviews. It identifies the main problems in the basin and presents the results of the causal-chain analysis, showing the root causes of the local problems and effects of the national priorities and political and institutional response to the water-energy-climate-food nexus on the basin. The sixth chapter summarizes main findings, indicates possible development pathways for the Ili-Balkhash basin and provides the reader with recommendations for addressing to the WECF nexus on the national and local levels and for ensuring sustainable development in Kazakhstan.

2. Research design and methodological and analytical frameworks

2.1 The complex character of the research

The current research is of a mixed type, including exploratory, explanatory, descriptive and prescriptive features (Marshall and Rossman 1989). As the issue of the WECF nexus is a new phenomenon, firstly, the interconnections between water, energy, climate and food are *explored* and different pieces of the existing international literature on separate links within the nexus are put into one picture, which present the conceptual model for identifying the components of the WECF nexus on the regional, national and local scenes. The following analysis of the incorporation of the WECF nexus into the political and institutional frameworks of Kazakhstan aims to *explain* what policies are shaping the address to the WECF nexus and to reveal the causal links between national priorities and the position of water, energy, climate and food in the political and institutional settings. The causal links between the focus of the national priorities and the political and institutional settings in terms of the position of WECF and incorporation of environmental concerns and the local basin situation are also presented during the exploration of the WECF nexus in the Ili-Balkhash basin by the causal-chain analysis. In addition, in this part the structures of the phenomenon of the WECF nexus in the Ili-Balkhash basin are disclosed and this is a main characteristic of the *descriptive* research. Finally, the indication of the possible development paths for the Ili-Balkhash basin, shaped by the focus of national priorities, regional situation and climate change, is an element of *predictive* research.

2.2 Research design

The research included four main stages: problem definition, preparatory stage, field research and analytical stages (Figure 1). The problem definition was the very first stage, when the problem was chosen and decisions on the research method and experimental design to approach this problem were made. It must be noted that the initial topic was "The nexus of water and energy problems in the transboundary Ili-Balkhash basin", which was chosen for the research during the academic year after several projects on the problems of transboundary cooperation between Kazakhstan and China, on cost-benefit analysis of the construction of the Kapshagay hydropower plant (KHPP) on the Ili river, on the energy challenges in Kazakhstan and on the threat to the regional sustainable development. The following preparatory stage involved screening the relevant literature on the internet, defining the scope, preliminary sample selection and identification of the main actors, contacting potential interviewees and formulating the research questions. The stage of the field research itself took place in Kazakhstan, in the cities of

Astana and Almaty, and included meeting with people, data collection by conducting interviews and obtaining materials from interviewees and simultaneous analysis of the data. In addition, two conferences "Regional conference on renewable energy development in the CAR and CIS" in Astana and "Capacity development for IWRM in Central Asia" in Almaty were attended; this helped to understand some dimensions of the energy and water perspectives. During the field trip the interviews started to present a broader and at the same time a narrower picture. Not only energy and water issues were raised, but also climate change and agricultural problems were addressed as connected to the energy and water issues by some interviewees. At the same time, some details of the reasons for these problems in the Ili-Balkhash basin connected the problems on the local level with the political and institutional settings on the national and regional scenes. Therefore, the decision was made to broaden the topic by including water, energy, climate and agricultural problems of the Ili-Balkhash basin into the case study and including the exploration of the political and institutional settings as an umbrella for it. Moreover, the coverage of the stakeholders was changed and new interviewees from the area of climate and agriculture were added and the interviews with them fortunately were obtained during the field trip. This decision to change the topic influenced the following theoretical and analytical stage as it increased the scope of the secondary data collection. However, during secondary data collection, I stumbled upon the book "*Water security: the water-food-energy-climate nexus*", which referred to the water, energy, climate and food challenges as interconnected. This finally explained the decision to change the problem during the research period and was chosen as a theoretical framework for addressing the problem. The theoretical and analytical stage included secondary data collection and literature review, the development of the analytical framework, the choice of approaches to the analysis and the overall data analysis itself.

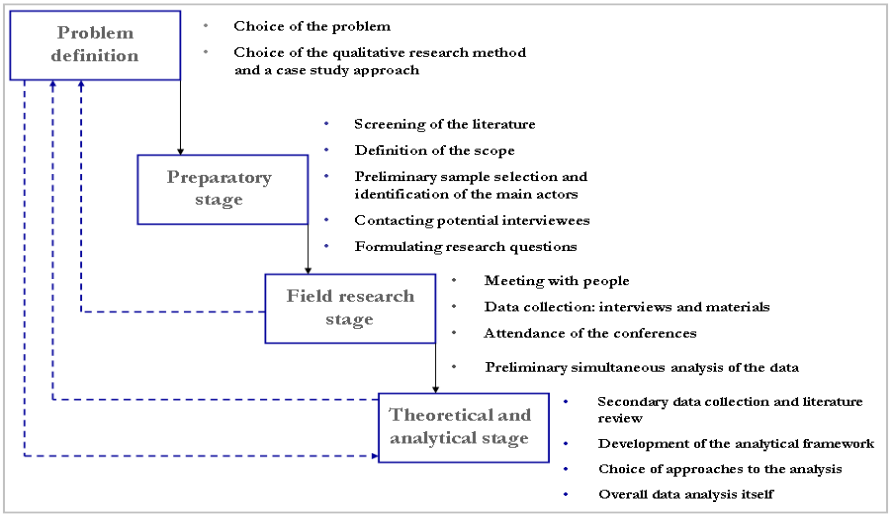

Figure 1. Research design

2.3 A case study approach

A case study approach was chosen for the research in order to ensure in-depth, multi-dimensional exploration of the WECF nexus on the local level and the factors affecting it, including national priorities and the institutional and political capacity to address the WECF nexus on the national level. This approach utilizes a variety of analytical lens from different data sources and, thus, different components of the phenomenon of the WECF nexus and its context were explored. In addition, the use of the case study to evaluate the general capacity of the political and institutional settings in Kazakhstan to address the WECF nexus is justified as the WECF nexus on the local level is a part of the national, regional and global nexus and the problems on the local level arise from the decisions made on the higher levels. As the phenomenon in the research is addressed within its context, the case study approach was the best option for the research (Yin 2003).

2.4 Site selection

The selection of the Ili-Balkhash basin for the case study was determined by different criteria. Firstly, this basin is the potential area of a water crisis. The basin first drew an attention of the country and international community during 1980s after the construction of the KHPP as the concerns that the lake Balkhash will face the fate of the Aral Sea rose. Currently, despite the fact that the level of the lake was restored the concerns are still present due to the fact that water demands on both Kazakhstan and Chinese sides are growing without an established mechanism for joint water use. Secondly, the region is the object of national energy and agriculture development plans. In addition to the existing load on the basin, they aim to develop new energy projects in order to solve the problem of the regional electricity deficit and to introduce new irrigation areas. Thirdly, the basin is considered to be one of the most vulnerable regions to climate change impacts (Strukova *et al.* 2010). Fourthly, the basin is an important national food provider. Meanwhile, irrigated agriculture, which is the water main consumer in the basin, is considered to have the highest risks, which will affect the food situation. Finally, the basin is an object for promoting IWRM practices and its implementation requires political and institutional changes.

2.5 Data collection

2.5.1 Interviews

Collection of the primary qualitative data by conducting interviews with experts from different groups was an essential part of the research due to several reasons. Firstly, the discourse of

WECF nexus is a new phenomenon, which needed to be explored. As it is qualitative research that seeks to explore phenomena (Mack *et al.* 2005), qualitative research was the best way to approach the research problem. In addition, as it is new, there is a lack of publications and studies on the issue; thus, qualitative data was a very useful source under the conditions of the deficit of published materials. Secondly, interviews with people from different groups such as the Government, NGOs, science and international organizations helped to collect different perspectives on one issue and to present their various interests and opinions. In particular, the interviews provided an insight into the understanding of the WECF nexus by different stakeholders from water, energy, climate and food areas, their attitude towards the realization of national plans and their vision of the problems and their solution. Thirdly, interviews helped to identify the level of cooperation between the main actors in the area of water, energy, climate and food.

2.5.1.1 Sample selection

For the sample selection of interviewees a mix of sampling strategies was used in the research. On different stages from the preparation for the research trip to the interviewing process the two sampling strategies were used. The selected sample presents a result of a mix of purposeful sampling types - quota sampling and snowball sampling. The goal of purposeful sampling is to select interviewees from whom interviewer can get rich information on important issues for a research (Patton 2002). Quota sampling, sometimes referred as one of the types of purposive sampling, is about selection of certain number of people with certain characteristics (Mack *et al.* 2005). Snowball or chain sampling is based on finding information from key informants about potential interviewees during interviews with them (Patton 2002). Together these strategies aimed to select interviewees, who represented different groups and had rich information relevant to the research question.

Regarding the size of a sample, unlike quantitative, qualitative sampling is not concerned about a the size of a sample (Patton 2002). There are no strict rules in qualitative research. However, sample size depends on the purpose of the research, resources and time available and the method of sampling (Mack *et al.* 2005). Generally, with the use of snowball strategy size of a sample gets bigger, as the process of interviewing goes on. As regards quota sampling, sizes and proportions of groups of interviewees are important to reach some extent of representativeness (Mack *et al.* 2005).

The process of sample selection for the research was long and continuous. It started prior to the research trip to Kazakhstan in the form of the investigation of main water, energy, climate and food policymakers on the national and local levels mainly through finding information and newspaper articles on the internet, and through analyzing institutional framework on the national level. There was a search for representatives from relevant governmental, scientific, non-governmental, international and business organizations. During the research period, including the preparation for the research trip and the research trip itself, 25 people were contacted (Appendix 1). By the end of the research trip, 12 of them provided interviews. Others provided some information for the research and advised to contact other people or could not give interview for various reasons. As a result, 12 representatives from 4 groups of the Government, Science, International Organizations and Non-Governmental Organizations presented a final sample (Appendix 2). The representatives of the business group[1], which was initially planned to be one of the groups within a sample by the strategy of quota sampling, could not provide interviews. One of the arguments of the representatives of the business group was that the Ministry of Industry and New Technologies is the only authority responsible for a national energy policy and they are national operators of the policy.

2.5.1.2 The format of the interviews

Interviews were conducted in person during the research trip to Kazakhstan. The conversations had the form of semi-structured interviews, which means that most of the questions were prepared in advance. However, the process of interviewing is usually made flexible in order to make interviewees feel free to share information they think is the most essential and relevant to the research (Ghauri and Gronhaug 2002). Therefore, prepared questions often were paraphrased, restructured and new follow-up or more specific questions added. The list of sample questions is given in the Appendix 3. Due to the first reluctant reaction of informants towards recording, especially of those from the Ministries, the decision was made not to make records, but field notes. The duration of interviews varied from 30 minutes to one hour depending on respondents' schedule on time available.

2.5.1.3 Anonymity

The interviewees preferred not to be mentioned by names but to be referred as officials from institutions. This limitation appeared to have its own advantages, as the interviewees have turned

[1] "Samruk-Energo" and "KEGOC" JSC are national energy companies, which can be considered as both business structures and operators of the national policy

out to be less reluctant to answer to certain questions. For convenience, the table of interviewees with their ID and represented institutions was created (Appendix 2). In the paper interviewees are referred by their IDs.

2.5.2. Secondary data

The secondary data was collected throughout the research. The collected secondary data can be categorized into three groups:

- Existing published materials, including various reports, books and articles;
- National documents, including national cross-sectoral and sectoral strategies, concepts, programmes and plans;
- Materials on the Ili-Balkhash basin and on the national situation, including reports, presentations on different conferences and materials obtained during the field trip.

Collection of different types of published literature contributed to the overview of the WECF issues on the different scenes, helped to put different findings and opinions on the interconnections between WECF into one picture of the WECF nexus and to choose appropriate methods for the research. National documents were used for the analysis of the political setting. The third group of the secondary data was important for the analysis of the institutional setting and for understanding the dynamics on the national and local levels.

2.6 Data analysis

2.6.1 Analytical and methodological frameworks

The analytical framework presented by the Figure 2 below, shows how the research problem was approached and analyzed. The comprehensive overview of WECF issues on the global, regional, national and local levels is an important component of the analytical framework. The overview of the global scene presents a theoretical framework for understanding and addressing the WECF nexus. The identified elements of the WECF nexus model are revealed through the overview of the regional scene, which also presents some preconditions of the WECF challenges in Kazakhstan and factors determining the national priorities and policy responses. The overview of the national scene is the analysis of WECF challenges and policy responses in Kazakhstan. These challenges to some extent are addressed during the overview of the local scene, which introduces the case study of the Ili-Balkhash basin, giving its distinctive characteristics in water, energy, climate and food spheres. Then the analysis zooms into the national and local levels. The following analysis of incorporation of WECF nexus into political and institutional frameworks of Kazakhstan has two distinctive analyses of the political and institutional settings. In addition, the

relevant themes identified in the interviews were added. This analysis is important for exploring the WECF nexus in the IBB and the problems of the basin, as they are determined by the capacity of the political and institutional settings to deal with the WECF nexus. The analyses on the national and local levels are closely interconnected, as well as both of them are connected with the overview of WECF issues through themes identified in the interviews. The methods of the analysis are presented in the methodological framework (Table 1).

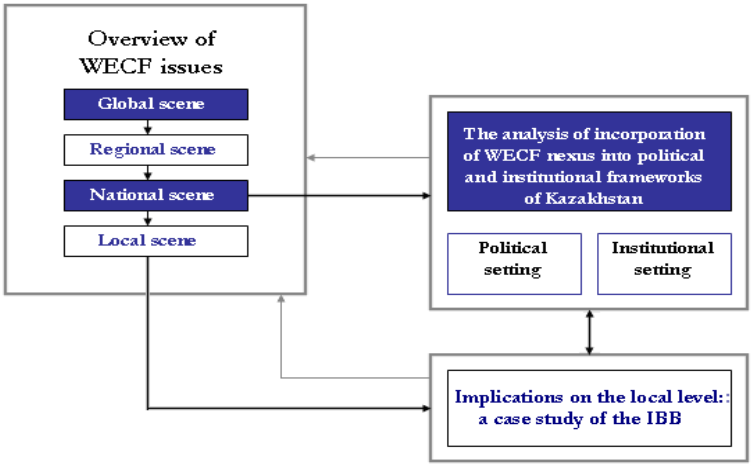

Figure 2. Analytical framework

Table 1. Methodological framework of the thesis

Objectives	Methods	Expected outcomes
Analyze prerequisites for the emerging WECF nexus on the global, regional, national and local levels and *identify* WECF and political challenges for Kazakhstan	Literature review	• Understanding of the nature of the WECF nexus and its prerequisites on the different levels is obtained; • WECF and political challenges for Kazakhstan are identified; • Factors determining the national priorities and policy responses are identified; • The background information of the case study is introduced (Answer to the research question 1)
Analyze political and institutional settings of Kazakhstan: *identify* national priorities and *evaluate* the capacity to provide an adequate the response to the WECF nexus	Gap-analysis of cross-sectoral and sectoral national strategies, programmes and plans Analysis of the institutional setting Analysis of semi-structured interviews	• National priorities are identified; • The position of water, energy, climate and food in the political and institutional settings is distinguished; • The main actors on different levels are identified; • The capacity of the political and institutional settings to provide an adequate the response to the WECF nexus is evaluated • Thematic network is developed, including related themes identified in the interviews (Answer to the research question 2)

Explore the existing problems of the Ili-Balkhash basin, *identify* their root causes and *present* possible future consequences of the realization of national plans on the basin	Analysis of semi-structured interviews Causal-chain analysis	• The existing problems of the basin and their immediate, underlying and root causes are identified; • The factors effecting the WECF situation in the basin are distinguished; • The attitude towards the old and new energy projects is presented (Answer to the research question 3)
Discuss findings and their implications, *indicate* possible development paths for the Ili-Balkhash basin and *develop* recommendations for addressing WECF nexus on the national and local levels	Overall analysis of the findings	• Findings and their implications are discussed • Possible development paths for the basin are indicated; • Recommendations are developed and discussed (Answer to the research question 4)

2.6.2 Analysis of the interviews

A process of analysis is an ongoing process, which starts long before a transcription of interviews (Patton 2002). According to Miles and Huberman (1994) this cyclical process continues through the whole period of collection, reduction, display of data and drawing conclusions (Figure 3). Qualitative data is analyzed through collecting data, noticing interesting things in data, putting them together and writing about them (Seidel 1998).

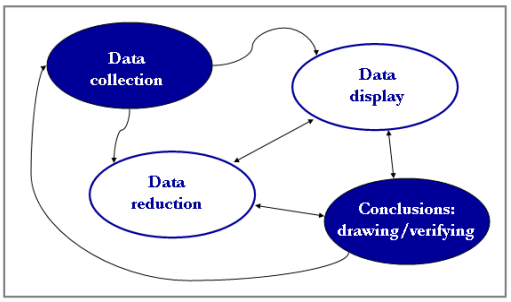

Figure 3. Components of data analysis
Source: Miles and Huberman 1994

Several approaches to qualitative analysis, including content, thematic, comparative analyses and the narrative, are used in qualitative research and in some cases can be synthesized with quantitative approaches (Dixon-Woods *et al.* 2004). The two most commonly used qualitative analyses are content and thematic (Namey *et al.* 2008; Dawson 2007). Content analysis identifies frequent ideas and keywords by measuring frequency of words, their synonyms or other relevant elements in raw qualitative data, whereas thematic analysis identifies and describes not only explicit but also implicit ideas (Namey *et al.* 2008).

For this research mainly thematic analysis was applied, based on the analysis of codes in the context. In addition to the thematic analysis, comparative analysis, which is closely connected to the thematic analysis and often used together (Patton 2002), was also applied to make a cross-case analysis of perceptions of different people and identify contrasts. As a result of a qualitative comparative analysis visual playgrounds and a so called "truth table" (Patton 2002) were constructed**,** showing the difference in attitudes of representatives from various groups towards the energy projects and answers to "yes or no" questions.

The main steps of the analysis included several steps of preparation of data, coding and presenting results of the analysis. The first steps of the process of the analysis were transcription and coding. The qualitative data collected during interviews in the form of field notes in Russian and Kazakh languages was translated into English and transcribed. Various coding strategies were used interchangeably in the data processing with theme-based coding and structural coding being the main types of coding. The thematic coding was the main type of coding. Its process had three stages. At the beginning it was mainly about identifying themes, interesting things and some meaningful units through rereading transcripts and selecting quotes. Then these meaningful units were reformulated and redefined in more general words in themes. And the last stage included playing with themes and putting them together, finding connections, differences at the higher level of analysis. A thematic network was constructed and will be presented in the chapter 4.

2.6.3 Gap-analysis of cross-sectoral national strategies, programmes and plans

This method was used for the analysis of the horizontal dimension of the political setting on the national level. Thorough analysis of the cross-sectoral national strategies, programmes and plans included identification of the national priorities and finding the position of water, energy, climate and food issues in the current political framework. Each national document was examined in terms of its inclusion of water, energy, climate and food priorities.

2.6.4 Causal-chain analysis

The causal chain analysis was used in order to identify the root causes of the problems in the IBB. It included identification of the main problems due to the interview analysis, their impacts, immediate, underlying and root causes. The factors and catalysts, influencing the situation on the local and level levels are also presented.

3. Overview of water, energy, climate and food issues on different levels

This chapter is an important component of the analytical framework, as it introduces the emerging WECF nexus and policy responses on different levels. It not only presents a comprehensive literature review but also identifies the WECF challenges on the national level and introduces a case study of the Ili-Balkhash basin. Both national and local components will be analyzed in the following chapters. The chapter is divided into four parts, showing global, regional, national and local perspectives.

3.1 Global Scene

As the issue of the WECF nexus is a new area of research, it was crucial for me to create an overall picture of how the nexus is understood on the global level first. The understanding of its components and interconnections between them and finding currently promoting policy responses to the nexus was essential for approaching the complex issue on the national and local levels in this research.

3.1.1 Nature of a water-energy-climate-food nexus

The nature of the WECF nexus has recently started to be explored. Previously to the acknowledgement of this global nexus, the separate parts of it such as interconnections or conflicts of water and energy (WEF 2009; Marsh 2008; Granit and Lindström 2011), water and food (Seckler and Amarasinghe 2004; Khan and Hanjra 2009), water and climate (Smith *et al.* 2009; McIntyre *et al.* 2009; Bates *et al.* 2008), energy and food (Sachs and Silk 1990; Molle *et al.* 2008), energy and climate (McIntyre *et al.* 2009; Venema and Rehman 2007), and climate and food (McIntyre *et al.* 2009; Garnet 2011) were investigated. I could not find a simple graphical representation of the WECF nexus in the literature.

Figure 4 presents my effort to visually introduce the nexus and its interconnections based on the integration of existing literature findings on water, energy, climate and food interconnections. Water lies in the centre of the WECF nexus and links together food, climate and energy (Waughray and Workman 2011). Strong intrinsic links between *water and climate* were highlighted in IPCC technical paper (Bates *et al.* 2008). Hydrological patterns, availability and quality of water and water services are sensitive to climate change (Sadoff and Muller 2009). Although impacts of climate change Although impacts of climate change on freshwater systems are projected to be

different in different places, globally negative impacts seem to prevail (Sadoff and Muller 2009). At the same time, large water bodies can affect the climate situation (Bates *et al.* 2008).

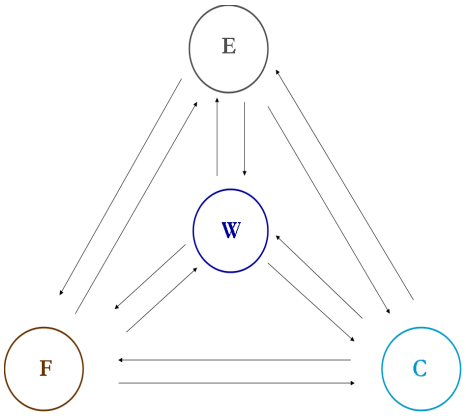

Figure 4. A simple graphical representation of the WECF nexus

Regarding links between *water and energy,* a significant amount of water used in the primary energy and electricity value chain and the amount of energy needed for water value chain, both including transition through stages of raw materials, transformation and delivery to a customer, were presented in the WEF report (WEF 2009). Marsh (2008) demonstrated close links between electricity and water sectors, noting hydropower generation as the main point of direct sector integration and water use by the electricity sector. *Water and food* interrelations are mainly connected with high dependence of food production on water. There are tradeoffs between all water using sectors, but agriculture and the environment are major consumers (Rijsberman and Molden 2001). Agriculture is responsible for about 70% of total withdrawal and 86% of consumption of water worldwide (McIntyre *et al.* 2009).

The interlinkages between food and other components I identified mainly in the recent IAASTD report (McIntyre *et al.* 2009). According to the report, *climate and food* are interconnected in several ways. Changes of climate patterns such as temperature and precipitation, changes of inter-year variability and increasing glaciers melting can have combined effects on agriculture as they can cause both increases and decreases in yields, depending on the geographical distribution of climate change effects, type of crop and an adaptation potential of a region. In addition, melting of glaciers caused by climate change can lead to the changes in runoff of rivers that are used for irrigation. Thus, agriculture is the main sector for climate change adaptation, as there is the need to store increased summer runoff to use in the dry period. However, agriculture is also the second GHG emitter and is responsible for about 30% of GHG emissions due to livestock production, flooded rice fields, use of fertilizers and changes in land use and agricultural practices, therefore, its role in mitigation of climate change can be significant. *Energy and food* are

connected through the use of some amount of energy in food processing, agriculture, fertilizer industry and transport of agricultural products and the use of crops as an energy source. It was noted that bioenergy is the issue of land scarcity and the potential competition between land for food production and land for energy resources (McIntyre *et al.* 2009). However, the biggest conflict lies between irrigation and hydropower due to the different water regimes needed (Molle *et al.* 2008).

Energy and climate are interconnected both directly and indirectly. The direct link lies in the fact that energy sector is the largest GHG emitter. The indirect influence of climate on energy is presented through climate change mitigation policy affecting energy policy. The effect of this global climate change mitigation policy on the national policies of Kazakhstan will be addressed in the analysis of the political setting in the next chapter.

Waughray and Workman (2011) claim that the water, energy, climate and food issues will become more and more interlinked in the future and the existing tradeoffs will become more acute. For example, with the depletion of water resources tradeoffs between preventing water scarcity and biofuel production will be urgent (CA 2007). According to Sadoff and Muller (2009), climate change will make tradeoffs within water sector more critical. Growing demand on electricity and water due to such factors as population growth can make water and energy even more closely interconnected in the future (Marsh 2008).

Despite the fact that I could not present all interlinkages and implications of the nexus due to its complexity, the identified components and possible interconnections can be used as a framework for the following identification of the nexus on the regional, national and local scenes.

3.1.2 The need for integration of policies

After understanding the complexity of the WECF nexus I realized the need of integrated policy response to address not only its components, but interconnections and possible tradeoffs between them. In order to evaluate the policy response in terms of its capacity to address the nexus in Kazakhstan, I searched for frameworks for evaluation and integrated policy frameworks, addressing more than one component of the nexus.

The idea of policy integration, developed as a response to problems of achieving coordination and coherence within different policies (Persson 2004), is essential in the environmental context, as there are close interconnections within environmental components and existing trade-offs

within different policy areas (Hellegers *et al.* 2008; DHI 2008). Environmental policy integration, the concept aiming to ensure that environmental issues are taken into consideration in policy-making, is often viewed as sector integration (Persson 2004). A special framework for evaluating integration of environment into sector policies was developed by EEA (EEA 2005), as the coherence across different sectors and policy areas guarantees good governance and integrated and reinforcing policies are more effective (EEA 2005). Lafferty and Hovden (2003) defined horizontal and vertical dimensions of EPI, including development of cross-sectoral integration strategy and implementation within each sector. SEA is viewed as a tool for integration of environmental concerns into policies at plan and programme levels with assessment of their links with social and economic aspects (Sheate *et al.* 2003; OECD 2006).

Despite the fact that the main focus of my research is not environmental policy integration, I used the concept in order to analyze the political setting of Kazakhstan as I consider environmental policy integration to be crucial for provision an adequate response to the nexus. I analyzed the horizontal and vertical policy dimensions to identify national priorities, including those related to water, energy, climate and food. In addition, I addressed the problems of the environmental policy integration and implementation as obstacles for provision an adequate response to the WECF nexus.

3.1.3 Integrated policy of climate change adaptation and mitigation

Climate change adaptation and mitigation have been identified by the UNFCCC as the responses to climate change and the need to implement these measures have been recently underlined again (UNFCCC 2010). However, climate policy with mitigation and adaptation responses to climate change (Figure 5) is becoming broader.

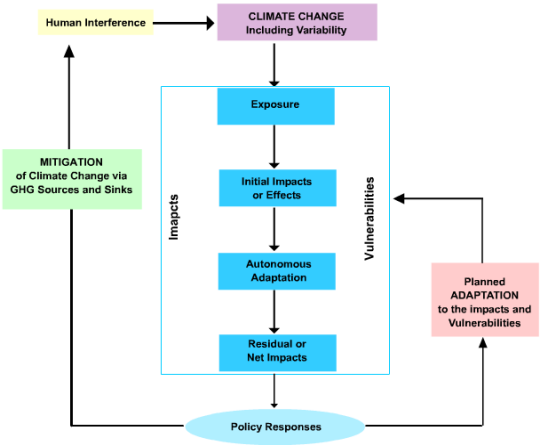

Figure 5. Human system's response to climate change through adaptation and mitigation
Source: The Energy and Resources Institute website http://know.climateofconcern.org

It is spreading to different sectors due to various options for mitigation and a need to adapt to a range of impacts for various sectors and communities (Klein *et al.* 2005).

It was highlighted that despite the fact that both adaptation and mitigation are accepted by UNFCCC as main components of climate policy framework, they differ in terms of the spatial and temporal scales of their effectiveness, the extent to which their cost-effectiveness can be assessed and in terms of actor network and policy types needed for their implementation (Klein *et al.* 2005). Thus, mitigation can be effective on the global scale and its results can be seen within several decades, emissions reductions can be expressed and compared in CO2-equivalents and sectors involved into mitigation implementation are limited to energy, transportation, forestry and agriculture on the national level. In contrast, the adaptation's effects can be immediately seen on the local or regional scale, its benefits are hard to express and compare and many sectoral interests such as agriculture, water sector, tourism, nature conservation and human health are involved at different levels from local to national (Klein *et al.* 2005).

However, these responses can be complementary in reduction of climate risks as well as climate policy can be synergetic with other policies. For example, focus on decentralized renewable energy presents both mitigative and adaptive approaches to climate change and is addressed in both climate and energy policies (Venema and Rehman 2007). However, it was also noted that long-term aims of climate change mitigation and energy security can differ as compared to climate policy, energy security agenda's main emphasis is not on reduction of GHG emissions but on energy access and availability of energy resources (Stephan 2010). Still development of a low-carbon infrastructure and increase of energy efficiency can manage the conflict of aims of the two policies (Stephan 2010). As regards integration of climate change policy with other policies, it was highlighted that climate change is becoming a point of integration in sectoral and development policies (Klein *et al.* 2005). It was argued that mainstreaming of climate policy and its integration with development policy can be beneficial on both national and international levels (Kok *et al.* 2008). However, for many actors involved into climate policy implementation, especially on the local level in developing countries, climate change is not an issue of top importance compared to food and water security, for example (Klein *et al.* 2005).

The policy response of Kazakhstan to climate change will be introduced during the analysis of the WECF challenges on the national scene. It will be also indicated throughout the thesis how

national and local priorities towards climate change differ in Kazakhstan and what are the obstacles for the development of renewable energy in the country.

3.1.4 The concept of IWRM

IWRM presents another integrated policy framework, which is promoted globally. IWRM was identified by GWP as a process which promotes the co-ordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (GWP-TAC 2000). Aimed to ensure wise water governance, IWRM lies on three pillars: enabling environment, management instruments and institutional framework (Figure 6). Effective process of IWRM requires appropriate policies and legislation, institutional framework for their implementation and management instrument for effective work of these established institutions (GWP-TAC 2004). Environmental sustainability, equity and economic efficiency drive these pillars in order to reach the balance between environmental and human well being (Pahl-Wostl and Sendzimir 2005).

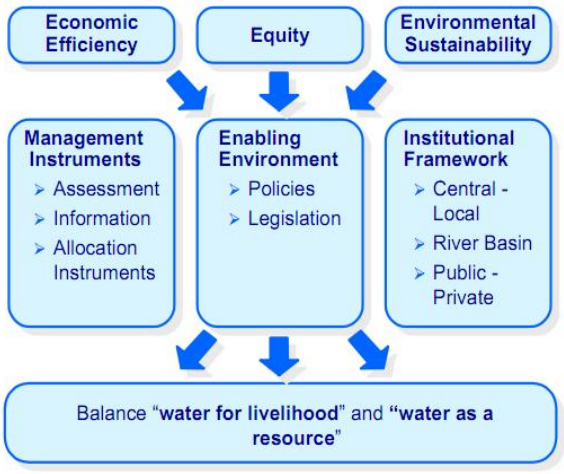

Figure 6. Three pillars of IWRM: management instruments, enabling environment and institutional framework
Source: GWP-TAC 2004

IWRM uses a holistic approach and promotes integration between natural and human systems as well as within them (CWP-TAC 2000). Integration within natural systems is based on the acknowledgement of the unity of hydrological cycle and the need of integration of water and land management, surface water and groundwater management, upstream and downstream water-related interests, quantity and quality in water resources management etc (CWP-TAC 2004). Integration within human systems is viewed by IWRM as cross-sectoral and cross-interest integration with mainstreaming of water resources from local to international scale and

considered to be an essential element of IWRM implementation (GWP-INBO 2009). IWRM implementation is planned to serve as a link between water use sub-sectors, using water for people, for food, for nature, for industry and other users (Figure 7).

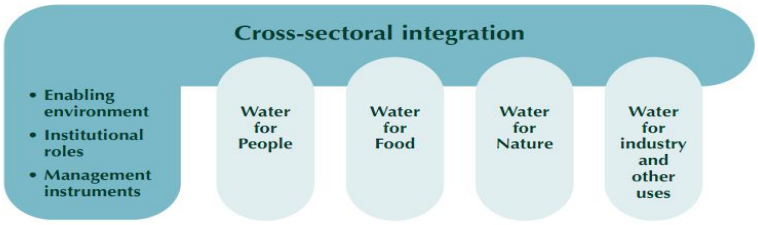

Figure 7. IWRM and its relation to subsectors
Source: GWP-TAC 2000

The integration also implies that, on the one hand, all national and sectoral policies and strategies in governmental planning consider their implications for water resources development and other water users and, on the other hand, water policy of IWRM is consistent with governmental and sectoral plans (CWP-TAC 2000). Despite the fact that governments are presented as key players in the implementation of an IWRM framework, it is important that all relevant stakeholders participate in the planning and decision-making processes and this participation is both top-down and bottom-up (GWP-TAC 2000).

Both weaknesses and strengths of the IWRM were broadly highlighted in the literature. On the one hand, there is a strong critique of the IWRM. Jeffrey and Gearey (2006) argue that IWRM is lost in the tensions between complexity and holism and, as a result, there is a significant gap between the theory and practice. According to Blomquist and Schlager (2005), the main problem for the IWRM implementation is that planning of natural resources proposed by IWRM differs from normal stage-based planning with development of a policy to implement one proper solution to a problem, as the former tries to obtain deep understanding of wicked problems in complex natural systems. Biswas (2004) criticized the general vagueness of the concept, absence of measurable criteria and underlined lack of examples of successful IWRM implementation and problems with its implementation into institutional and political setting.

On the other hand, the integration potential of IWRM is considerable. For example, a strong potential of IWRM for the long-term integration and planning and its fitness into national and transboundary resources management was underlined (GWP-INBO 2009). Moreover, it was concluded that optimal transboundary water cooperation between riparian countries takes place only under the conditions of cooperation based on the principles of IWRM (Batz *et al.* 2006). In

addition, it was highlighted that the idea of IWRM is close to strategic planning and sustainable development (Pahl-Wostl *et al.* 2007). The combination of IWRM and SEA was suggested as an effective framework for implementation of climate change adaptation by Slootweg (2009). In addition, despite the differences IWRM is complementary with the adaptive water management (Pahl-Wostl and Sendzimir 2005; Biswas *et al.* 2009; Mysiak *et al.* 2010), which is important for integrated river management regime, especially in the transboundary context (Raadgever *et al.* 2008; Timmerman and Bernardini 2009).

IWRM is currently being promoted in the Central Asian region by international agencies for solution of water conflicts, which will be described in the next section. It is also part of the response to water challenges in Kazakhstan and is being implemented on the local level. The problems connected with its implementation in Kazakhstan will be mentioned in the following chapters.

3.1.5 The main policy dimensions to address the WECF nexus

Figure 8 presents my reflections on the policy dimensions on the global level in the fields of water, energy, climate and food. As previously identified, climate change policy and IWRM are the major integrating policy frameworks, which have a potential to address the WECF nexus. Policies on climate change mitigation (CCM), on the development of RES and reduction of GHG emissions in particular, currently are closely interconnected with energy policies and being actively promoted in all countries. Meanwhile, IWRM and climate change adaptation (CCA) are important policies needed in the water and food spheres.

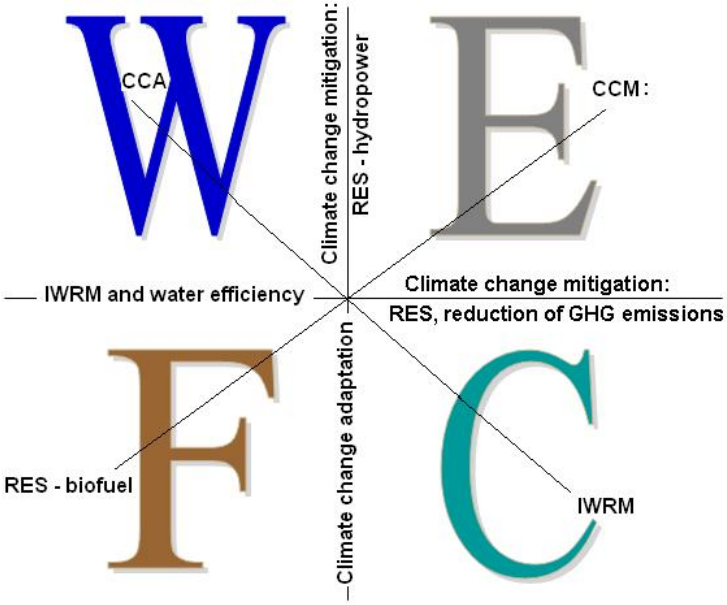

Figure 8. Main policy directions to address the WECF nexus on the global level

This identification of the main policy dimensions developed to address some components of the nexus is important for the analysis of the development of these policy dimensions in Kazakhstan. I consider that equal attention to all components of the nexus is crucial for provision an adequate policy response to the challenges and addressing the nexus on the national level. For this reason, I will analyze if policies are proportionately developed.

3.2 Regional Scene

The overview of the WECF issues on the regional scene presents the components of the nexus and its implications from the complex regional perspective. This regional context is also important for understanding the WECF and political challenges in Kazakhstan and the regional factors influencing the national policy. In addition, the interviewees underlined the importance of the regional factors for the water situation on both national and local levels, including the Ili-Balkhash basin. The analysis of the interviews will be presented in the next chapters.

3.2.1 The WECF nexus in Central Asia

The issues of water, energy, climate and food in Central Asia are substantially presented in the literature with a main focus on water-energy conflicts, problems of water management and geopolitical aspects. In Central Asia water issues attract the biggest attention within the nexus. The two main rivers in Central Asia discharging into the Aral Sea, the Amu Darya and the Syr Darya, are almost completely regulated (Libert *et al.* 2008). Water is an important driver of economies of Central Asian states. It is a main energy source for Kyrgyzstan and Tajikistan, which have about 85% of Central Asian water resources (Vinokurov 2007) and the basis for irrigation and social stability in agriculture dominated Uzbekistan, and also Turkmenistan and southern Kazakhstan (Abbink *et al.* 2005). Being important for both hydroelectricity generation and irrigation water is the cause of hydroelectricity and irrigation conflicts in the region (World Bank 2004). As about 90% of water flow is used for agriculture, which is becoming more cereals oriented, water is essential for the regional food security (Granit *et al.* 2010). Water availability and food security is also becoming affected by climate change in the vulnerable region (Zoï 2009).

The water, energy, climate and food issues are important underlying factors and key drivers in the region, interconnected with broader issues such as stability, economic development, security, democracy promotion, etc. (Granit *et al.* 2010; Khamzayeva 2009). Water resource management in Central Asia stands beyond just water sector and is affected by political environment, social aspects and economic growth, ecological conditions and demands and other interacting factors

(Dukhovny *et al.* 2008). Complex interplay of factors and drivers in Central Asian region (Granit *et al.* 2010) together with the system of interacting factors within water resources management process (Dukhovny *et al.* 2008) are presented in the Appendix 4.

The nexus is becoming more and more obvious as the water situation in the region is becoming critical. According to Libert (2008), climate-impacted decrease in water availability and deterioration of the ecosystems will make the situation worse as the problems of the Aral Sea shrinkage, the upstream-downstream conflict over water distribution and water release schedules, hydropower-irrigation conflict are still unresolved. However, it was underlined that water resources in Central Asia are not naturally scarce compared to other regions in the world; they are just very poorly managed (Rahaman and Varis 2008).

3.2.1.1 Soviet legacy

During the Soviet Union era upstream and downstream Central Asian states presented one centrally managed economic zone with tightly interlinked water, energy and food sectors (Eyerberenov *et al.* 2009). Constructed dams and reservoirs in the upstream mountainous Tajik and Kyrgyz Soviet Republics served to collect water from the Amu Darya and the Syr Darya and to provide water during irrigation season to the irrigation systems built in the downstream Turkmen, Uzbek and Kazakh Soviet Republics (Libert *et al.* 2008). According to the USSR plan to develop cotton specialization of the Central Asian region the irrigated area increased from 4.5 to 7 million hectares within the period from 1965 to the late 1980s (Eyerberenov *et al.* 2009) and 20,000 miles of canals, 80 reservoirs and 45 dams and were constructed (Siegfried 2010). At that period hydroelectricity generation in the upstream states was not a main focus, as there was one electricity grid within all Soviet Unions Republics and electricity needs of deficient in primary energy resources Kyrgyz and Tajik Republic were satisfied by carbon energy rich regions, including also Kazakh, Uzbek and Turkmen Republics (Eyerberenov *et al.* 2009; Libert *et al.* 2008). This regional cooperation between sectors in Central Asia and all allocation issues, including irrigation quotas and water release schedules, were managed by the USSR central government, in particular by the USSR Minvodkhoz, dealing with water management and land reclamation, the USSR State Planning Committee and, since 1986 the Amu Darya and the Syr Darya basin water management organizations (Weinthal 2006; Libert *et al.* 2008).

After the collapse of the USSR and the creation of five independent countries, the Aral Sea basin became transboundary. The countries realized their high interdependence on each other due to inequitable resources allocation and had to start building new relations in order to manage

together old water and energy infrastructure and satisfy their needs in water, energy and food (Eyerberenov *et al.* 2009; Granit *et al.* 2010). As about 85% of the Central Asian water resources are formed in Kyrgyzstan and Tajikistan (Vinokurov 2007), the downstream countries realized their dependence on the upstream countries in terms of water supply, including water for irrigation, and began to develop their own national strategies and food security (Eyerberenov *et al.* 2009). In turn, the upstream countries faced the problem of energy security. Inherited from the Soviet Union water and energy infrastructure has deteriorated significantly since then, as the collapse of the USSR led to deep economic crisis in the countries (O'Hara 2003; Vinokurov 2007). According to O'Hara (2003), lack of investment into the water sector due to the economic crisis together with the following privatization of farms resulted in the following ineffective irrigation with 45% of water losses in deteriorated irrigation systems on the one hand and to the increased demand for water due to increased number of water users on the other hand.

3.2.1.2 Aral Sea disaster

In addition to water and energy infrastructure, the states inherited the Aral Sea disaster. The desiccation of the Aral Sea (Figure 9) and its salinization started during the Soviet period, when large amount of water from its tributaries, the Amu Darya and the Syr Darya rivers, were diverted to irrigation (Kobori and Glantz 1998; Micklin 2007). In addition, significant amount of water was lost in enormous irrigation systems due to generally high evaporation and infiltration in the deserts (Micklin 2007). As a result, by 2007 the surface of the lake was only 10% of original area (Granit *et al.* 2010), and the salinity increased 4 times (Dukhovny and Sokolov 2002).

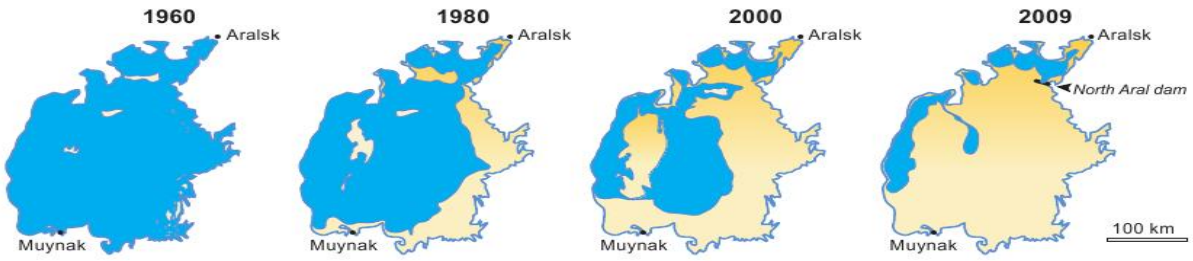

Figure 9. The desiccation of the Aral Sea

Source: Zoï 2009

3.2.1.3 Hydropower-irrigation conflict in Syr Darya River basin as a result of failed agreements

By signing the "Agreement on Cooperation in Joint Management, Use and Protection of Interstate Sources of Water Resources" in 1992 and establishing the Interstate Commission for Water Coordination (ICWC) the countries began to cooperate. However, together with the

decision to stick to the Soviet arrangement on water quotas, the controlling rights of the countries over resources for energy and agriculture within the boundaries were also highlighted (Granit *et al.* 2010). Thus, as the reliable energy compensation during winter period was not provided by the downstream countries, Kyrgyzstan and Tajikistan started to exploit their full hydropower potential in winter for electricity generation releasing water in winter, when it is not needed downstream (Weinthal 2006). These winter water releases lead to flooding, water logging, irrigation systems freezing and the lack of water during summer irrigation season (Vinokurov 2007; Eyerberenov 2009). This gave a start to hydropower-irrigation conflicts in both the Amu Darya (Wegerich 2008) and the Syr Darya basins (World Bank 2004).

The conflict in the Syr Darya basin connected with the operation of the Toktogul dam in Kyrgyzstan and the difference in seasonal water requirements is becoming more and more urgent mainly between Kyrgyzstan, Uzbekistan and Kazakhstan (World Bank 2004). There were some unsuccessful attempts to solve the conflict by regional water-energy barter agreements, which were based on the payment for electricity generated by the Toktogul dam by the downstream countries during the summer irrigation season and the payment for energy delivery by the upstream countries during winter (Libert *et al.* 2008). However, the conflict is still unresolved (Abbink *et al.* 2005).

Moreover, due to the failure of regional agreements, prioritizing of national interests in economic development over regional environmental concerns and general mistrust among countries, the states started their policy of water and energy self-sufficiency by constructing new reservoirs, counter-regulators and hydropower capacities ignoring water management problems within and between countries and, thus, exacerbating negative environmental impacts on the basin system.

3.2.1.4 Policy of self-sufficiency

Moreover, due to the failure of regional agreements, prioritizing of national interests in economic development over regional environmental concerns and general mistrust among countries, the states started their policy of water and energy self-sufficiency by constructing new reservoirs, counter-regulators and hydropower capacities ignoring water management problems within and between countries and, thus, exacerbating negative environmental impacts on the basin system. While water flows in the Aral Sea basin are already highly regulated (Appendix 5), the Central Asian countries continue to increase their own water diversion. The states promote the national goals to increase their irrigated lands by water intakes (Khamzayeva 2009). New reservoirs for

irrigation and counter-regulators for flood prevention are being constructed in the downstream countries: the Golden Century Lake in Turkmenistan, several reservoirs in Uzbekistan and the Koksarai reservoir-counter-regulator in Kazakhstan (Khamzayeva 2009). Meanwhile, economic impact of the construction of new reservoirs for irrigation by Uzbekistan, for example, is insignificant unless there is efficient regional cooperation (Abbink *et al.* 2005). The difficult and expensive construction of the Koksarai reservoir also could have been avoided given mutually beneficial water-energy cooperation with Kyrgyzstan (Khamzayeva 2009).

Despite the possibility of energy imports from the energy-rich downstream countries and existing energy infrastructure connecting Central Asia and Russia through the Central Asian energy grid**,** upstream Kyrgyzstan and Tajikistan aim to increase their national hydroelectricity potential by introducing new large-scale hydroelectricity capacities (Appendix 5). The Rogun and Sangtuda dam and hydroplant projects are being constructed in Tajikistan and the Kambarata 1 and 2 hydroplant projects – in Kyrgyzstan (Khamzayeva 2009). However, the realization of these projects translate into increasing concerns of the downstream countries and is leading to further tensions, as proper management of such infrastructure is questioned and the introduction of large dams can lead to dangerous consequences for the downstream countries (Siegfried 2010). Vinokurov (2007) argues that these new energy projects in the Central Asian region are needed to solve the problem of the regional energy deficit. He suggests that the introduction of new electricity generation capacities together with market-based regulation of energy transit within integrated energy infrastructure can solve the Central Asian water-energy conflict and, moreover, additional electricity can be exported to Russia and China (Vinokurov 2007). The increasing role of China in the Central Asian hydroelectricity sector was underlined by Peyrouse (2007). By investment into new electricity lines and small and medium projects in Tajikistan, Kyrgyzstan, Kazakhstan and Uzbekistan China plans to import electricity from Central Asia (Peyrouse 2007).

In addition to policies of water and energy self-sufficiency, the Central Asian states promote their national strategies for food security based on food self-sufficiency (Babu and Tashmatov 2000). As a result, new areas were introduced for cereals production. Cereals, mainly wheat, even displace cotton; the wheat areas have increased by 25% since the countries got their independence (Babu and Tashmatov 2000). Introduction of another monoculture on soils with already low soil fertility and high salinization is another environmental load, which can be ineffective due to decreased yields (Siegfried 2010; Babu and Tashmatov 2000).

3.2.1.5 Climate change in Central Asia

According to the synthesis of Zoï environment network on climate change in Central Asia (Zoï 2009), climate change will have significant impacts on Central Asia (Appendix 6) and make its water, energy and agriculture challenges more urgent. According to different scenarios temperature will increase from 1 to 3°C by 2030-2050 and it can be even higher by 2100 if there is no action on climate change mitigation (Zoï 2009). In the short-run it will lead to melting of glaciers and, thus, increased run off and the threat of floods. However, in the long run it will lead to the vanishing of glaciers, natural water storages, resulting in the reduction of the runoff (Siegfried 2010). Climate change will have severe drought impacts in the downstream countries and will cause hazards, connected with outburst of glacial lakes, in the mountainous upstream countries with the following threat to the downstream states (Zoï 2009; Siegfried 2010).

Meanwhile, Central Asia is considered to be very vulnerable to climate change impacts due to ecological arid preconditions, deteriorated water and energy infrastructure, low adaptive capacity to climate change, inefficient regional water management and high dependence on water for agricultural production and electricity generation (Zoï 2009; Siegfried 2010; Granit *et al.* 2010). Tradeoffs between various sectors and competition for water within the Aral Sea basin will increase whereas river flows and water availability will decrease in the nearest future (Zoï 2009). There has already been an example of high vulnerability of the Central Asian states to climatic conditions, when an extremely cold winter and a very dry summer in 2008 resulted in extensive winter hydropower generation in Kyrgyzstan, breakdown of heating and water supply and the following people and livestock losses in Tajikistan and lack of water for summer irrigation in Uzbekistan and Kazakhstan (Libert 2008; Granit *et al.* 2010).

3.2.1.6 Prospects for regional cooperation through IWRM in Central Asia

Despite the current interstate conflicts over water, the Central Asian states will have to cooperate due to high water interdependence and security issues (Khamzayeva 2009). There is already one example of the improvement of the regional cooperation between Kazakhstan and Kyrgyzstan on the management of the Chu and Talas rivers (Rahaman and Varis 2008). However, it must be noted that the regional cooperation is facilitated mainly by international agencies and donors due to weak institutional capacity of the states (Khamzayeva 2009). According to Kipping (2008), the Central Asian region is the main area of efforts of international donors towards water management improvement. The regional cooperation is guided by the International Fund for the Aral Sea (IFAS), which is organizing and financing water resource management in the structure

of regional water governance institutions (Dukhovny and Sokolov 2003). IFAS and other international organizations such as UNECE, UNDP, OECD and the EU underline the need of national policy dialogues, improvement of the institutional framework and the need of integrated resources management in Central Asia.

The need of integrated approach towards water, energy, climate, agriculture issues in Central Asia was in one form or another underlined in the literature (Granit *et al.* 2010; Rahaman and Varis 2008; Eyerberenov *et al.* 2009; Khamzayeva 2009). According to Siegfried (2010), integrated resources management, agreement between water, energy and agricultural strategies on water releases schedule, irrigation deliveries and crop choice together with a long-term risk management plan are extremely needed in Central Asia in order to provide adequate response to climate change. The example of the multiple crises in Tajikistan in 2008 showed high dependence of food security on water, energy and climate security (Fumagalli 2008; UNDP 2009; Granit *et al.* 2010). For finding consensus between water and energy sectors Dukhovny (2010) suggested the development of the regional water strategy, based on IWRM principles and strengthening the institutional framework, tools and management methods by introducing joint management of hydropower plant cascades on the Amu Darya and the Syr Darya rivers and establishing the Inter-state Water and Energy Consortium.

For integration of water, energy, climate, agriculture and development of new water governance within and between the Central Asian states GWP, UNDP, SIDA and other international agencies suggest the concept of IWRM (Khamzayeva 2009; Rahaman and Varis 2008). The regional roadmap for IWRM implementation, including promotion of regional strategic planning, strengthening of legal and institutional framework, facilitating information network and training system, technical modernization and capacity building at the national level, was presented by Dukhovny and his colleagues (Dukhovny *et al.* 2008). The Ferghana Valley pilot project of IWRM implementation in Central Asia aims to strengthen institutional setting for water management between Uzbekistan, Kyrgyzstan and Tajikistan (Khamzayeva 2009)

However, according to Kipping (2008), IWRM is lacking capacity to implement its well-defined strategies towards the solution of the international upstream-downstream conflicts over relative and absolute water distribution and the various local conflicts over water scarcity, existing in Central Asia. In addition, he argues that international externally-driven institutions such as IFAS do not obtain capacities to influence regional water policies and only prevents water conflicts due

to local water experts, left from Soviet times (Kipping 2008). However, it was argued that the main obstacle to IWRM implementation in the region is disintegrated political economy of the countries and it is only international agencies that can manage their dialogue and solve the conflicts with the introduction of IWRM (Eyerberenov *et al.* 2009).

3.2.2 Chinese presence

PRC is increasingly becoming a strategic player in all spheres of Central Asia, including the water governance due to increasing development of Xinjiang (Allouche 2007). According to Clarke (2008), growing development and modern infrastructure construction of Xinjiang as well as connection of this infrastructure to the Central Asian countries is the basis of the Chinese strategy of double integration. This will allow China to build proper integration with Xinjiang and with Central Asia and to prevent social unrest in Xinjiang and to provide with influence on Central Asia (Clarke 2008).

3.2.2.1 Importance of the transboundary cooperation for the downstream Kazakhstan

China is becoming an important player in the water governance of Central Asia (Allouche 2007). It shares about 20 rivers with Kazakhstan and the river Tarim and several other small rivers with Kyrgyzstan (Allouche 2007; Peyrouse 2007). However, for Kazakhstan the transboundary cooperation with China is more critical as the basins of the Irtysh and Ili rivers, the main two rivers in the country, are flowing from China (Peyrouse 2007). It adds to the water security issue in Kazakhstan, as it is largely dependent on transboundary waters with seven out of eight water basins being transboundary (Ryabtsev 2008). In addition, the Irtysh and Ili river basins are of the highest strategic, economic and social importance in Kazakhstan (Zholamanova 2007; Peyrouse 2007) as:

- All hydropower potential and significant industrial potential is developed on the Irtysh river
- Water is extensively used for irrigation in the Ili river basin
- Main cities of Astana and Almaty are supplied within the basins
- Around three million people in five provinces are supplied by the Irtysh river and more than three million people in Southern Kazakhstan are dependent on the Ili river.

3.2.2.2 Chinese plans for Xinjiang development: increasing water intake

Xinjiang, Chinese administrative division where both Ili and Irtysh originate, was set as a priority area for the massive exploitation of petroleum resources, agricultural development and population migration (Peyrouse 2007; Allouche 2007). The Ili and Irtysh rivers are already being extensively used after the construction of series of drainage canals and reservoirs on

the tributaries of the Irtysh and the Ili rivers (Zholamanova 2007). China is using "the 300 kilometer-long and 22 meter-wide "Kara Irtysh-Karamai canal", which annually transfers about 500 million cubic meters of water from the Irtysh river for irrigation of 140, 000 hectares of arable lands and for development of the Karamay oil fields (Peyrouse 2007). The Ili water is also currently used for irrigation of 400 hectares and this area seems to increase to 600 thousand (Zholamanova 2007). About half of Xinjiang's arable land is under cotton cultivation and a significant part under wheat cultivation (Peyrouse 2007). However, China's strategic plan is to increase cotton and wheat production even more. For example, the wheat production is planned to be doubled and give five million tonnes of wheat annually (Peyrouse 2007). Regarding water use for petroleum industry, as Karamay oil field reserves in Xinjiang are confirmed to contain 1.7 billion tonnes of oil, this region is planned to be developed as a national energy center in order to satisfy growing demand for energy (Peyrouse 2007). In addition, the Government promotes migration of up to 40 million people to Xinjiang (Allouche 2007), increasing population load on the basins.

Such plans of the regional development will inevitably lead to the increase of the water intake from the Irtysh and Ili rivers (Peyrouse 2007). According to Zholamanova (2007), the future plans of China by 2020 imply the increase of water intake from the Irtysh into the Kara Irtysh-Karamai canal to 1.5 billion cubic meters, which is up to 12% of the annual runoff from the Chinese territory to Kazakhstan. Regarding the future water intake from the Ili river, the runoff from China of 12 billion cubic meters can decrease to 10 (Dunn 2010). These decisions on water intake and regional development in China concern Kazakhstan and the environmental community (UNECE 2009), as such significant water diversion can lead to various negative environmental, economic ands social consequences. According to Zholamanova (2007), the possible consequences of the upstream Xinjiang development on downstream Kazakhstan will include disruption of the water balance of the Balkhash and Zaysan Lakes, local climate change, reduction of crop yields, pasture degradation limitation of industrial and hydropower production, threat to irrigation, the increase of pollutant concentration making water unsuitable for industrial and domestic water consumption, social unrest and many other consequences. Thus, water, energy, climate and food issues in Kazakhstan will become more critical.

3.2.2.3 History of negotiations between unequal partners

Kazakhstan has been addressing the issue of joint control over water use in the Ili and Irtysh river basins since 1994 (Zholamanova 2007). In 1996 the issue of the regulation of water use in

the transboundary river basins based on the principles of international law was raised during the negotiations between Nazarbayev and Jiang Zemin. In 1999 after the personal request of the President of Kazakhstan to the President of the PRC Kazakhstan-Chinese consultations on the transboundary rivers began at the expert level (Zholamanova 2007).

In 2001, the Agreement between the Government of Kazakhstan and the People's Republic of China about cooperation in area of transboundary water use and protection was signed and a Kazakhstan-China Joint Commission was founded (Ryabtsev 2008). This agreement was followed by:

- Agreement between the Ministry of Agriculture of Kazakhstan and the Ministry of Water Resources of China on the emergency notification of the parties about disasters on transboundary rivers
- Agreement between the Ministry of Agriculture of the Republic of Kazakhstan and Ministry of Water Resources of People's Republic China on Development of Scientific-Research Cooperation on Transboundary Rivers
- Agreement between the Ministry of Environment of the Republic of Kazakhstan and Ministry of Water Resources of People's Republic China on Exchange of Hydrological and Hydrochemical Information (Data) of Border Gauging Stations on Major Transboundary Rivers (Ryabtsev 2008)

However, there are many difficulties and unresolved questions in the negotiation process between "unequal players" (Peyrouse 2007), as being an initiator of the cooperation Kazakhstan cannot influence China. According to the UNECE report on river basin commissions and other institutions for transboundary water cooperation (2009), the activity of the Joint Kazakhstan-China Commission is extremely cautious in the discussion of the transboundary problems. The signed agreements and the cooperation between Kazakhstan and China are limited to monitoring and joint research (UNECE 2009) and the major interstate agreement on water allocation has not been signed yet (Zholamanova 2007). Currently Kazakhstan is preparing a draft of a new agreement on the integrated management of the Ili-Balkhash Basin, involving China, Kazakhstan and Kyrgyzstan (UNECE 2009).

However, the Chinese side already rejected once the proposal of the Kazakh side to involve Russia into the negotiations about the regulation of the Irtysh river basin, transboundary basin between China, Kazakhstan and Russia (Zholamanova 2007). Following its policy of regionalism (Zholamanova 2007) China insists on the bilateral format of the negotiations on all its

transboundary rivers (UNECE 2009). This Chinese condition to make only bilateral agreement questions the possibility of the implementation of integrated approaches to water management such as IWRM.

In addition, compared to Kazakhstan, China is not a Party to the international water agreements such as Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) and Convention on the Law of Non-Navigational Uses of International Watercourses (Zholamanova 2007) and often does not follow the international law (Sievers 2002). According to Sievers (2002), Kazakhstan was ignored when the decision on the construction of the Kara Irtysh – Karamay canal in the 1990s. However, Kazakhstan itself is "desperate to avoid any sort of confrontation with China" due to high economic dependence on China (Sievers 2002, 7). Sievers (2002) also criticizes Kazakhstan's inability to show real compliance with international regimes at the local level and to establish an institutional framework with effective regime committees.

However, according to Kenshimov (2011), there are some recent positive improvements in the transboundary cooperation between Kazakhstan and China, as the Agreement on the quality of transboundary rivers was signed in February 2011 and the preparatory work on the technical aspects of the water allocation will be finished by 2014.

3.3 National scene

The national literature on the policy responses to the WECF challenges is far from being rich. Nevertheless, there are some reports which were used for the analysis of water, energy, climate and food challenges for Kazakhstan. In addition, the policy responses to them are introduced by naming the main national strategies, programs and plans and highlighting international projects in the field of water, energy, climate and food. This overview is a basis for the comprehensive analysis of the political and institutional analysis developed in the next chapter.

3.3.1 Climate challenges and responses

3.3.1.1 Climate challenges

According to Kazakhstan's second national communication under the UNFCCC, climate patterns are changing in Kazakhstan (Esserkepova 2009). From 1935 till 2005 an average 0.31°C temperature increase was observed every 10 years across all Kazakhstan with a maximum 0.44 °C increase during winters. Although no obvious trend for annual and seasonal precipitation regime was identified, it was highlighted that among several climatic zones of Kazakhstan deserts and

semi-deserts will face the main changes of climatic patterns towards severe climate aridity. The records showed intensifying degradation of glaciers: within the last fifty years the annual decrease rate has been 0.8% in the glaciers area and 1% in the volume of ice. This glacier degradation will eventually decrease the flows of mountainous rivers and add to the existing problem of water scarcity in Kazakhstan (Esserkepova 2009). The synthesis of Zoï environment network on climate change in Central Asia (Zoï 2009) supports the projection of the reduction of the river flow in the southern part of Kazakhstan. On the other hand, it shows that the northern river flow will increase in the future (Appendix 6).

Meanwhile, the vulnerability of Kazakhstan to climate change is considerable (Strukova *et al.* 2010; Esserkepova 2009; Zoï 2009; World Bank 2009). Water availability, water quality and quantity can be impacted by climate change. Change of climatic conditions can decrease water availability in Kazakhstan together with the increasing water need of growing population, industrial and agricultural development in Kazakhstan and increasing water intake from neighboring countries in Central Asia and China (Esserkepova 2009).

The largest potential damage from unfavorable weather and climate conditions (70%) can be assigned to agriculture, the main water consumer in Kazakhstan (Esserkepova 2009; World Bank 2009). Frequent droughts and increasing regional aridity can decrease cotton, rice, fodder, vegetable and fruit crop production in irrigated southern regions (Esserkepova 2009; World Bank 2009). The changes of the intra-annual distribution of river flows from mountains with increases in winter and decreases in summer as well as general reduction of the mountainous river flow due to glacier degradation will have an additional negative impact on the irrigated lands (Esserkepova 2009). Despite a possible positive impact of CO2 concentration growth on wheat productivity in the northern region of Kazakhstan, significant temperature increase will worsen the conditions of plant development and consequently lead to a productivity decline (Esserkepova 2009). The World Bank (2009) argues that even though there are projections of agricultural prosperity due to warmer climate and more precipitation in the northern part of Kazakhstan, these climate conditions will not open new opportunities for Kazakhstan to become an agricultural leader together with Russia and Ukraine, given present problems of low agricultural performance, old infrastructure, low efficiency and low productivity.

Climate change can lead to economic losses, social stresses and environmental degradation (UNDP CRM 2010). According to the World Bank estimations, economic loss potential of

catastrophic events for Kazakhstan can be more than 5% of GDP in Kazakhstan (World Bank 2009). Extreme weather events and climate-related hazards such as avalanches, landslides and floods can cause threats to population and lead to migration. Poor population, which is highly dependent on agriculture, can suffer from yields reduction due to climate change. Existing environmental problems can be aggravated by climate change, for example, Aral Sea problem will become even more critical (UNDP CRM 2010).

Another challenge for Kazakhstan connected with climate change is the need to reduce its GHG emissions. Kazakhstan's GHG emissions started to grow from 1988 as its economic development was recovering after the collapse of the Soviet Union (Zoï 2009). According to the synthesis of Zoï environment network on climate change in Central Asia (Zoï 2009), Kazakhstan is the biggest emitter in Central Asia. Moreover, Kazakhstan took the third place after the United States and Canada by energy-related emissions per person in 2007 (Zoï 2009). According to Kazakhstan's second national communication under the UNFCCC, the total GHG emissions per person in 2005 were more than 16 million tonnes (Esserkepova 2009). Among GHG of Kazakhstan CO2 is the main type (see Figure 10). Figure 10 also shows that regarding GHG by sector, energy production has always been a key source of GHG emissions; in 2005 its share was 81% (Esserkepova 2009). The sector of agriculture was the second largest contributor (9.4%) and industrial processes are on the third place by GHG emissions (6.3%), mainly CO2 and CH4 (Esserkepova 2009).

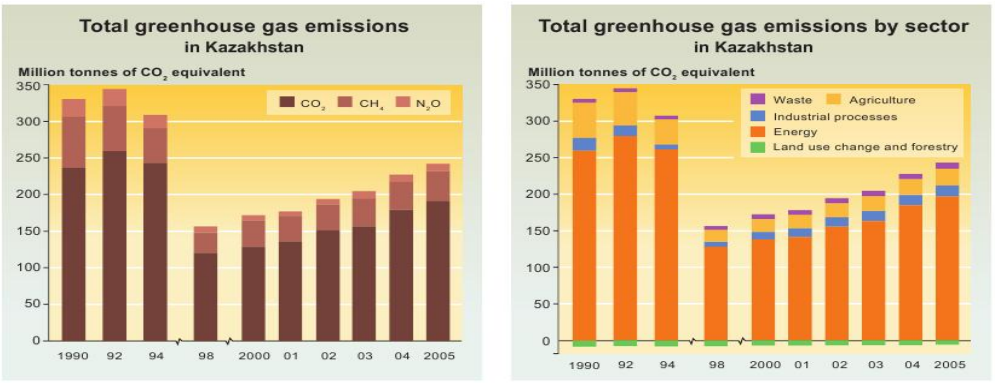

Figure 10. Total GHG emissions by type and by sector between 1990 and 2005
Source: Zoï 2009

3.3.1.2 Responses to climate change challenges

Being vulnerable to local climate change and adding to the problem of global climate change by emitting a significant amount of GHG, Kazakhstan has to provide adequate responses through both climate change adaptation and mitigation. Regarding the response of the Government to

climate change mitigation, the Republic of Kazakhstan ratified the Kyoto Protocol in 2009 and, moreover, took the voluntary quantitative obligations on the reduction of GHG emissions GHG by 15% by 2020 and by 25% by 2050 in comparison to 1990 emission levels (Averchenkova 2010). In order to create the basis for meeting these obligations UNDP and the Ministry of Environmental Protection developed the *Low-carbon development concept of the Republic of Kazakhstan by 2050*, which will help to meet the obligations without sacrificing energy security and limiting the increase of population's living standards to the standards in the developed countries (Low-carbon development concept 2010). Climate change mitigation is also addressed as an important issue in the *Ecological Code of the Republic of Kazakhstan*, where auditing and control of GHG emissions were introduced at the country level as well as at an enterprise level (Yesserkepova 2010). In addition, *Zhasyl Damu* or *Green Growth* programme for 2010-2014 has the reduction of GHG emissions by 1% by 2014 as an indicator.

As for climate change adaptation, it was highlighted that Kazakhstan is more willing to act in the sphere of climate change mitigation than adaptation (UNDP CRM 2010). According to Yesserkepova (2010) the importance of climate change adaptation is still not included in the legislation. However, since 2011 climate change adaptation issues are addressed by the UNDP Project "Climate risk management in Kazakhstan", incorporating elements of climate change adaptation and reduction of climate-driven risks. It presents a part of the Central Asian Multi-Country Programme on Climate Risk Management and aims to enable environment for CRM in Kazakhstan (UNDP CRM 2010). Previously there was another project "Strengthening the capacity in the field of sustainable development through integration of climate change issues into strategic planning in the Republic of Kazakhstan" during 2009-2010, which identified the framework for *the National concept on adaptation to climate change* (2010).

3.3.2 Water challenges and responses

3.3.2.1 Water challenges

According to the *Concept for developing the water sector and water policy of Kazakhstan by 2010,* approved by the Government in 2002, the main water problems in Kazakhstan include growing water scarcity, poor surface and groundwater quality as a result of pollution, enormous water losses, the problem of drinking water supply, transboundary water allocation problems and the threat of depletion of water resources due to population growth and economic development. Among the listed water problems the availability of water of required quantity and quality can be identified as a major underlying challenge for Kazakhstan. The threat of the depletion of water resources due to population growth and economic development together with the possible unpredictable

impacts of climate change and transboundary issues present challenges as factors determining water availability. The challenges of water losses, provision of drinking water supply, pollution and transboundary cooperation also determine water availability; however, these challenges are more dependent on the water management of the country itself.

The threat of depletion of water resources is based on the trends of the increasing water use and decreasing of total water resources (Figure 11). Despite the previous decrease in water use connected with the economic crisis after the collapse of the Soviet Union, there is a projection of increasing demand in water due to population and economic growth. In addition, it was highlighted that water use also includes environmental, fishery-related and sanitary releases, thus, the need of taking into account environment as a consumer is underlined. In contrast, the total over-the surface flow, including both the water coming from the neighboring countries and the one formed in Kazakhstan, is projected to decline in the nearest future.

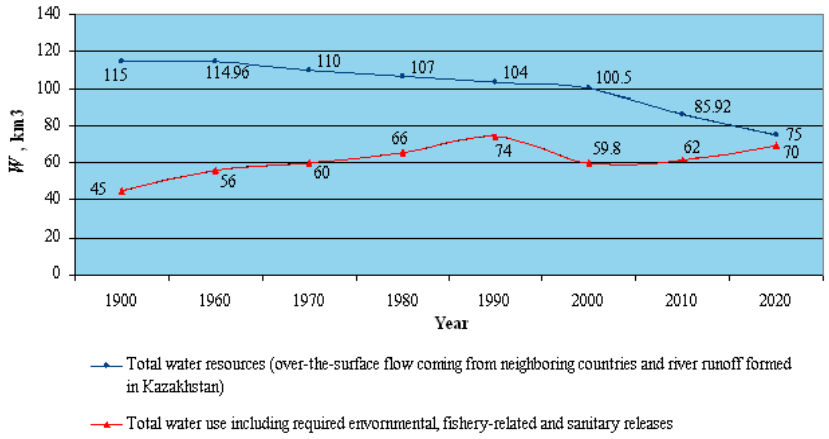

Figure 11. Water resources and water use in Kazakhstan
Source: UNDP 2007

According to the report "*Water resources of Kazakhstan in the new millennium*" (UNDP 2004), there are eight river basins in Kazakhstan (Figure 12) and the trend described before is observed in all of them. It was also highlighted that this situation is worsened as the river basins capacity is decreasing. The decrease of the river basins capacity, implying worse regeneration capacity of the aquatic systems and the following environmental deterioration in the whole basins, is caused by the same factors of the overuse of water resources for industrial and agricultural development, population growth and pollution (UNDP 2004). In addition, the environmental conditions of the river basins are highly dependent on the activity of the neighboring countries and this fact can add to the problem as the previous exploration of the regional scene revealed that seven of the

river basins are transboundary and a lot of problems of transboundary cooperation remain unresolved.

In all river basins of Kazakhstan water is being extensively used by all sectors. This exploitation is extremely inefficient and causes significant water losses. The main water consumer is agriculture (78%). Even though the level of water use efficiency is inadequate in all consuming sectors, irrigated agriculture is responsible for the majority of water losses (UNDP 2004). The use of the old irrigation network left from the Soviet era and poor agricultural practices results in more than 40% water loss (UNDP 2004). It was criticized that irrigated agriculture is in fact overusing water resources and by doing that decreases crop yields and promotes salinization of soils (UNDP 2005).

Figure 12. Water basins of the Republic of Kazakhstan
Source: UNDP 2004

It was highlighted that as well as in other Central Asian states, Kazakhstan's main problem is not water scarcity, but poor water management. The adequate response to water challenges on the first place has to be improvement of water management in Kazakhstan (O'Hara 2003).

3.3.2.2 Responses to water challenges

The response of Kazakhstan to the water challenges is shaped by both national and international attempts. From the national part, Kazakhstan took obligations on the Johannesburg World Summit on Sustainable Development in 2002 to develop a national IWRM and water efficiency plan (Kenshimov 2005). The Government's main steps towards the fulfillment of its obligations included the development of the Concept for developing the water sector and water policy of

Kazakhstan by 2010 and improvement of the water legislation on the national level (UNDP 2004; Kenshimov 2005). Signed by the Government in 2002 the Concept for developing the water sector and water policy of Kazakhstan by 2010 underlined the improvement of water management as a priority of the national water policy (UNDP 2005). The Water Code of 1993 was replaced by the new Water Code in 2003, based on the international principles of water management, close to IWRM principles (Nikolayenko 2006). In addition, sectoral program Potable water aiming to provide adequate water supply was launched (UNDP 2004). Another national concern is transboundary cooperation on water use with the neighboring countries (UNDP 2004).

The activity of international agencies and external donors is significant in terms of facilitating Kazakhstan to face water challenges through promoting IWRM. The UNDP launched several projects, including "National Integrated Water Resources Management and Water Efficiency Plan for Kazakhstan" in 2004-2008 and "Transboundary Dialogue and Cooperation in the Ili-Balkhash basin" within the regional project "Promoting Integrated Water Resources Management and Fostering Transboundary Dialogue in Central Asia", which promote institutional, legal and political changes in water governance in Kazakhstan. For example, due to these projects eight basin councils were established (UNDP and CWR 2005), the *Programme on improving integrated water resources management and water efficiency in Kazakhstan up to 2025* was developed and some amendments into Water code were made (Nikolayenko 2006). The vision of the programme is presented in Appendix 7. In addition to these large UNDP projects on the regional and local levels, other international agencies launched several projects, promoting principles of IWRM, for Irtysh, Aral Sea, Syr Darya, Tobol, Chu and Talas rivers (Nikolayenko 2006).

3.3.3 Energy challenges and responses

3.3.3.1 Energy challenges

Initial richness in carbon resources (IBRD 2010) and oil and gas exports helped Kazakhstan to recover after the collapse of the Soviet Union and since then the energy sector plays a crucial role in Kazakhstan's economy and provides the main input into Kazakhstan's GDP (Cohen 2008). High dependence on carbon exports with the main focus on satisfaction of external energy demand resulted in poor commodity diversification, high energy intensity and problems of domestic energy supply. Insignificant change in deteriorated and uneven energy infrastructure inherited from the Soviet era (Appendix 5) also adds to the problems of the energy access, energy losses, energy security and insufficient energy supply. The main generating capacities, thermoelectric coal-based plants are situated in the areas of coal reserves in the northern part of

Kazakshtan, whereas the southern Kazakhstan is better connected to the Central Asian Power Grid and suffers from lack of electricity supply (WEC 2007). The situation is getting more urgent as internal electricity demand is growing due to economic development and population growth (WEC 2007) as well as external regional electricity and primary energy demand on oil and gas, especially in the neighboring largest energy consumer – China (Cohen 2008). Figure 13 illustrates growing electricity generation and electricity consumption between 1992 and 2008. According to the resources from the Ministry of Industry and New technologies, electricity consumption in Kazakhstan is projected to increase to 100 billions kilowatt-hours by 2015.

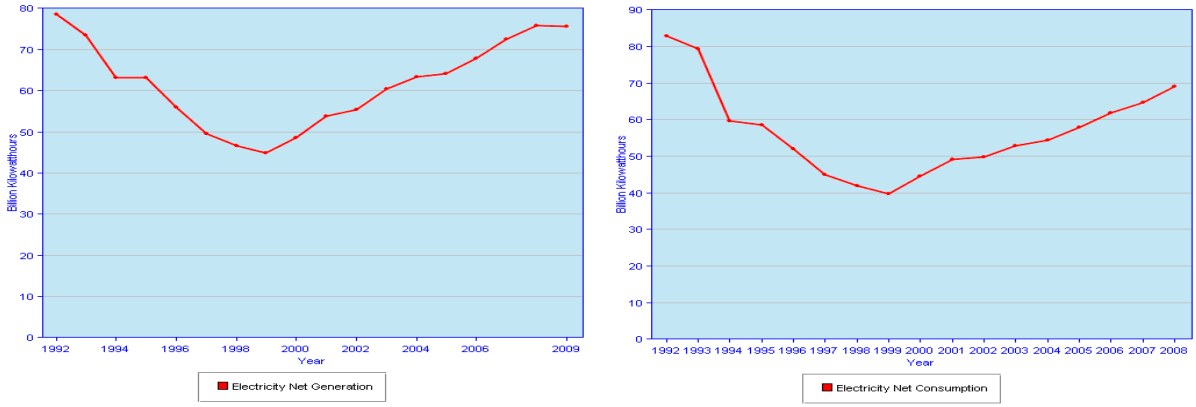

Figure 13. Electricity generation and electricity consumption between 1992 and 2008
Source: U.S. Energy Information Administration website

In addition, due to the fact that total primary energy supply and electricity production in Kazakhstan is highly dependent on coal (Figure 14), there is another problem of energy-related GHG emissions. Non-carbon based hydroelectric plants produce the rest 15% of electricity (IISD 2008). It was also underlined that there is a considerable renewable potential in Kazakhstan, which is almost not used (IISD 2008).

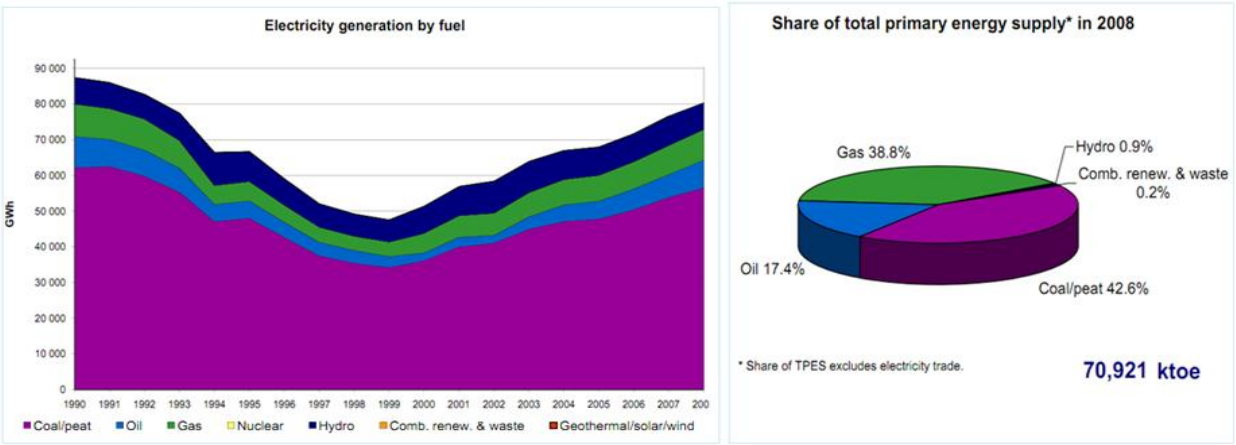

Figure 14. The dominance of coal in electricity generation and total energy supply
Source: International Energy Agency website

3.3.3.2 Responses to energy challenges

The development of the energy sector is one of the main priorities of the national policy. The energy issues are addressed in the Strategy "*Kazakhstan 2030*", *Concept of transition to sustainable development from 2007 to 2024*, *State program on forced industrial and innovative development of the Republic of Kazakhstan on 2010-2014*. They aim to decrease energy intensity of economy and industry in particular, to promote modernization of energy infrastructure and introduction of new generation capacities, to increase energy efficiency and to develop renewable energy sources. The sectoral *Program of development of nuclear power in Kazakhstan from 2010 till 2014 with prospects to 2024* was also developed. Several laws concerning the energy challenges were adopted, including *Law on power industry* (2004), *Law on Energy saving* (1997) and *Law on supporting renewable energy sources* (2009).

The development of new generation capacities and the realized construction of two transmission lines from the northern part to the electricity-deficit southern part are the components of the previously mentioned policy of energy self-sufficiency from the other Central Asian states. After the experience of strong electricity shortage by the Southern Kazakhstan in 2008 when all hydroelectricity was used by Kyrgyzstan due to extremely cold winter, Kazakhstan started to concern about energy security of the electricity-deficit southern region dependent on the Central Asian Power Grid.

In addition, UNDP's Energy and Environment Unit supports the Government to address some of energy challenges. There are UNDP-GEF projects "Kazakhstan - wind power market development initiative" (2004-2010) and "Removing barriers to energy efficiency in municipal hot water and heat supply" (from 2007). Both aim to assist to the Government in meeting its GHG reduction targets: the former - by promoting the development of wind energy and the latter - by increase of energy efficiency.

3.3.4 Food challenges and responses

3.3.4.1 Food challenges

Kazakhstan is not a food deficient country, compared to the rest of Central Asian states (Babu and Tashmatov 2000); moreover, together with Russia and Ukraine, Kazakhstan with historically livestock raising oriented population is now the main grain exporter in the region (World Bank 2009). However, due to inefficient agricultural practices, absence of united system of management and extensive approaches in agriculture there are significant environmental impacts, which intensified with climate change and decrease in water availability can in turn lead to the destabilization of the agricultural sector and pose a threat to food security and Kazakhstan's

agricultural plans. According to the analysis of RFCAratings (2010), the main problems of the agricultural sector in Kazakhstan include inefficient use of arable land, weak introduction of modern agricultural technologies, the lack of fertilizers and pesticides application, poor technical equipment and its deterioration and the lack of control of the state of soil fertility.

It was underlined that these current management problems in the agricultural sector are consequences of the agricultural reforms in Kazakhstan after the collapse of the Soviet system of centralized land management, as the privatization process turned large public enterprises into a huge number of small weak farms, lacking equipment and workforce and left without social protection by the state (Baydildina *et al.* 2000). The agricultural reforms also resulted in livestock decrease by 54% between 1990- 1998 and decrease of its productivity (Baydildina *et al.* 2000). According to O'Hara (2003), the food challenges are strongly connected with the ineffective water management and inadequate distribution of water for irrigation, as by affecting farmers they affect the crop production and its consumers. Meanwhile, unsustainable crop production, overgrazing, inadequate use of fertilizers and pesticides, overuse of water resources in the irrigation systems lead to soil erosion and pollution, land degradation and secondary salinization of soils (World Bank 2007).

3.3.4.2 Responses to food challenges

There is a sectoral *Programme on the development of the agro-industrial complex in 2010-2014,* aimed to develop the agro-industrial complex of Kazakhstan, providing both national food security and agricultural export increase. According to the *Programme* (2010), the diversification of the crop production will take place due to optimization of the crop areas. Although the area under grain cultivation is planned to be slightly decreased from 17.2 million to 16.7 million hectares by 2014, the area for durum wheat is planned to triple for export facilitation. In addition, productivity is planned to double, agricultural export will reach 8% of the total export of the country and domestic food products will provide more than 80% of the inner market. In addition, the *Program on Combating Desertification in 2005-2015* was launched by the Ministry of Environmental Protection within the Central Asian Countries Initiative on Land Management of ADB (World Bank 2007).

There are also a number of other projects, mainly facilitated by international agencies. The UNDP project "Sustainable Rangeland Management for Rural Livelihood and Environmental Integrity" launched in 2009 till 2011 aims to eliminate existing barriers to sustainable rangeland

management by enabling environment at the national and local scale. Problems of grassland management and soil destruction are addressed by a GTZ programme in the Aral Sea and in the Almaty region (UNDP CRM 2010).

3.4 Local Scene: introduction to the Ili-Balkhash basin case study

The abundant and comprehensive literature about geographical characteristics of the IBB and the Lake Balkhash dates back to the Soviet era. However, the data on the current state of the basin is very fragmented. For this reason two main recent comprehensive sources, combining the existing data from the Soviet period and the analysis of the present situation were chosen. They are the book on the management of the hydroecosystem of the Lake Balkhash (Dostai 2009) and documentation of the EU-funded project "Development and improvement of policy instruments for environmental protection in Republic of Kazakhstan" (Mott MacDonald 2010).

The IBB is one of the two transboudary river basins is shared by Kazakhstan and PRC (Figure 15). Its total area of 480,000 km² is made up by the Ili river catchment (196,000 km²) and the catchment of the Lake Balkhash with its other inflows (284,000 km²) (Mott MacDonald 2010). In Kazakhstan the IBB is a section of the Balkhash-Alakol river basin (Figure 12) without the Alakol-Sassykkol lake system, and is situated in the south-eastern part of Kazakhstan mainly within Almaty and partly East Kazakhstan, Karaganda and Zhambyl administrative units and there is also the largest city in Kazakhstan – Almaty (MEP 2005). According to geographical and hydrological patterns, the IBB can be divided into two zones: the mountainous zone of runoff formation, including mountains of the Northern Tien Shan and Djungarian Alatau, and the zone of the runoff dispersion or loss, including the middle plain of the most intensive consumption and the delta of the Lake Balkhash in the sands (Dostai 2009).

Figure 15. Location of the Ili-Balkhash basin
Source: the map was created by a cartographer Kmusser in 2008 and is available on the internet

3.4.1 Hydrological characteristics

At the moment the IBB presents a naturally and artificially developed hydrological network, which is made up by numerous rivers and different temporary water flows, small lakes and artificial reservoirs, wetlands and ponds, irrigation canals and waterways (Mott MacDonald 2010). The center of the hydrological network is the half-salt and half-fresh Lake Balkhash, the third biggest closed lake in the world after the Caspian and Aral Seas. Under the conditions of the arid climate the closed lake directly depends on the main inflows – the rivers Ili, Karatai, Aksu, Lepsi and Ayakoz (Dostai 2009). The main contributor to the lake (75% of the inflow) is the Ili river, which is mainly formed in China (70%) and the rest 30% is added by the Charyn and Chilik rivers in Kazakhstan. There is a great periodical, year-to-year and seasonal variability of river flows with summer peaks bringing 70% of the year flow (Dostai 2009). Average river flow into the lake is around 29 km³ with about 60% formed on the Chinese side (Mott MacDonald 2010).

There is a high correlation between the quantitative characteristics of the lake such as its level, volume and area with the river inflow and the balance of precipitation and evaporation (Dostai 2009; Mott MacDonald 2010). The level of the Balkhash lake has been changing significantly (Figure 16), decreasing to less than 341 m, identified by numerous studies as a critical level, and exceeding 342 m, considered to be a safe level (Mott MacDonald 2010). The decline of the lake level after 1970s is connected with the construction of the Kapshagay reservoir and introduction of the vast agricultural areas, which were parts of the same regional policy of agricultural development in Central Asia, described previously. Determination of the ecological condition of the lake by the abstraction of the river inflow raises concerns about the growing demand on both Kazakhstan and Chinese sides (Mott MacDonald 2010).

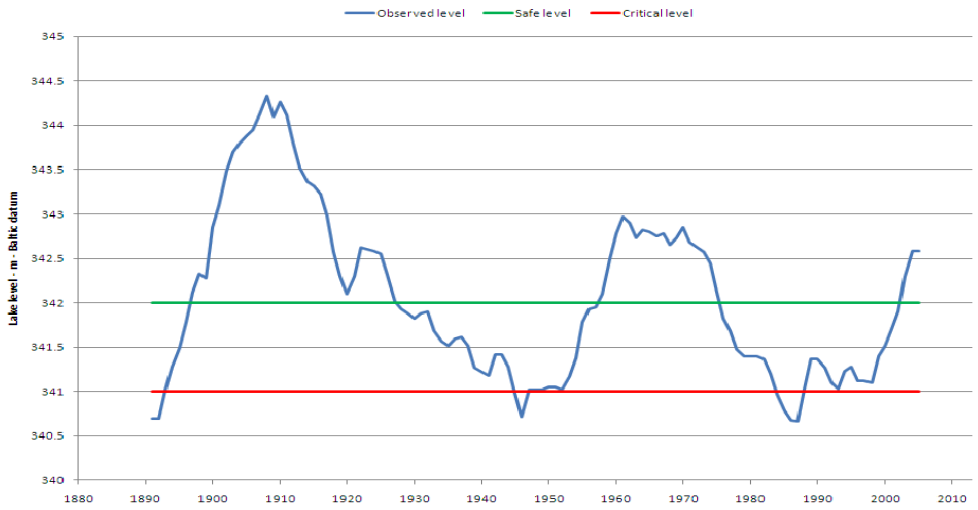

Figure 16. Fluctuations of the level of the lake Balkhash between 1880 and 2005
Source: Mott MacDonald 2010

3.4.2 Climate change

According to the time series of precipitation and temperature anomalies (Appendix 8) over the Balkhash-Alakol basin, temperature is increasing, whereas annual precipitation is relatively stable. However, the analysis of precipitation by seasons reveals slight change in the precipitation regime with more precipitation during winter and less precipitation during summer (Kazhydromet 2010). According to Dostai (2009), precipitation in the region is generally uneven not only within a year but also over the different areas of the region. Rainfall is the highest in the mountains and the lowest in the Balkhash delta.

As well as other glaciers of Kazakhstan, glaciers of the IBB region are deteriorating. The records show that the area and volume of the glaciers in the region decreased by around 30% in the period from 1955 till 1999 (Mott MacDonald 2010). As this trend is projected to continue, the volume of ice glaciers in the Ili river basin will decrease to 83 km³ (Figure 17).

Region / River Basin	The volume of ice glaciers (km³)					
	2000	2010	2020	2030	2040	2050
Kazakhstan part of Ili river basin	35.04	32.91	30.08	27.50	25.14	22.99
Chinese part of the Ili river basin	90.41	87.32	79.83	72.98	66.72	60.99
Total	125.45	120.23	109.91	100.48	91.86	82.98

Figure 17. Projected decrease of the volume of ice glaciers in the Kazakhstan and Chinese part of the Ili river basin
Source: Mott MacDonald 2010

3.4.3 Irrigation

During the Soviet period irrigated areas in the basin were increased to more than 600 thousand hectares and there was a plan to reach one million hectares (Dostai 2009). A dense irrigation system was developed between and within farms. After the collapse of the Soviet Union and the agricultural reform in Kazakhstan, described previously, the main irrigation systems were privatized and since then have been maintained by local companies dealing with water management for irrigation (Mott MacDonald 2010). Regarding the irrigation systems within farms with the length of more than 16 thousand kilometers, they are still unregistered and not maintained (Mott MacDonald 2010). All these factors continued to result in extremely high water inefficiency and water loss (Dostai 2009).

In addition, the total irrigated area decreased by 34% and in 2006 it was about 420 thousand hectares. For example, in Almaty oblast, which presents the largest part of the IBB, 102 thousand hectares of irrigated areas are not used mainly due to the problems of salinization, floods, water-

logging and problems with irrigation and drainage system. However, there are governmental plans on revitalization of agriculture in Kazakhstan led by the policy of food self-sufficiency. The IBB is an important agricultural area with diverse crops. As it can be seen on the graph, there is a general shift towards wheat production on the total area as well as on the irrigated area. There are several irrigation fields, including Akdala rice field, Karadala, Shengeldy fields and the area of the Big Almaty Channel (BAC).

n/n	Crops	On the total area				On irrigated area			
		1990	%	2009	%	1990	%	2009	%
1	**Cereals**	471.77	54.3	200.9	51.3	138.27	34.8	107.8	42.3
	Wheat	133.58	15.4	83.7	21.4	46.34	11.7	40.0	15.7
	Maize	76.58	8.8	36.5	9.3	76.58	19.2	36.5	14.3
	Rice	15.35	1.8	9.6	2.4	15.35	3.9	9.6	3.8
2	**Industrial**	21.44	2.5	29.5	7.5	12.15	3.1	25.0	9.8
	Sugar beet	3.69	0.4	1.3	0.3	3.69	0.9	1.3	0.5
3	**Potatoes, vegetables, melons**	29.14	3.4	40.7	10.4	29.14	7.3	38.0	14.9
4	**Fodder**	345.15	39.8	121.0	30.9	217.55	54.8	88.0	34.5
	Total	867.5	100.0	392.1	100.0	100.0	397.11	254.7	100.0

Figure 18. Area and structure of crops in the IBB
Source: Mott MacDonald 2010

3.4.4 Old and new energy projects

The KHPP together with the Kapshagay water reservoir were introduced for electricity peak regulation and for irrigation during the Soviet period (Mott MacDonald 2010). At that time the need of the Balkhash lake was questioned by the Soviet irrigation and energy policy on the use of the water resources of the basin, where the lake was considered to be an object of huge evaporation and, instead, introduction of irrigation areas and the hydroelectric capacities of 1.5 million kWh were promoted (Dostai 2009). According to Dostai (2009), construction of the enormous Kapchagai reservoir with the volume of 28 km^3 and the area of 1,800 km^2 changed the regime of the Ili river, led to the increase of evaporation and filtration losses and caused the destruction of the Ili delta. Due to further growing concerns about the ecological crisis of the Balkhash lake the KHPP has not been fully operated since then. Currently it is a 364 kWh hydropower plant with two out of four turbines working for electricity generation for Almaty city (Mott MacDonald 2010; Dostai 2009).

According to the *State program on forced industrial and innovative development of the Republic of Kazakhstan on 2010-2014* (2010) currently the new energy projects of the Balkhash thermo power plant (BTPP) and the Moynak hydropower plant (MHPP) are being implemented in order to provide the electricity deficit southern region, including the area of IBB. Regarding the BTPP, there has been an argument for the construction of the nuclear power plant instead of the BTPP. The

MHPP is being constructed on the Charyn river, the tributary of the Ili river. These and other projects planned within the program will be presented on the map of industrialization (Figure 19) in the next chapter.

3.5. Summary

Kazakhstan's main WECF challenges are the same as in other Central Asian states - water availability, energy access, climate change impacts and food security. As almost all basins in Kazakhstan are transboundary, the major political challenge for the country is to ensure effective transboundary cooperation with Central Asian states and China. These Central Asian and Chinese factors, the latter in particular, affect Kazakhstan in many ways. The conflict situation in Central Asia has a consequence that all states, including Kazakhstan, started to promote the policy of self-sufficiency. The Chinese factor can affect national priorities and policy responses due to the high economic dependency of Kazakhstan on China. In general, the policy responses to all the challenges are shaped by the national priorities, programmes, and international obligations as well as by internal and external demand on the resources. To a large extent, the responses are facilitated by the international agencies such as UNDP.

4. The analysis of incorporation of the WECF nexus into the political and institutional frameworks

After the collapse of the Soviet Union the Republic of Kazakhstan has been developing its own policies in accordance to its national interests and in compliance with the global context. Meanwhile, Kazakhstan is becoming an active player on the regional and global levels in terms of the involvement into environmental governance. It is already a party to 24 MEAs. As it was mentioned previously, Kazakhstan ratified the Kyoto Protocol and the UNFCCC and took specific obligations. The country also took obligations to implement the objectives set in Agenda 21 and further agreements on sustainable development. To address transboundary water challenges Kazakhstan joined the UNECE Water Convention. In order to meet these and other obligations and provide adequate integrated responses to the challenges it is important for Kazakhstan to have an effective policy, legal and institutional framework ensuring integration of environmental policies and equal attention to the components of WECF nexus. This chapter presents a comprehensive analysis of the political and institutional frameworks in Kazakhstan in terms of their incorporation of water, energy, climate and food issues.

4.1 The analysis of the political setting

The analysis of the political setting uses horizontal and vertical dimensions, suggested by Lafferty and Hovden (2003) as a framework for the analysis of EPI, for the analysis of strategies, concepts, programs and plans, identification of their priorities, including those connected to water, energy, climate and food issues.

4.1.1. Horizontal policy dimension

For the analysis of the horizontal policy dimension three groups of policies were analyzed. They are the main national cross-sectoral integration strategies, governmental policies with a cross-sectoral focus and new policies addressing broad issues of climate change and water.

4.1.1.1 The main national cross-sectoral integration strategies

At the moment there are three fundamental strategic documents in Kazakhstan that can be identified as cross-sectoral integration strategies. They are the *Development strategy of Kazakhstan 2030* (1997), the *Strategic development plan of Kazakhstan 2020* (2010) and the *Concept of the transition of the Republic of Kazakhstan to Sustainable Development for the period 2007-2024* (2006).

The main strategic document of the Republic Kazakhstan since 1997 has been the *Development strategy of Kazakhstan 2030,* presenting a vision of Kazakhstan in 2030 as a state with highly-developed economy, social welfare and security. All other national documents and programs were developed in compliance with the strategy and aimed to fit into this vision. Among seven priorities highlighted in the strategy, two priorities are connected to the environment and energy. The fourth priority of achievement of the environmental well-being of citizens, based on a healthy lifestyle and education, raises importance of the clean environment for life. The fifth priority underlines the need of effective use of energy resources by increases in oil and gas extraction and exports in order to gain income, which will promote sustainable economic growth and improvement of people's lifestyle. Thus, the main strategy of the country emphasizes energy as a priority, whereas it refers to the environment in general and to some extent indirectly without a special focus on water and climate.

The definition of the effective energy use as an economic benefit from oil and gas export in the fifth priority of the *Development strategy of Kazakhstan 2030* is in conceptual conflict with the recently introduced *Low-carbon development concept of the Republic of Kazakhstan by 2050,* which will be analyzed further. According to the technical report for the UNDP and MEP project "Strengthening the capacity in the field of sustainable development through integration of climate change issues into strategic planning in the Republic of Kazakhstan" (Ismagulova 2010), the corrections need to be made into the strategy in terms of this priority, as effective energy use is about energy intensity, which should be made as a priority under the conditions of future energy crisis and climate change.

Adopted in 2010 the *Strategic development plan of Kazakhstan 2020* is the second stage of the *Development strategy of Kazakhstan 2030*. It underlines high global economic instability and the need to increase the sustainability of the national economy to the global and regional crises by promotion of the forced industrial and innovation development. According to the plan the forced industrialization will be realized in several stages starting with the development of export-oriented sectors of raw commodities production and their further transition to a higher level of processing and ending with the development of non-export and not connected with commodity sectors such as agriculture, light industry, tourism, information and communication technology, biotechnology and renewable energy. These priorities are replicated in the *State programme of forced industrial-innovative development for 2010-2014*.

As the strategy Kazakhstan 2030, the plan prioritizes issues of the energy sector; however, water, climate and food issues are also addressed. Regarding the energy priority, it was highlighted that the growing economy needs in energy will be satisfied by the national energy sources by 100%, the share of renewables in electricity supply will reach more than 3%, new generation capacities will be introduced as well as old energy infrastructure modernized. According to the plan, water use efficiency will be increased due to infrastructure modernization and the formulation of the policy of rational water use and environmental protection. The level of water and electricity losses in the transportation will decrease to 15% and 12% by 2020. The water use efficiency will be increased in the agricultural sector. The access to piped water will be improved and 50% of the total number of rural areas and 100% of small towns will be supplied. It was underlined that despite being one of the biggest producers of carbon energy, Kazakhstan will participate in the solutions of global climate change by modernization of the energy infrastructure and increasing energy efficiency. For provision of the food security the agricultural sector will be developed, the food processing in particular. At the same time, the export potential of the agricultural sector will be increased to 8% of the total export of the country, mainly due to the increase of the labor productivity. In addition, measures on climate change adaptation in the crop production will be taken. Thus, the strategic plan to some extent addresses all areas.

The *Concept of the transition of the Republic of Kazakhstan to Sustainable Development for the period 2007-2024* is the important step of Kazakhstan towards implementation of Agenda 21. The concept was developed before the previously discussed *Strategic development plan of Kazakhstan 2020* and this to some extent ensured its compliance with the concept in terms of the presentation of sustainable economic growth through introduction of sustainable technologies, increasing effectiveness of resources use and at the same time improving social welfare. According to the concept, the transition will progress through four stages: the preparatory stage, facilitating sustainable development integration into all spheres during the process of economy diversification; the first stage, when Kazakhstan will become one of the fifty most competitive countries in the world according to *the Strategy of Kazakhstan's joining the world's fifty most competitive countries*; the second stage, encouraging Kazakhstan's leading position by the improvement of life standards, efficient use of resources and ensuring national environmental sustainability; and, finally, the third stage of reaching international standards of the sustainable development.

It is the main environmental concept of Kazakhstan, aiming the achievement of the balance between economic, social and environmental goals. There are 17 priorities of the transition for

sustainable development defined in the concept. Five of them are related to water, energy, climate and food. They are access to drinking water of high quality, solution of transboundary water problems, energy efficiency and energy saving, reduction of GHG and ozone depleting gases emissions and combating desertification. In addition, the use of renewable energy sources is mentioned as a direction and mechanism of the transition to sustainable development. The concept also lists priority measures for ensuring environmental sustainability through introduction of regional sustainable development programmes, setting targets, time and mechanisms for industries determining their shift towards a cleaner production, attracting green investment and recovering historically degraded and polluted ecosystems. It must be noted that the concept underlines the need to go beyond administrative boundaries when introducing regional sustainable development programmes and offers the development of regional plans for the eight basin ecosystems. This innovation of the concept was then used as a justification of the *Programme on improving integrated water resources management and water efficiency in Kazakhstan up to 2025,* which will be examined afterwards. In general, the concept equally prioritizes water, energy, climate and food components.

4.1.1.2 Other governmental policies with a cross-sectoral focus

In addition to these three underlying cross-sectoral documents there are several governmental documents that to some extent have a cross-sectoral focus. These documents are the *Concept of ecological safety of the Republic of Kazakhstan for 2004-2015, State programme of forced industrial-innovative development for 2010-2014,* and *Zhasyl Damu.*

The *Concept of ecological safety of the Republic of Kazakhstan for 2004-2015* was signed prior to the Concept of the transition to sustainable development in 2003. Its third stage started from 2011, which according to the concept will lead to the improvement of the environmental situation and to the achievement of a favorable level of environmentally sustainable development of society. Among the priorities of the concept are reduction of anthropogenic pressure, leading to climate change and destruction of the ozone layer, prevention from depletion and pollution of water resources, solution of transboundary water problems through promotion of joining to international water conventions among Central Asian states and prevention of desertification and reduction of land degradation together with the increase of productivity of agricultural areas. Energy is not explicitly addressed in the concept. However, it was defined that the main direction of ensuring environmental safety is greening economy through the decrease of the role of "dirty"

industries and improvement of environmental mechanisms. In addition, the importance of the ratification of the Kyoto Protocol for both ecological and economic benefits was underlined.

State programme of forced industrial-innovative development for 2010-2014 is a part of the implementation of the *Strategic development plan of Kazakhstan 2020* and shares the same goals. The programme states that successful diversification is inextricably linked to sustainable development of the Republic, as it provides optimization of the management system for sustainable development, introduction of the policy towards "green" low-carbon economy and reduction of the negative impacts of human pressure on natural ecosystems by attracting investments into cleaner production and strengthening responsibilities to reduce emissions into the environment. However, the main priority of this comprehensive and detailed programme is the implementation of major investment projects in the traditional export-oriented sectors with the implication of new opportunities for small and average business through the development of the national scene with the following shifts towards processing.

The *Map of industrialization for 2010-2014* (Figure 19), presenting the location of the investment projects, and the *Business roadmap 2020*, facilitating the integration of business activity and the creation of the supporting infrastructure between the governmental institutions and business, are important components of the programme. The number of investment projects is growing; only during first year of the programme 152 projects were started, which exceed the number of initial 100 projects on the map of industrialization presented on the Figure 19 below. More than 23,000 people were provided with jobs (Caspionet 2010). According to the programme the main criteria for selecting projects are performance, energy efficiency and export orientation. The latter is selected as a criterion mainly due to the possibility for realization of the potential of the Customs Union[2]. It was mentioned that the JSC National Welfare Fund "Samruk-Kazyna" together with the main companies of the energy and metallurgy sectors as well as strategic foreign investors will be the initiators of the large projects. The construction of the BTPP and the MHPP in the IBB is also a part of the industrialization.

[2] Customs Union of the Russian Federation, the Republic of Belarus and the Republic of Kazakhstan was created in 2010 in order to introduce the single economic space

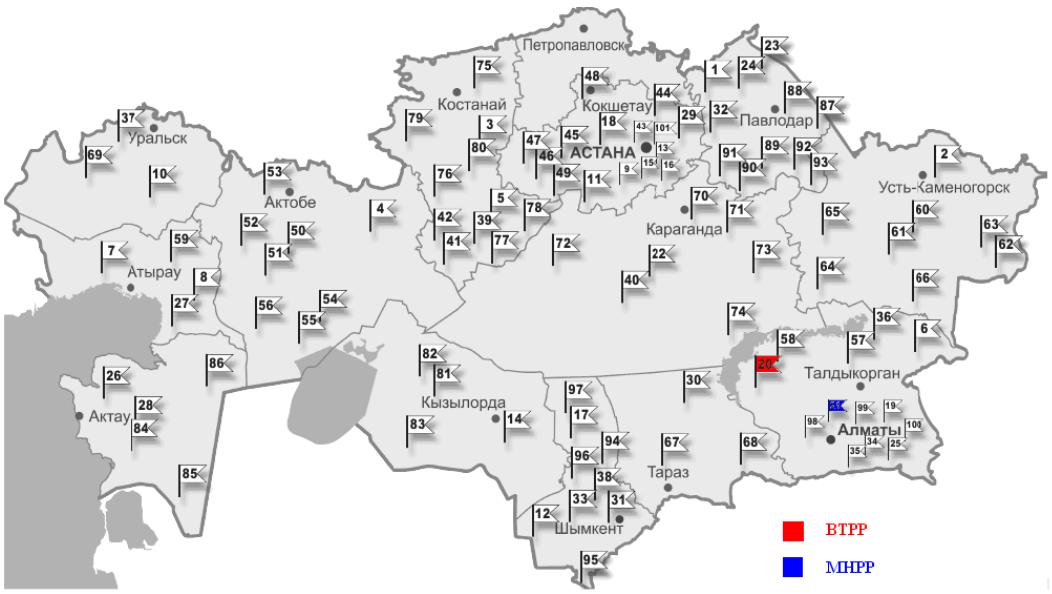

Figure 19. Map of industrialization showing locations of the planned investment projects in Kazakhstan
Adopted from *Map of industrialization for 2010-2014*

The programme implies development of priority sectors which will provide the diversification of the economy and competitive growth. The main focus of the programme is the energy and industry sectors. In addition, the sector of transport and communications, light industry, engineering, pharmaceutical industry, construction and agricultural sector are also prioritized. However, it was underlined that the list of priority sectors is not complete and can be supplemented during the process of the implementation of the programme. In terms of water, energy, climate and food priorities, the programme is mainly focused only on energy and food issues as the energy and agriculture were identified as the priority sectors. In the energy sector two external and internal development directions can be identified. The former is connected with the increase of oil and gas production and exports, development of export infrastructure. The latter is focused on the internal supply aimed to provide energy self-sufficiency by increase of coal production and large-scale development and modernization of energy infrastructure. In addition, the development of the sectors of the "economy of the future", including atomic industry for export and alternative energy for domestic supply, is addressed. According to the programme, the share of renewables in total electricity consumption will reach 1% by 2015. The development of the agricultural sector will be connected with the increase of agricultural production for export by diversification of the agricultural industry, introduction of modern water resource efficient technologies, wide chemicalization and introduction of new and currently not used irrigated areas. Water and climate issues are not explicitly present in the programme. However, there are some references to water and climate through some linkages between water and food and energy and climate. Thus, the programme suggests introduction of modern water

resource efficient technologies and underlines the positive effect of the modernization of the energy infrastructure and introduction of new energy efficient projects for climate change mitigation.

The programme *Zhasyl Damu*[3] *for 2010-2014* was developed in order to reach the goals of the *Strategic development plan of Kazakhstan 2020* and to optimize the implementation of the *Concept of ecological safety of the Republic of Kazakhstan for 2004-2015* through its incorporation into the programme. As it is stated in the programme, its aim is to create conditions for the conservation and restoration of natural ecosystems through the development of green economy, reducing human impact on the components of the environment and health, preservation and restoration of natural ecosystems and development and improvement of environmental quality management for 2010-2014. The program obviously has a cross-sectoral character, as it addresses many broad issues from greenhouse gas emissions and air pollution and water problems to the problems of environmental disaster zones, protected areas, waste and arrangement of green spaces. In terms of its priorities in water, energy, climate and food issues, the programme highlights the acuteness of the problems of water quality, air quality and land degradation and desertification, and underlines the impacts of climate change on ecological systems.

According to the programme, there will be two stages. The first stage (2010-2012) will be focused on providing activities and organizational measures to reduce environmental pollution by optimizing environmental management, establishing mechanisms for sustainable development and development of guidelines and plans for transition to standardization based on the best available technology for large industrial enterprises. The second stage (2013-2014) aims to improve management of the quality of the natural environment, to facilitate improvement and implementation of mechanisms for sustainable development and introduction of best available technologies and to achieve the target indicators. According to the programme indicators, the level of pollutant discharge into water will decrease by 3.5%, the GHG emissions will be decreased by 1%, the area of deserted and degraded lands will be decreased by 0.05 hectare. However, there seems to be no detailed action plan ensuring the achievement of these indicators. Moreover, the probability that highlighted actions to address some indicators will eventually lead to the achievement of these quantitative indicators can be questioned as the actions are not detailed and are of general nature. Although state and local authorities, ministries

[3] "Green growth" in kazakh language

and agencies responsible for the achievement of the objectives, target indicators and performance indicators are listed in the programme, there appears to be no plan ensuring their involvement in the implementation of the programme.

Meanwhile, strengthening of the potential of the state in the realization of this programme of green growth is one of the justifications of the *Green Bridge* initiative, put forward by Kazakhstan at the 6-th Ministerial Conference on Environment and Development in Asia and Pacific last year, which aims to promote the Eurasian integration for "green growth". Both the programme and the initiative appear to be intended to show Kazakhstan's devotion to the international principles of sustainable development. These national actions are also a part of the improvement of the compliance of the national policies and priorities to with the global context and international obligations. The initiative aims to create a platform on cooperation for integrated approach towards harmonization of national and regional environmental policies, for attraction of investments and technology transfer from developed countries and for introduction of the best practices on improvement of the legal, political, institutional settings, for provision interstate, intersectoral cooperation. It also identifies transboundary cooperation, especially in the water area, and climate change actions as the priority areas for this cooperation.

4.1.1.3. New policies addressing broad issues of climate change and water

Climate and water policy directions are actively developing and are present in the *Low-carbon development concept of the Republic of Kazakhstan by 2050, National concept on adaptation to climate change* and *Programme on improving integrated water resources management and water efficiency in Kazakhstan up to 2025*. And currently the *National programme on adaptation to climate change for 2011-2013* is being negotiated. This group of documents addresses broad issues which conceptually lie beyond the competency of one sector. However, compared to the previous governmental documents, these concepts and programmes are mainly driven by UNDP. *Low-carbon development concept of the Republic of Kazakhstan by 2050* and *National concept on adaptation to climate change* were developed in 2010 within the joint UNDP-MEP project on "Strengthening the capacity in the field of sustainable development through integration of climate change issues into strategic planning in the Republic of Kazakhstan". The *Programme on improving integrated water resources management and water efficiency in Kazakhstan up to 2025* is a result of the UNDP project "National plan for integrated water resources management and water efficiency".

The main directions of *the Low-carbon development concept* are energy efficiency of the national economy, support and development of renewable energy sources and implementation of the mechanism of GHG emissions trading. The concept on adaptation is mainly focused on the reducing vulnerability of population, economy and natural systems to the current climate variability and projected climate change. Whereas the low-carbon development concept is mainly focused on the energy sector and climate change mitigation, *the adaptation concept* gives a particular attention to water and agriculture. It underlines the need to improve water resources management, especially in terms of increasing water efficiency in agriculture, to increase efficiency of the use of land resources and to adapt rural population to climate change. Regarding the energy sector, the need to improve electricity access of rural population in isolated areas is referred in the concept. Thus, both climate change mitigation and adaptation are addressed.

The aim of the *Programme on improving integrated water resources management and water efficiency in Kazakhstan up to 2025* is to assist in achieving sustainable development through the implementation of integrated water resources management and water efficiency. The programme presents a detailed plan of action towards an adequate water situation in all water bodies and transboundary management of rivers through IWRM implementation. Although it refers to other sectors by underlining the need to increase water efficiency in all consuming sectors, the programme mainly is focused on the management and institutional setting of the water sector itself. However, a number of the programme actions suggest the address the challenge of climate change by improvement of the system of climate monitoring.

It must be noted that out of all documents, the programme on improving IWRM and the concept on climate change adaptation are the first to raise the institutional problems in Kazakhstan, including problems of cooperation between sectors and levels and the problems of the lack of institutional capacity to address the complex issues and implement the policies. These and other problems of will be discussed later in the analysis of the institutional setting in the next section.

4.1.1.4 Comparative gap-analysis of horizontal policies

The overall results of the gap-analysis, identifying water, energy, climate and food in the horizontal policies of Kazakhstan, are presented in the Table 2. As it can be seen, Kazakhstan 2030, the main development strategy of the country, which was developed in 1997 and prioritized oil and gas extraction and exports, has not been modified since then in accordance to the

Table 2. Water, energy, climate and food in the horizontal political dimension in Kazakhstan

	Strategy, concept, program, plan	Priorities			
		Water	**Energy**	**Climate**	**Food**
The main cross-sectoral documents	Development Strategy Kazakhstan 2030		Oil and gas extraction and exports		
	Strategic development plan of Kazakhstan 2020	Water use efficiency in agriculture and households; Water access	Oil and gas extraction and exports; Energy self-sufficiency; Introduction of generation capacities; Modernization of energy infrastructure; Energy efficiency; Renewable energy	Mitigation due to modernization of the energy infrastructure and energy efficiency; Adaptation in agriculture	Food self-sufficiency; Food processing; Grain exports
	Concept of the transition of the Republic of Kazakhstan to sustainable development 2006-2024	Access to drinking water of high quality; Solution of transboundary water problems	Energy efficiency and energy saving; Renewable energy	Reduction of GHG and ozone depleting gases emissions	Combating desertification
Documents with a cross-sectoral element	Concept of ecological safety of the Republic of Kazakhstan for 2004-2015	Prevention of depletion and pollution of water resources; Solution of transboundary water problems		Reduction of anthropogenic pressure, leading to climate change and destruction of the ozone layer	Prevention of desertification and reduction of land degradation; Increase of productivity of agricultural areas
	State programme of forced industrial-innovative development for 2010-2014		Increase of oil and gas production and exports; Development of export infrastructure; Large-scale development and modernization of energy infrastructure for domestic electricity supply; Increase of coal production for domestic supply; Development of atomic industry; 1% share of renewables in total electricity consumption		Increase of agricultural production for export; Introduction of modern water resource efficient technologies, Wide chemicalization; Introduction of new and currently not used irrigated areas
	Zhasyl Damu	Water quality		Reduction of GHG emissions by 1% by 2014	Combating land degradation and desertification
Documents addressing a conceptually broad issue	Low-carbon development concept of the Republic of Kazakhstan by 2050		Energy efficiency Renewable energy	Climate change mitigation: GHG trading	
	National concept on adaptation to climate change	Water efficiency in agriculture; Water resources management	Electricity access of rural population in isolated areas	Climate change adaptation	Efficiency of the use of land resources; Suggestion to introduce the Law on pastures
	Programme on improving integrated water resources management and water efficiency in Kazakhstan up to 2025	Integrated water resources management for solution of internal and transboundary water problems		Monitoring of climate change	
Policy directions shaped by the regional challenges Policy directions, satisfying both "economy-driven" and "environment-driven" policies: climate change mitigation and energy efficiency and renewable energy					

growing water, energy, climate and food challenges, identified in the previous chapter. In contrast, recently developed plan of Kazakhstan 2020, as well as the concept of the transition to sustainable development and the concept on climate change adaptation address all four components of the nexus. However, these policy documents still appear not provide the adequate political response to the WECF nexus.

Despite the fact that Kazakhstan 2020 has priorities in all nexus areas and incorporates principles of sustainable development, implying that the national priority is given not only to the sectors directly contributing to the economic development but also to the environmental and social components, eventually only the economic direction of the policy seems to be in fact prioritized. The main reason for that is that the two main "economy-directed" and "environment-directed" sub-policies developed to contribute to the overarching goals of Kazakhstan 2020 are incomparable in terms of their potential of being implemented into the horizontal and vertical dimensions of the political setting. Mainly "economy-directed" state programme of forced industrial-innovative development for 2010-2014, which is according to the gap-analysis focused only on energy and agriculture, has a detailed action plan with concrete target indicators for a number of sectors and these sectors also developed their sectoral strategic plans in order to reach these targets. Moreover, the industrialization process is highly financially supported by the Government, which also attracts external investments. In contrast, "environment – directed" Zhasyl Damu programme aiming to achieve only few narrow indicators for improvement of water quality, climate change mitigation and combating land degradation and desertification, has a low potential for its implementation, which was discussed previously. Moreover, it was mentioned in the CAREC/IGES/APAN report (2011), that the Zhasyl Damu programme has a status of a sectoral programme within the MEP despite its initial cross-sectoral mission to ensure environmental sustainability. This practice of limitation of complex issues to purely environmental, limitation of their scope and limitation of the competency to address this issue to the MEP is generally common in Kazakhstan and it has been applied for a concept of ecological safety and *Programme on Combating Desertification in the Republic of Kazakhstan 2005-2015*, launched to ensure the implementation of the concept of transition to sustainable development, as well. Thus, there is a possibility that the environmental component of the industrial-innovative development promoted in Kazakhstan 2020 can be ignored. This can again lead to the negative environmental consequences that took place during the Soviet industrialization process, which, by the way, had the same four and five year plans.

The existence of the concept of the transition to sustainable development is a crucial component for horizontal EPI and for addressing WECF nexus in Kazakhstan, as it assures that environment is taken into consideration on the highest level of the strategic planning and promotes finding a balance between various existing tradeoffs taking place around and within the nexus. However, the concept is ineffective without ensured integration and implementation into the political and institutional settings of Kazakhstan. In general, according to OECD briefing note on the progress of environmental policy integration in Central Asia (OECD 2009), the progress on EPI in Kazakhstan is still slow. There were some improvements such as creation of the NECSD, a multi-functional multi-stakeholder coordinating body in 1997, which developed the *National Environmental Action Plan (NEAP) for Sustainable Development* in 1998, and creation of the Sustainable Development Council, chaired by the Prime-Minister and including the Government members, MPs, public officials, international experts and heads of large enterprises, in 2004 and JSC Sustainable Development Fund "Kazyna" in 2006. In addition, the regional sustainable development plans were developed for all main administrative units as well as for the eight basin ecosystems, including the IBB within Balkhash-Alakol basin. However, according to the first environmental performance review (UNECE 2000), these plans as well as NEAP are not being implemented as funds are used not for environmental protection but for other purposes. The problem of vertical EPI into sectoral strategic development plans was also mentioned in the review. It must be noted that during the internet search for JSC Sustainable Development Fund "Kazyna" I have identified that the fund was then reregistered into the JSC "Corporation for export development and promotion" in 2008, which conceptually significantly distorts the priorities of the concept of sustainable development and shows that currently highest priority of the country is assigned to exports.

Regarding the *National concept on adaptation to climate* change developed by a multi-stakeholder expert group, its intention to address some challenges in all components cannot be realized as its detailed programme has not been accepted by the Government yet. It is possible that the Government is generally reluctant to develop this programme as being the Annex I country without specific climate change adaptation obligations and at the same time having taken quantitative obligations to reduce its GHG emissions, it is more willing to promote climate change mitigation than climate change adaptation. According to the report on climate change adaptation in Central Asia (CAREC-IGES-APAN 2011), the development of climate change adaptation programme by the Government under these conditions can be considered as a voluntary activity.

I noticed two interesting aspects of policy directions. They are indicated in the table by color. The first aspect is that some policy priorities can be identified as policy directions shaped by the regional challenges, which were discussed in the previous chapter. These policies are focus on the solution of transboundary water problems and self-sufficiency in energy and food. The second aspect is that there are policy directions, satisfying both "economy-driven" and "environment-driven" policies. This results in the prioritization of climate change mitigation together with the renewable energy and energy efficiency.

Both the concept of the transition to sustainable development and the strategic plan Kazakhstan 2020 are common mainly in the energy and climate sphere in terms of promoting renewable energy and energy efficiency and climate change mitigation. The low-carbon development concept underlines that it fits into the programme of forced industrial-innovative development, which in turn promotes investment attraction into the construction of energy projects, including renewable energy and energy-efficient projects. In addition, the low-carbon development concept suggests GHG trading for achievement of climate change mitigation goal of Kazakhstan 2020. Introduction of the GHG trading system, renewable energy sources and energy efficiency, suggested by the concept are important for Kazakhstan in order to meet its international obligations on reduction of GHG emissions. Moreover, in contrast to adaptation, the necessity of climate change mitigation is integrated into the *Ecological Code*. Accounting and control of GHG emissions are introduced at the national level as well as at an enterprise level (Yesserkepova 2010).

However, meeting such quantitative obligations of 15% and 25% reduction by 2025 and 2050 seems questionable as according to Kazakhstan 2020 and the forced industrial-innovative development there will be no shift towards gas. Moreover, coal production will be increased for domestic supply. It can make Kazakhstan's challenge of energy-related GHG emissions, discussed in the previous chapter, even more urgent given the fact that the total primary energy supply and electricity production in Kazakhstan is already highly coal-dominated. As it was revealed in the interviews and will be presented later the development of renewable energy is also facing several obstacles.

At the same time, despite being stated in several documents water, food and climate adaptation priorities are in fact being overlooked as the concept of transition to sustainable development, the concept of environmental safety and Zhasyl Damu have a low potential of being

implemented due to the reasons discussed earlier. It must be noted that the implementation of the Zhasyl Damu programme, the "environmental sub-policy" to the Kazakhstan 2020, is in competency of the MEP, whereas water and food lie beyond its competency. Although the programme on improving IWRM and water efficiency addresses all water problems, has an implementation potential and actively promoted in the Central Asian region its implementation is facing serious institutional and political barriers and, therefore, theoretically being promoted as a framework for addressing the WECF nexus, even cannot provide an adequate response to the water challenges. These and other institutional inconsistencies will be explored afterwards.

4.1.2. Vertical policy dimension

As it was mentioned previously, there are problems connected with implementation of the concept of transition to sustainable development due to lack of implementation within different sectors and regions. According to the report on development and improvement of policy instruments for environmental protection made for Kazakhstan (Mott MacDonald 2010), the existing sectoral and regional strategies are mainly aiming to reach economic goals and the environmental impact of their implementation is not evaluated even though there are some provisions on SEA in the *Environmental Code*. Meanwhile, currently all sectors and ministries have their own strategic plans.

The main ministries in charge of water, energy, climate and food are the Ministry of Agriculture (MoA), the Ministry of Environmental Protection (MEP), the Ministry of Industry and New Technologies (MINT) and the Ministry of Oil and Gas (MoOG) (see Figure 20). Interestingly, the MoA represents both food and water issues, climate is limited to the competency of the MEP and energy issues are divided within two ministries of MINT and MoOG, with the former dealing with issues of domestic energy supply and the latter - with export-oriented energy items. The MINT was specially created to implement the State programme of forced industrial-innovative development for 2010-2014.

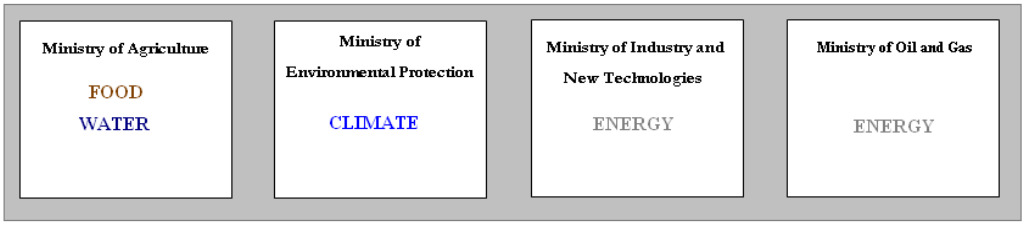

Figure 20. Ministries responsible for water, energy, climate and food

The currently active sectoral programmes of the ministries are presented in Table 3. The main documents of the ministries, the strategic plans, are developed by the currently introduced departments of the strategic planning within each ministry to reach the targets set in the programme of forced industrial-innovative development and the strategic plan Kazakhstan 2020. The programme Ak Bulak[4] is developed to fulfill the objective of Kazakhstan 2020 to ensure water access. The reference to the Concept to transition to sustainable development is mainly found only in the strategic plans of the MEP – Zhasyl Damu and Programme on combating desertification.

Table 3. Sectoral programmes of the ministries

Ministries	Sectoral programmes
Ministry of Agriculture	• The programme Ak Bulak for 2011 - 2020 • The program of the development of the agroindustrial complex of Kazakhstan for 2010 - 2014
Ministry of Environmental Protection	• Strategic plan of the Ministry of Environmental Protection for 2011-2015 • Zhasyl Damu • Programme on Combating Desertification in the Republic of Kazakhstan 2005-2015
Ministry of Industry and New Technologies	• Strategic plan of the Ministry of Industry and New Technologies for 2011-2015
Ministry of Oil and Gas	• Strategic plan of the Ministry of Oil and Gas for 2011-2015

4.2 The analysis of the institutional setting

A strong institutional setting, with effective cooperation within it, is important for implementation of the numerous policies discussed previously. As the political framework, the institutional setting in Kazakhstan has been changing significantly. These changes reflect the development of national priorities, including those connected to water, energy, climate and food. To ensure an adequate response to the WECF nexus, ideally, Kazakhstan's institutional framework also needs to present a network of equally significant and interconnected water, energy, climate and food institutional bodies. Previously the main governmental bodies incorporating the components of the nexus were indicated. However, identification of the main actors on different levels is crucial for the analysis of the institutional response to the WECF nexus and its adequacy. In order to present visually the main actors in the sphere of water,

[4] "White Creek" from kazakh language

energy, climate and food on different levels, the Figure 21 was created. It was developed through a comprehensive analysis of the modest literature to some extent addressing institutional aspects, governmental websites and websites of institutions, presentations made on different conferences and according to the data obtained from the interviews with the representatives from some actor groups. It was difficult to present all actors and interconnections between them, as due to time limitations not all main actors were interviewed and scarce literature on the institutional setting does not fully address the interconnections between actors. Still identification of the main actors on all levels and indication of interconnections between some of them allows to show the following:

- where water, energy, climate and food are addressed in the institutional setting of the country;
- what levels exist, on what levels which components are present and what are the differences between levels;
- what is the specifics of the institutional setting for each component and is there some prerequisites for integration;
- what business, NGO and science groups are in the spheres and what is their focus;
- what actors influence the response to the nexus and what actors can be affected by the inadequate institutional response.

4.2.1 Ministries where water, energy, climate and food are addressed and their history

On the national level, the highest level within the country, water, energy, climate and food are addressed in the ministries of agriculture, of industry and new technologies, of oil and gas and of environmental protection. Currently there is no separate ministry of water resources. Water issues are addressed and presented by the Committee of Water Resources (CWR) within the Ministry of Agriculture. Historical dynamics of the status of the central water management body in Kazakhstan shows that from being the large Ministry of Irrigation and Water Management of Kazakh Soviet Republic under Minvodkhoz during the Soviet era the water management body after independence in 1991 got the status of the State Committee of Water Resources, which then was given to the Ministry of Agriculture in 1994, then to the Ministry of Environmental Protection in 1997 and finally it returned again to the Ministry of Agriculture in 2002 (Petrakov 2011). Thus, these institutional changes in the sphere of water management lowered the status of the body dealing with water from the level of ministry to one of the committees of the Ministry of Agriculture. Such institutional response to water challenges to some extent may show that

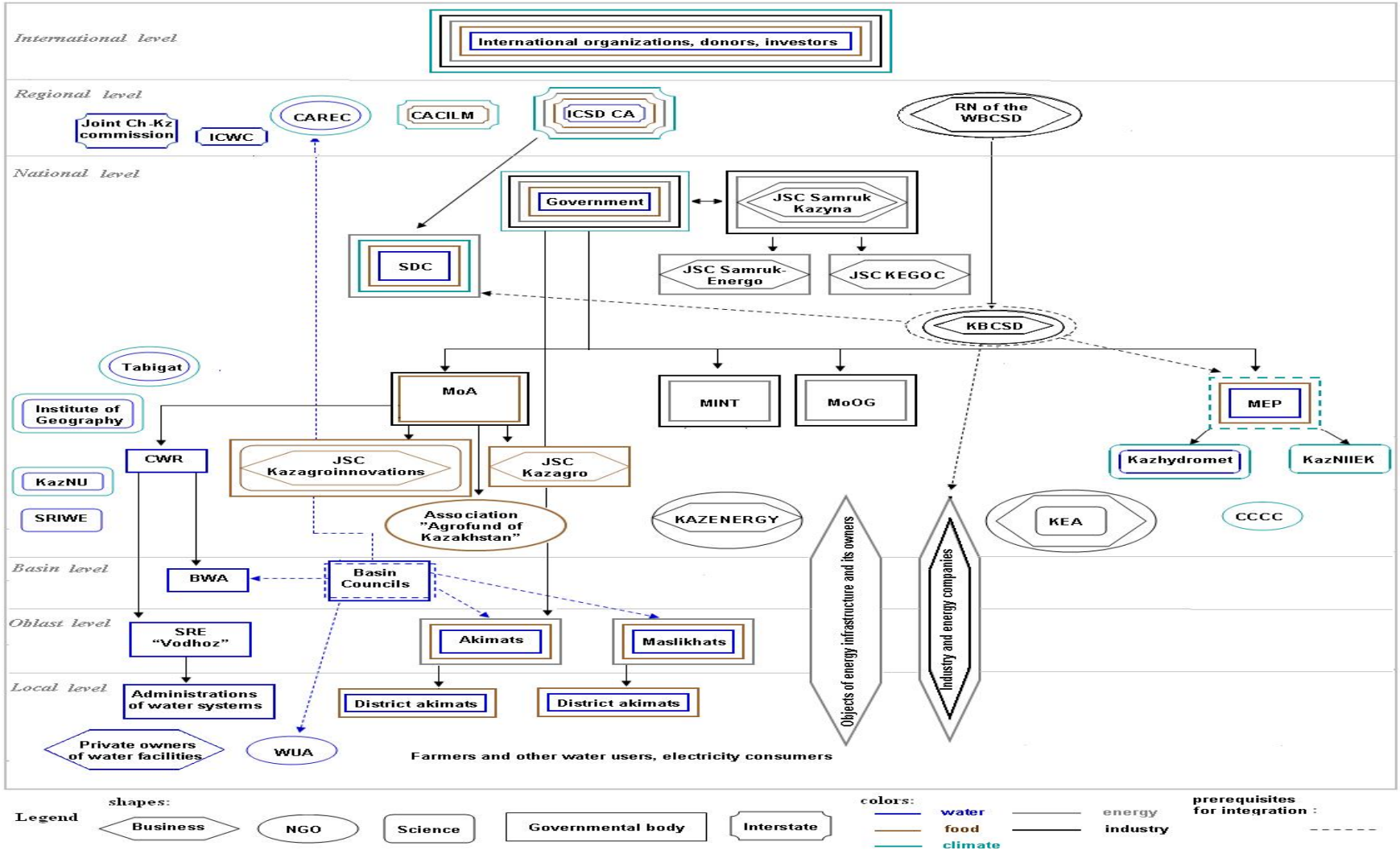

Figure 21. The main actors on different levels in the sphere of water, energy, climate and food

currently the main political focus is not on water. The low status of the CWR is visually obvious on the Figure 21. The implications of this will be discussed further in this chapter.

Recently changes also have been made in the energy institutional setting. In 2010 the Ministry of Energy and Mineral Resources was transformed into the Ministry of Oil and Gas and the Ministry of Industry and Trade became the Ministry of Industry and New Technologies by the decree of the President. The MINT got the energy functions of the Ministry of Energy and Mineral Resources such as electric power, nuclear industry, mining as well as the industrial direction. The MoOG has two main departments of the development of the oil industry and of the gas industry. The structure of these two ministries clearly reflects political priorities of the country in the energy sphere, identified previously. For example, the priority of oil and gas extraction and exports is being addressed by the two departments of the development of the oil industry and of the gas industry. The MINT's department of electric power and coal industry is facilitating the increase of coal production for domestic electricity supply as well as addresses the development of such energy priorities as atomic industry, energy efficiency and renewable energy. Its departments of atomic industry and of new technologies and energy saving, the committee of nuclear power and administration of development of the use of RES within the department of electric power and coal industry seem to be specifically created to address these issues.

The Ministry of Environmental Protection, the main executive body in charge of implementation of governmental environmental policies, including underlying sustainable development policy, to some extent addresses the water, climate and food challenges. The implementation of the environmental and sustainable development policies is the responsibility of one of its departments, the department of environmental policy and sustainable development. Another department of international environmental agreements and conventions deals with ensuring that Kazakhstan is fulfilling taken obligations, including those connected to water, food and climate. It must be noted that previously the Ministry of natural resources and environmental protection of Kazakhstan included the committee of water resources as well as the committee of forestry, fishing and hunting and the committee of mining and protection of mineral resources. However, in 2002 it was transformed into the Ministry of environmental protection and its functions of environmental protection were distributed between different ministries. In particular, that is how the responsibility for water, forest and fish resources was transferred in the competence of the MoA, with regard to the protection of water resources, forests and natural resources and their use was given to a number of specialized committees of the Ministry of Agriculture. Since then the MEP was given mainly the controlling functions, which are now

performed by the 8 departments of ecology, based on the territorial or basin principle. Currently the main focus of the Ministry seems to lie on climate change mitigation, the priority identified as common for "environment-driven" and "economy-driven" national policies. The Department of Kyoto Protocol was created in the Ministry in 2009 to address the concrete tasks to facilitate Kazakhstan's introduction into the Annex B of the Kyoto Protocol, to introduce and coordinate the emissions trading system within Kazakhstan, to develop the idea of low-carbon development of economy and to facilitate the fulfillment of international obligations taken by Kazakhstan on emission reduction.

4.2.2 Specifics of the levels where water, energy, climate and food are addressed

The main actors represent different levels from international to local. International organizations, donors and investors are shaping the response to the WECF nexus in accordance to their priorities in water, energy, climate, food and industry. However, priorities, focus, facilitating and financing capacity and compliance of the priorities with the national priorities differ within the actors on the international level. There are a number of international players in Kazakhstan, the country of possibly the largest interest of the international community in Central Asia. However, the main international actors appear to be UNDP, UNECE, World Bank, ADB, TACIS, GEF/UNEP, GTZ, large energy and industry investors. In addition, as it was mentioned previously, Central Asia in general and Kazakhstan in particular present a geopolitical playground with the world's geopolitical players struggling over power and over resources under the conditions of the growing scarcity of resources and intensifying interconnections within the global WECF nexus.

The interstate institutions on the regional level reflect the institutional response to the regional challenges and to the obligations taken on the international level. The Interstate Commission for Sustainable Development in Central Asia (ICSD CA) presents the Central Asian Initiative on preparation and implementation "Sub-regional Agenda 21". It was created to perform coordinating and management functions for regional cooperation in the sphere of environment and sustainable development and to address the regional socio-economic problems through promotion of effective cooperation between governments and sectors. The Regional Environmental Centre for Central Asia (CAREC), non-commercial and non-partisan organization founded by the Central Asian States with the help of UNDP and European Commission to promote multi-sectoral cooperation from local to the national and regional levels, is responsible for providing expert and technical support and ensuring stakeholder involvement

according to the Aarhus Convention for the ICSD CA in its initiative. Despite the fact that ICSD CA and CAREC address different aspects, their main focus is on water probably due to the water conflicts in the region, discussed earlier. The Joint Kazakhstan-China Commission is also addressing water challenges and was created to ensure expert assistance for transboundary water cooperation. Central Asian Countries Initiative for Land Management (CACILM), launched by the states and international donor community, reflects the concerns on growing land degradation and desertification due to poor land management and climate change and the following social and economic consequences on the local, national and regional levels.

Regarding the energy component, the regional energy players were hard to identify. This might be explained by prioritizing the policy of energy self-sufficiency by the Central Asian states despite internationally promoted need of energy cooperation. However, the industry business community is active and presented by the Regional Network of the World Business Council for Sustainable Development (RN of the WBCSD). The WBCSD presents a global association of more than 200 mainly industry companies dealing with business and sustainable development. In addition, it must be noted that at the 6-th Ministerial Conference on Environment and Development in Asia and Pacific the first Central Asian Leadership Programme on Environment for Sustainable Development was launched for emerging Central Asian leaders representing government, private sector and civil society. As it was presented the focus of the Programme is on human, environment and sustainable development dimensions (Figure 22). However, the special emphasis is made on climate change, energy efficiency and sustainable energy, again these priorities satisfying interests of both economy and environment.

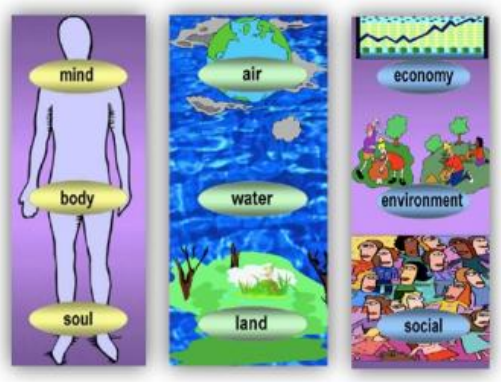

Figure 22. Focus of the Central Asian Leadership Programme

Source: website of the AIT-UNEP Regional Resource Center for Asia and the Pacific

In order to ensure institutional basis for these regional initiatives on sustainable development on the national level the Sustainable Development Council was created in Kazakhstan, which largely consists of the governmental representatives.

In addition to the international, regional and national levels there are also basin, oblast and local levels within the country, where the components of the nexus are addressed. However, the basin level is a characteristic of the response only to the water issues. The main actors on the oblast level are oblast akimats and maslikhats. Akimats are the executive bodies within each of 14 oblasts of Kazakhstan, representing the governmental will, realizing the governmental policies and administering executive structures within an administrative unit of oblast from the local budgets. Maslikhats are representative bodies, elected by inhabitants of oblasts and representing the will of the citizens. The same principle of maslikhats and akimats is introduced on the local level.

4.2.3 Specifics of the institutional setting in each sphere and prerequisites for integration

The main feature of the institutional setting in the sphere of water is that most of the main actors compared to other spheres generally are the representatives of the water management units on different levels (Figure 23).

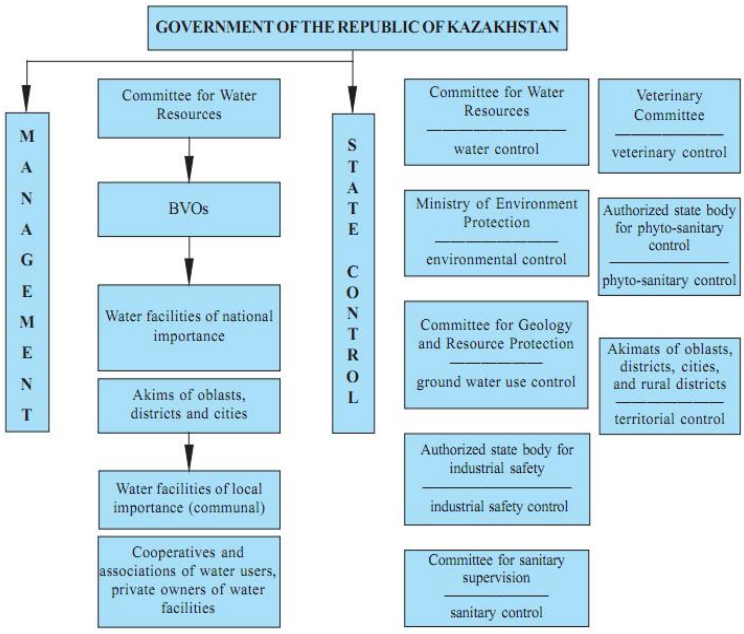

Figure 23. National water resources management

Source: UNDP 2004

The CWR of the MoA is the main body dealing with water management issues and is responsible for the development of policies and plans concerning the national water resources. The peculiarity of the water management coordinated by the CWR is that it is based on both basin and administrative principles. For this reason water is the only component of the nexus represented on the basin level. There are 8 Basin Water Management Units (BVOs), created for each of the eight basins, which are coordinated by the basin water authorities.

In addition, there are 14 SRE, managing water resources according to the administrative principle on the oblast level. Administrations of water systems on the local level are subordinate organizations of the SRE, which activities are carried on the self-supporting basis. Therefore, the relationships between administrations of water systems with private owners of water facilities such as provision of water for irrigation, diversion of drainage water and water development facilities are based on contracts. As it was discussed in Chapter 2 private owners of water facilities appeared after the collapse of the Soviet Union and replaced the Soviet centralized water management system. WUAs on the local level were deliberatively institutionalized by international donors in order to ensure water users participation into water management decision-making on the local level (Kangur 2008). However, according to Wegerich (2008) this institutionalisation is not accountable with local reality. The problems of compliance of internationally and nationally suggested policy and institutional frameworks and national priorities with the local realities and needs are revealed in the following chapter on the case study of the IBB.

Returning back to the specifics of the institutional settings, the institutional setting in the sphere of *food* is characterized by the presence of large business-involving actors on the national level in addition to akimats and maslikats on the oblast and local levels. JSC "Kazagro" and JSC "Kazagroinnovations" officially are subordinate organizations of the MoA. Although this fact does not necessarily mean that the Ministry has a bigger financial and human potential. JSC "KazAgro" National management holding", a comprehensive system of management of companies in the agricultural field, was created by the President decree in 2006 in order to develop the agro-industrial complex through industrialization and diversification, to ensure food security and to increase export potential. In addition, JSC "Kazagroinnovations", involving 25 research organizations of the MoA[5], was established by the Government in 2007 to facilitate a

[5] Interestingly, in 2002 all education institutions in the agricultural area were transformed from the Ministry of Education and Science to the competency of the Ministry of Agriculture

technological breakthrough in the agricultural sector through effective management of research institutions and innovative processes. All these institutional changes in the agricultural sector clearly reflect the identified national priorities in the food sphere and correspond with the framework of industrial-innovative industrialization.

As the agricultural sector, the *energy* sector is also dominated by large actors, presenting comprehensive management systems of companies. However, these actors are officially even higher of the competency of the ministries and closely interconnected with the Government, in particular with the Ministry of Finance, and other institutions recently created to serve as foundations of industrialization. The members of the Government appear to be in the board of directors of all energy holdings. JSC "Samruk-Energo" and JSC "KEGOC" are subdivisions of the JSC "National Welfare Fund Samruk Kazyna", the main institution for industrialization. Samruk Kazyna also includes National Fund, providing stability of the economy, and such development institutions, accompanying the process of diversification, as Development Bank of Kazakhstan and National Innovation Fund. In addition, it was also found out this year during the visit of the Kazakhstan's President to China, Kazakhstan and China decided to create the joint Investment Fund of 1 billion dollars. This fact again underlines the increasing role of China in the region discussed in Chapter 2. Regarding the main energy actors, JSC "Samruk-Energo" was created in 2007 in order to develop and implement the long-term state policy on modernization of existing and introduction of new generating capacities. It currently includes 16 energy companies. JSC "KEGOC" is the System Operator of the Unified Power System of the Republic of Kazakhstan since 1997. In 2006 state-owned shares of «KEGOC» have been passed to the paying up of placed shares of JSC "Kazakhstan Holding Company on state assets management "Samruk[6]". The latter was merged with the JSC "Sustainable development Fund "Kazyna[7]" into "Samruk Kazyna". As you can see such close and centralized incorporation of energy actors is a specific feature of the institutional framework for energy in Kazakhstan.

Another characteristic of the energy sector in Kazakhstan is its high intertwining with industry and business. Samruk Kazyna, the main institution for industrialization on the national level, includes about 500 subsidiaries and associated companies. JSC "Samruk-Energo" and JSC "KEGOC" also present semi-business structures. The MINT and the MoOG coordinate both energy and industry sectors. In general, industry and energy companies and owners of energy

[6] Samruk is a legendary phoenix-like bird of revival in Kazakh

[7] Kazyna means "capital", "wealth" from kazakh

infrastructure were referred as influential players in the energy sector by the interviewees. The importance of industry and energy business players will be revealed in this chapter in the next section.

Unlike other components, In Kazakhstan *climate* is mainly addressed only in the national level institutions. The institutional setting in the climate area can be characterized as a small group presented by the MEP, including its units RSE Kazakh Research Institute of Ecology and Climate (KazNIIEK) and RSE National Hydrometeorological Service (Kazhydromet), and the Climate Change Coordination Centre (CCCC). The RSEs are responsible for preparation of national communications on climate change and CCCC is mainly focused on coordination and implementation of the provisions of the Kyoto Protocol by promotion of climate change mitigation in civil society and provision of expert assessment.

Regarding prerequisites for integration in the overall institutional setting for water, energy, climate and food, some institutions can be identified as elements promoting integration. They are the MEP, basin councils and Kazakhstan Business Council for Sustainable Development (KBCSD). As it was previously discussed, the MEP is currently the only executive body responsible for cross-sectoral coordination for the implementation of the governmental environmental policies. However, as some functions of nature protection were transferred from the competency of the MEP, already low ministerial capacity to implement these policies became insignificant. Currently the focus of the Ministry seems to be directed by the governmental policy mostly on climate change mitigation, which is addressed in the Department of Kyoto Protocol. As fulfillment of international obligations to reduce GHG emissions is one of the priorities, the integration under climate change mitigation may to some extent be improved. In the field of water, the establishment of the basin councils presents an important step for promoting IWRM in Kazakhstan, facilitated by international agencies. The aim of these institutions representing the 8 basins of Kazakhstan is to ensure involvement and active participation of water user groups and stakeholders in water management at the basin level, to realize effective control over the management of water distribution, water quality and conservation of natural systems. However, according to some interviewees, the activity of these institutions is limited and they are facing serious obstacles, which will be presented further in this chapter. The KBCSD can be identified as an institution, which is connecting business to sustainable development and eco-efficiency. Although it consists of industrial companies it can be considered influential in the energy sphere, as energy and industry are institutionally interconnected. Being a member of Sustainable Development Council (SDC), Public Council within the MEP, and presenting various working

groups in the Parliament KBCSD is trying to connect their effort to promote eco-efficiency. However, KBCSD is mainly presented only by large industrial companies and two private environmental consultancies.

4.2.4 Business, NGOs and science groups are in the spheres of water, energy, climate and food

As it was indicated business is mainly present in the spheres of energy and food. Agricultural and energy holdings provide continuous participation of business. It must be noted that even NGOs in the energy sector such as "Kazenergy" and "Kazakhstan Electric Association" (KEA) in fact present all energy and industrial companies. Moreover, they are chaired by the directors of the "KEGOC" and "Samruk-Energo" and have members from the Government and the Parliament. This again shows the specifics of the institutional setting in the energy sphere in Kazakhstan.

In the water and climate areas there is no such active participation of business. In fact, there is no obvious business involvement in the area of climate. However, the role of business can increase as climate change mitigation efforts, the establishment of the emissions trading scheme in particular, will affect all energy and industrial companies. In the water sector private owners of water facilities play a crucial role on the local level. On the national level water is out of interest of business, but a main focus of several science institutions such as Institute of Geography, Scientific Research Institute of Water Economy (SRIWE) and Al-Farabi Kazakh National University (KazNU), the department of hydrology in particular, which underline the urgent water problems and the need of their solution on the very high level. In addition, non-governmental organizations such as CAREC and Tabigat put water and climate on the top of their agendas and CCCC directly addresses climate change mitigation.

Regarding science institutions focused on energy and food, they are highly incorporated into the institutional setting on the national level. All agricultural science institutions are within the agricultural holding "Kazagro". All energy institutions are active members of KEA, which seems to be an important consultative institution promoting its ideas and suggestions to the highest level through its members. This high involvement of research and science institutions reflects the idea of diversification through innovations, promoted in the policy of industrial-innovative development of Kazakhstan.

4.2.5 The main actors which influence the response to the nexus and actors that can be affected by the inadequate institutional response

International donors and industrial business community appeared previously several times as actors who play an important role in the institutional setting for water, energy, climate and food. International donors facilitated the creation of interstate institutions addressing water, climate and food challenges and sustainable development on the regional level and basin councils to promote participation on the local level. Meanwhile, industrial business community is highly involved on the national level and presented in the national energy institutions. Moreover, there is a link to the regional and international business community facilitated through the KBCSD. Although water and energy areas appear to be the main areas of activity of these actors recently food and climate are also being added to their agenda. Therefore, they are playing an important role in all areas and, by doing this, influencing the response to the nexus.

Meanwhile, farmers and other water users who are also electricity users are those who can be affected by the inadequate institutional and political response to the nexus. They are highly decentralized on the local level and, therefore, very vulnerable to the challenges, identified in the Chapter 2. Although maslikhats are set to express the will of citizens the top-down approach seems to prevail. This will be supported by the opinions of some of the interviewees afterwards. WUA and basin councils seem to be the only institutions which aim to involve public into the process of decision-making.

4.3 Interview themes connected with the problems of political and institutional settings

The representatives of some institutions, discussed earlier, underlined the problems of the political and institutional setting and gave their reflections on the current political priorities in the interviews. The table with interviewees can be found in Appendix 2. It must be noted that despite the fact that identification of priorities and the analysis of the political setting took place after the collection of the interviews and no specific questions were asked concerning governmental priorities, the themes on the political and institutional settings and reflections on the priorities were revealed during the interviews concerning the problems in the Ili-Balkhash basin. For the analysis of themes relating to the political and institutional problems thematic network was constructed (Figure 24), showing the basic themes, identified in the interviews, and organizing themes, presenting the groups of the basic themes. The following discussion is based on the same principle. The themes are presented in italics.

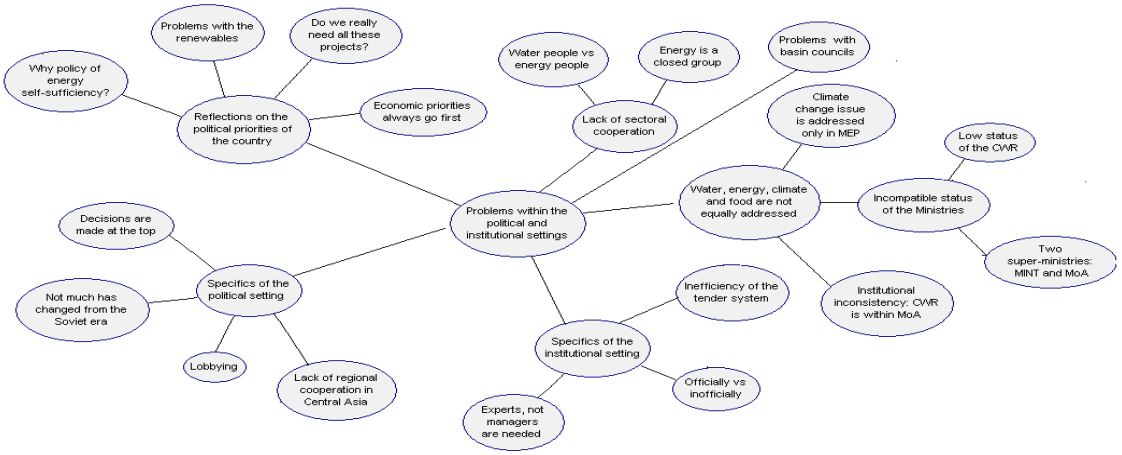

Figure 24. The network of themes connected to the problems of political and institutional settings

4.3.1 Reflections on the political priorities of the country

It must be noted that reflections on the political priorities differ among interviewees. It can be connected with the fact that they represent different groups and spheres. Generally, representatives from the energy and agriculture spheres, especially representatives from the ministries, were more positive about the current policies of forced industrial-innovative development, underlying the need to increase GDP, to ensure stability of the country by provision of food and energy security. The representative of MINT focused on the importance of planning for ensuring reliable energy supply and supported the short-term and long-term political goals. All other interviewees also acknowledged the need of economic development.

However, some themes were identified that show disagreement with the economic priorities and present problems of their realization. According to ID 8, *economic priorities always go first,* despite the fact that a number of water problems are still unresolved. The interviewee also asked the question "*Do we really need all these projects?"* referring to the number of projects on the map of industrialization being realized according to the programme of forced industrial-innovative development. The feasibility of the industrialization was questioned, as "we have China as a neighbor, which will suppress any industry" (ID 8 pers.comm.). ID 2 posed another question *"Why do we need the policy of energy self-sufficiency?"* explaining that the country should not be obsessed by the issue of energy self-sufficiency in energy, but provide better water and energy cooperation with the Central Asian neighbours (ID 2 pers.comm.).

The interviewees reflected differently to the development of renewables for climate change mitigation, the developing priority discussed previously. Most of them acknowledged the need to

introduce renewable energy and suggested it as a solution to energy problems in the southern regions. However, the ID 4 underlined that there are a lot of *problems with the renewables,* which even cannot provide some solution to the energy challenges of the country. The official of MINT stressed the word "naïve" several times addressing the suggestion of the development of renewable energy in Kazakhstan, underlining that renewables do not solve problems of large scale energy and that questions of energy storage, transfer and regulation as well as a question of high tariffs are unresolved (ID 4 pers.comm.). The representative of CAREC underlined that on the local level climate change mitigation is less important compared to water problems and the need of adaptation to climate change (ID 10 pers.comm.).

4.3.2 Specifics of the political setting

Some themes can be organized into the theme of general characteristics of the political setting. The theme *Decisions are made at the top* was raised by ID 8, ID 9, ID 10. Both representatives of the NGOs stressed that all decisions are made on the high level and even if all NGOs are against, they will not affect the results anyway. However, this opinion was argued by ID 4, underlining that the objectives set by the Government are based on the needs of people and every person can influence state policies. To this theme, ID 10 added the theme *Not much has changed from the Soviet era* referring to the political and economic priorities of the country and underlined that "we are still constructing huge thermo power plants on coal" (ID 10 pers.comm.). ID 7 also underlined that "we still follow a top-down approach" (ID 7).

Another theme is the issue of *lobbying* introduced by ID 8 with the reference to the numerous planned projects. According to the interviewee, there is definitely a process of strong lobbying in the energy and industry sector and "these lobby groups tell that we just need to build", as "large projects mean a lot of money and enormous investment" (ID 8 pers.comm.). According to ID 1, ID 9 and ID 10, there is strong lobbying in the energy sector, which presents a playground for the Government and business with strong lobby capacities. ID 8 concluded that the lobbyists are usually business companies, investors, operators of the projects and akims[8]. It was underlined that introduction of large energy capacities is beneficial for akims as they can get a lot of money and provide jobs. In addition, according to ID 8, lobbying takes place in the agricultural areas where interests of akims to increase agricultural areas for irrigation are lobbied.

[8] Heads of akimats, executive bodies on the oblast and local levels

Lack of regional cooperation was addressed several times especially by representatives from the area of water as a specific political problem. Official from the UNDP Project "Transboundary dialogue and cooperation in the Ili-Balkhash Basin" underlined the importance of a wise interstate water policy to address transboundary issues and the need to put water as a top priority for the country (ID 2 pers.comm.). According to ID 7, ID 8 the regional conflict over water is still unresolved.

4.3.3 Specifics of the institutional setting

According to some interviewees the problems of the institutional setting are connected with its current specifics. The theme *Experts, not managers are needed* appeared in the interviews. According to ID 3, for administrative-command system, or "for manual control" concrete specialists, experts are needed at power, not managers. ID 11 and ID 4 underlined lack of energy specialists, as well as ID 7 and ID 2 addressed the problem of lack of water experts. According to the official from the MoA, there are almost no agricultural specialists in "Kazagro", but it is full of managers and financiers (ID 12 pers.comm.).

Inefficiency of the tender system in Kazakhstan was referred as a common feature within the institutional setting by ID 8. This inefficiency was named as a limitation of the successful industrialization. According to ID 8, despite the fact that money is spent, the effectiveness is very low due to drawbacks of the tender system and inefficiency of ministerial and governmental officials. The long time gap between the tender announcement and realization of this money people launch projects in a hurry and results are often unsatisfactory.

Another theme identified in the interviews is *Officially vs inofficially,* which referred to the construction of new projects, including the BTPP and the MHPP. According to the representative from CAREC, all projects have to be presented on public hearings and be subjects of the environmental impact assessment, but all these public hearings are just an excuse and projects will be realized in any case (ID 10 pers.comm.). ID 8 underlined that even everything is done within the law officially, but there is always a question if all given recommendations are taken into account during the construction process and a question of the final result.

4.3.4 Problems of sectoral cooperation

The opinions about sectoral cooperation differed among the interviewees. Although the officials from MoA, MINT and CWR stated that there is active cooperation between different sectors, number of interviewees raised the problem of the lack of cooperation across sectors. According

to the official from the MEP, the interaction is minimal and each structure has its own corporate interests (ID 3 pers.comm.). ID 7 underlined that there is no interaction providing that all problems are taken into account. According to the official from the UNDP project "Climate risk management in Kazakhstan", which has the improvement of cooperation and integration of climate risk management into the decision-making process as one of the components, there is almost no cooperation between the MEP, MoA, Ministry for Emergency Situations and local governments (ID 1 pers.comm.). According to ID 8, the horizontal relations between the structures presenting water, energy, climate and food have "if you give me, I will give you" character.

Several interviewees differentiated water people and energy people. The theme *Water people vs energy people* was identified mainly in terms of the difference in the political power of water and energy people. According ID 9, energy people, power engineers are always more powerful because they have money and the current priority of the country is mainly on energy issues.

The theme *Energy is a closed group* was introduced by ID 1. According to the interviewee, the energy world in Kazakhstan is very exclusive. It is "a massive structure which is hard to change and influence". In addition, no legible algorithm and methodology exist, which can monitor and influence energy policies.

4.3.5 Water, energy, climate and food are not equally addressed in the institutional setting

This theme is an organizational theme for several themes concerning institutional position of water, energy, climate and food. According to ID 8, currently there are *two super-ministries of Industry and New Technologies and Agriculture,* which realize the national energy and food strategic policies. Meanwhile, the *status of the CWR is low* according to ID 8, ID 2, ID 10 and ID 7. According to ID 2, due to its low position of the part of the MoA the CWR cannot connect with other ministries and authorities and it can only act through the MoA. As a result, even the CWR is the authority responsible for the conservation and management of water resources, its influence is inconsiderable as the Committee is not a member of the Government compared to the ministers. The Committee cannot make its suggestions by itself, only through the Ministry. It was underlined that often ministers of agriculture do not want to risk and raise the water problems on the governmental level. In addition, "if the minister is a veterinarian, he or she may not even understand the importance of the suggestion" (ID 2 pers.comm.).

According to ID 10, the suggestion to increase the status of the CWR and to create a separate agency has been discussed on every water conference or meeting by all water experts in all

projects for the last 5 years. It was noted that the number of people in the body responsible for the management of all water resources of the country is only about 35 (ID 8 pers.comm.). The representative from the UNDP Project "Transboundary dialogue and cooperation in the Ili-Balkhash Basin" underlined that the action to increase the potential and status of the central body for water resources was one of the aims of the *National plan of IWRM and water efficiency* (ID 2 pers.comm.). However, despite the fact that important steps towards the introduction of IWRM in Kazakhstan were made from 2002 to 2011, the plan has not received proper attention and the status of the Committee has not been changed yet (ID 2 pers.comm.). The interviewee noted that this fact leave international obligations of Kazakhstan on the water issues not fulfilled and many questions of the operation of the water sector, protection and restoration of water resources unresolved. ID 10 also noted that the low status of the body creates a problem in the negotiation process with China as it is lower that the Ministry of Water Resources in China. That can be considered a serious institutional obstacle for effective transboundary cooperation.

In addition, ID 8 and ID 1 underlined that the position of water within the ministry responsible for agriculture, the main water consumer in Kazakhstan presents institutional inconsistency. According to ID 1, water resources should be presented in a separate ministry, as there are intersectoral interests in water resources. ID 8 criticized the fact that water policy is in the competency of the MoA, which is highly influenced by akims lobbying for increases of agricultural areas for irrigation.

At the same time, according to ID 1, a broad issue of *climate change is addressed only in MEP,* which has a low potential to facilitate a cross-sectoral cooperation. It was underlined that MEP mainly gives only recommendations and its unit Kazhydromet just provide meteorological and hydrological data (ID 10 pers.comm.). ID 10 also noted that the Ministry is currently "obsessed with quotas", meanwhile water and agriculture adaptation measures are not integrated into the institutional and political settings.

4.3.6 Problems with Basin Councils

As it was discussed previously, the establishment of basin councils financed by the state is the main achievement in the implementation of IWRM in Kazakhstan. However, according to ID 8 and ID 10, these institutions promoting integrated policy to deal with water problems in the basins, are facing a lot of difficulties. According to ID 8, the main reason is conflicts of interest between the institutions on the oblast level and the institutions on the basin level. ID 2 underlined that this conflict takes place within the CWR itself as the differentiation of functions

between administrative and basin units RSE and BWA respectively is not distinct. According to ID 8, attitude of akims towards Basin Councils is negative, as they are against any other regional management except management within administrative units.

In addition, the power of basin councils is limited. According to the Water Code, Basin Councils function as a consultative body, not as a legal entity (ID 2 pers.comm.). Therefore, the influence of Basin Councils is weak as they only give recommendations and have no official power (ID 8)

There also problems within the Basin Councils themselves. According to ID 2, basin plans have not been approved in any of the Basin Councils. It was noted that the suggested plans have the problem of corresponding with the national plans on resource use, which can be an obstacle for implementation. In addition, there is no control of the implementation of its decisions. The interviewee suggests that Basin Councils have to choose only one of three functions of planning, implementation and monitoring, otherwise there always will be a conflict of interests.

However, even though the power of Basin Councils is limited, there are some positive implications. According to ID 8, some people from different sectors saw each other for the first time on the meetings of Basin Councils and hear each others concerns and needs. However, it was noted that first time large water users in basins participated in the meetings mainly for certain lobbying of their interests. Although all energy projects are discussed at the meetings of Basin Councils and people of the MINT are also members of Basin Councils, the influence of Basin Councils on the final decision is weak (ID 8 pers.comm.).

4.4 Summary

Despite the fact that the national policy documents to some extent address the WECF challenges and indicate the response to these challenges as national priorities, in fact, currently only the direction of the economic priorities in the area of energy and food, energy and food exports in particular, is developing. Thus, components of the WECF are not equally addressed in the political setting with water and climate being overlooked. This is also connected to the lack of implementation of the national concept of sustainable development and the new policies addressing water and climate. Only policy direction of climate change mitigation is developing among the policy areas needed to address the WECF nexus. The WECF institutional setting reflects the predominance of economic priorities in energy and food. The position of water, the centre of the nexus, is the lowest in both political and institutional frameworks. Due to the lack of cooperation the interconnections of the WECF nexus are also overlooked.

5. Case study of the Ili-Balkhash basin: exploration of the water, energy, climate and food related problems and identification of their causes

This chapter is a continuation of the interview analysis with a special focus on the local level. It presents problems related to water, energy, climate and food in the Ili-Balkhash basin and their causes. It must be noted that climate change was not identified as a separate problem, but as the factor influencing water and agricultural problems of the basin. Here the problems and causes, which context was indicated in the introduction of the case study in the chapter 3, are explored on the basis of the opinions of the interviewees. The identification of the local problems and understanding of the causes is crucial for provision of the national address to the challenges. It is important that the interconnections between the local problems and the causes on the national level as well as the impacts of the local problems and the challenges on the national level are shown. For this reason, this chapter also includes the representation of the causal-chain analysis connecting the problems of the basin with their root causes, identified during the interview analysis and throughout the previous chapters. In addition, the attitudes of the representatives of various institutions towards the new energy projects BTPP and MHPP and unresolved problems with the old KHPP are given.

5.1 Identification of the water, energy, food problems in the IBB and the causes and factors affecting them

5.1.1 Water problems in the basin

The interviewees identified many water problems in the basin. However, all of them can be organized into three main categories such as degradation of water quality, instability and possible reduction of the flow and change of the hydrological regime of the Ili river, the main river of the basin. The following subsections present the thematic discussion on internal and external causes of these water problems. In addition to external Chinese factor, climate change was also identified as a factor of future water problems and, thus, presented in the section.

5.1.1.1 Internal causes or "we add to the problems ourselves"

The theme "We add to the problems ourselves" appeared throughout the data in such comments as "we have to restrict ourselves first and then address to other countries" (ID 8 pers.comm.), "we also add to the problem" (ID 6 pers.comm.), and "we have to learn how to regulate our water resources first" (ID 10 pers.comm) etc. The internal reasons of water problems of the IBB

were seen as both general causes of water problems on the national level and some causes specific to the IBB. Intersectoral conflicts, especially between energy and agriculture, irrational water use for agriculture and municipal utilities and interdepartmental disunity were referred as reasons of water problems not only for the IBB, but for Kazakhstan in general.

According to the Official from the Department of Hydrology at the Al-Farabi Kazakh National University, "the difference of interests of the energy sector and the irrigation sector is obvious not only in the IBB" (ID 7 pers.comm.). *Intersectoral conflicts, mainly conflicts between energy sector and irrigation*, were called the main reason of water problems in both the Aral-Syr Darya basin and the IBB (ID 6 pers.comm.) The hydropower was given as a bright example. As maximum of electricity consumption is during winter, an energy sector is interested in using water resources in winter and in collecting these resources during summer. It does not satisfy irrigation because they need water during hot season. It was noted by ID 6 that the intersectoral conflict in the Aral-Syr Darya basin transformed even into interstate conflict within Central Asian states as the countries are interested in different regimes of water use. In addition, according to ID 2, the conflict in the IBB is not only between the water use for energy and the needs of other sectors but also the needs of the ecological system itself.

Irrational water use, especially for agriculture and municipal utilities due to generally high water consumption in Kazakhstan, water losses and inefficient irrigation technologiewas was also highlighted by ID 2, ID 3, ID and ID 8. It was underlined that "we consume three times more water than in developed countries and at the same time the effectiveness of water use is very low." (ID 2 pers.comm.). According to the official from the Institute of Geography "we are still using primitive inefficient technologies in the water sector" (ID 6 pers.comm.). The reason of a low level of efficiency of irrigation systems, which results in large water losses, was listed as a first reason of the water problems in the IBB by ID 8. The Official from the Ministry of Environmental Protection argues that even given the situation that the IBB gets only the runoff on the Kazakhstan side and there is significant water intake in China, this water could be enough for current needs in water resources under the conditions of the rational water use in agriculture and municipal utilities (ID 3 pers.comm.).

Another identified cause of *interdepartmental disunity* was already introduced during the institutional analysis as a general institutional problem and here it appears again as a cause of water problems in the IBB. According to ID 7 and ID 3, this disunity is not only between different sectors such

as water and energy sectors, but also within water sector itself. Such comments as "different departments have different interests" (ID 7 pers.comm.) and "each structure has its own "corporate" interests" (ID 3 pers.comm.) underlined the interdepartmental disunity in terms of difference of interests. It was also noted that there are no legible interaction mechanisms created for different departments (ID 1 pers.comm.).

Change of the hydrological regime of the Ili River due to the construction of the KHPP, instability of water inflows into the Ili River, water pollution by the copper-smelting plant "Balkhashtsvetmet" and increasing population load in the region, especially in Almaty megalopolis, were addressed by the interviewees as internal reasons of water problems, which are specific for the IBB. *Change of the hydrological regime of the Ili River* was referred as a consequence of the construction of the KHPP several times. As the Official from UNDP Project "Transboundary Dialogue and Cooperation in the Ili-Balkhash Basin" explained, the change of the hydrological regime of the Ili River was provoked not by the KHPP itself but by the Kapshagay water reservoir (ID 2 pers.comm.). In general functioning of hydropower plants implies construction of water reservoirs, collecting water in summer and using it in winter. Big water reservoirs of hydropower plants artificially soften spring and summer peaks of flooding. This leads to a change of a hydrological regime of a river, as nature prefers a natural sequence of hydrological events. As a result, degradation of the Ili delta took place (ID 2 pers.comm.). It was mentioned that there was a technological mistake in the construction design of the KHPP and its reservoir (ID 7 pers.comm.). According to the Official from the Department of Hydrology, the KHPP is a rare example in the history of engineering, when the volume of the reservoir was projected to exceed the runoff of the river twice (ID 7 pers.comm.). Later the level of the Ili declined significantly and then it was decided that the KHPP cannot be fully operated.

The Official from the Institute of Geography underlined that the case with the KHPP is a typical example of the *intersectoral conflicts* (ID 6 pers.comm.). The huge Kapshagay reservoir was built to create pressure and to produce more electricity when the interests of the energy sector were at the first place. Then the concept changed and the level of filling of the reservoir was decreased as the volume of the reservoir was too large. However, according to ID 6, the main problem of changing its regime still exists. The hydropower still works and there is still a conflict between it and the lower reaches of the river.

Other specific internal reasons appeared throughout interviews were *instability of water inflows into the Ili River, water pollution by "Balkhashtsvetmet", increasing population load in the region, in Almaty in particular*, and *pollution by waste waters*. According to ID 8, many of 20 inflows to the Ili River are unstable and in some cases small amount of water reaches the river. ID 8 and ID 10 named the copper smelting plant "Balkhashtsvetmet" as a main polluter in the basin. They explained that its emissions and dumping have a serious negative impact on the Lake Balkhash and water area around. In addition, there is the factor of population load in the region. The IBB is the region where the third of the population lives and the growing megalopolis of Almaty with 1.5-2 million people is situated (ID 7 pers.comm.). According to ID 7, situation of Almaty in the basin negatively affects the IBB, as it creates problems of water supply and management of waste water in Sorbulak, the biggest lake – sediment of waste water. It was noted that municipal and industrial waste waters are returned untreated into the Ili River.

5.1.1.2 External causes of the water problems: Chinese factor

Chinese transboundary aspect, integrating concerns about *water intake and pollution on the Chinese side, population migration in China and difficulties connected with the negotiation process*, was mentioned by most of the interviewees and in some cases several times. It was noted that in average 12 out of 17.5 cubic km of the runoff reach the territory of Kazakhstan, which currently is enough for Kazakhstan's needs (ID 2 pers.comm.). However, as 80% of the runoff is formed on the Chinese side (ID 5 pers.comm.), this volume of water can decrease due to the increase of water intake in China as "everything what is done there in terms of water use and water intake has impact on the Kazakhstan's side" (ID 7 pers.comm.).

Concerns about current and projected intensive use of water resources on the Chinese side were elaborated. According to ID 10, "8 water reservoirs are being constructed and population is increasing due to the migration to the basin". Interestingly that exact figure of 100 million people projected to live on the Chinese side by 2030 was repeated by three respondents - ID 10, ID 2 and ID 6. According to some interviewees, such increase in population will lead to increase of the irrigation areas and water intake (ID 2 pers.comm.; ID 8 pers.comm.). As a result, there will be water deficit not only for water users but also for the Balkhash Lake itself (ID 8 pers.comm.). It was mentioned that there is the scenario which projects the division of the Lake into three parts under the conditions of the decrease of the inflow from the Chinese territory (ID 8 pers.comm.) and turning of the Balkhash Lake into a second Aral Sea (ID 10 pers.comm.).

However, according to ID 3, "water problems in this basin are more projected than existing" and most of these projections are connected with a possible decrease in water runoff from the territory of China. The comment that the current level of the Balkhash Lake is stable and there is enough water now was highlighted by ID 6 and ID 7. Moreover, according to ID 7, now the level of the Lake Balkhash is increasing and it is not acceptable to speculate now that the Balkhash is facing the fate of the Aral Sea at the moment. It must be noted here that views of the leader of the green NGO "Tabigat", who stated that the Balkhash is repeating the fate of the Aral Sea, were argued by ID 7 and ID 8. However, both of them underlined that there is a natural cycle of the Balkhash Lake, when its water level increases during wet years and decreases during dry years, and the coincidence of dry years with the increase of water intake in China can lead to catastrophic consequences. The Official of the NGO "Tabigat" in turn argues that now the water level is slightly rising only due to the melting of the glaciers and "we already have lost 40% of the glaciers' area"(ID 9 pers.comm.).

According to ID 6, "the current problems not about quantity but quality". There is a problem that "water from China is polluted and Chinese hide this information" (ID 6 pers.comm.). The absence of an adequate access to Chinese information takes place even given the fact that there are already some agreements on the information exchange. The official from the Committee of Water Resources within the Ministry of Agriculture admits that the negotiation process is hard (ID 5 pers.comm.). However, it was noted that by 2013-2014 agreements on water regulation are planned to be signed. Moreover, it was underlined that a joint commission is currently dealing with sharing water resources and dividing runoff and research, which will also include the ecological needs of the Balkhash Lake, is underway. However, according to the Official from the Institute of Geography, the negotiation process with China appears to be a large problem for the Government of Kazakhstan as "Chinese seem to have a strategy of procrastination of the negotiation" (ID 6 pers.comm.). Additional problem in the negotiation process is that the status of the Committee is lower that the Ministry of Water Resources in China (ID 10 pers.comm.).

5.1.1.3 Climate change as a factor of future water problems

Climate change was referred as a reason of possible water problems in the IBB by ID 1, ID 6 and ID 9. According to the Official from the Institute of Geography there are two main factors, which will influence the water situation in the IBB in the future: Chinese transboundary aspect and climate change (ID 6 pers.comm). The first was referred as more important, as "the whole country is at the lower reaches with 7 transboundary basins of our 8". It was underlined that the

climate projections vary, but the main conclusion is that "it will be even more water in wet places and more water deficit in dry places".

According to the Official from the UNDP project "Climate risk management in Kazakhstan", the Southern Kazakhstan, Almaty oblast in particular, was identified as the most vulnerable to climate risks by the preliminary expert assessment of the vulnerability of Kazakhstan's regions to climate risks within the UNDP project (ID 1 pers.comm.). It was suggested that extreme hydro meteorological events such as floods and temperature increase will exacerbate the existing water problem in the basin and elevate the risk of sills. All these events and changes in the water runoff will lead to inevitable socio-economic consequences. It was highlighted that despite climate change is not very important in the short term, as the melting of the glaciers will lead to the accumulation of water, the following 2-4% decrease in the surface runoff will affect the region significantly, as local population is highly dependant on irrigated agriculture, stock raising and melon-growing.

The Official from the green NGO "Tabigat" also underlined the increasing problem of climate change. It was argued that the water level is slightly rising currently only due to the melting of the glaciers. "We already have lost 40% of the glaciers' area and the remaining ice will melt even more rapidly" (ID 9 pers.comm.). This will threat the availability of drinking water in the future. It was added that about 70% of the territory of Kazakhstan is deserts and this process is being intensified, as previously it was 66%.

5.1.2 Agricultural problems in the basin

According to the official from the Ministry of Agriculture *soil degradation* and *salinization* are the main problems affecting agriculture in the basin (ID 12 pers.comm.). According to ID 7, since the collapse of the Soviet Union no maintenance works have been held and there is still high underinvestment into the irrigation systems. ID 10 underlined that the irrigation systems are worn by 60%. According to ID 2, this poor technical condition of the irrigation infrastructure does not provide proper drainage and, as a result, salinization of irrigated areas takes place. ID 7 added that deteriorated water system as well as irrigation system also leads to salinization. In addition, due to poor drainage water logging of irrigated lands takes place, which results in the deterioration of the quality of drinking water (ID 10 pers.comm.). Regarding soil degradation, according to ID 12, it is mainly connected with poor agricultural practices. Despite the existing problems, according to ID 7, the irrigated area is increasing since 2006. The reason of this increase seems to be connected with the current national agricultural policy.

In addition, it was noted that despite the fact that the construction of the reservoir for the KHPP promoted economic development and was beneficial for some people, local people making living on agriculture were severely affected. On the other hand, the recreational zone was created for Almaty, irrigation systems with the Large Almaty channel were developed and, thus, new jobs and food were provided (ID 8 pers.comm.). According to ID 6, the hydropower plant not only played essential role to address peak loads in the region but also promoted development. On the other hand, a great area of fertile agricultural lands was flooded and that directly affected the local agricultural sector (ID 8 pers.comm.; ID 9 pers.comm.). According to the official from the UNDP project "Climate risk management in Kazakhstan", which mainly focuses on climate risks for agriculture and people, the construction of the KHPP and the Kapshagay reservoir decreased the cost-effectiveness of agriculture in the region and, therefore, cut the income of the local population (ID 1 pers.comm.). In addition, the Kapshagay hydropower plant completely destroyed muskrat farming causing the economic loss of over 1 million of muskrat fir (ID 2 pers.comm.; ID 1 pers.comm.). As the migration routes were blocked by the dam, the crisis of fisheries took place (ID 2 pers.comm.). ID 1 also presented the results of the survey of their projects: "According to local people, they did not benefit from the construction". The representative from the project underlined that local people depending on irrigated agriculture are currently the most vulnerable group, which does not have a proper attention from the top.

The interviewee introduced climate change as a future serious problem for agriculture in the basin and underlined that climate change adaptation, in particular risk management, should be the priority of the country. In addition, it was noted by ID 1 that the monitoring capacity of Kazhydromet should be increased. The representative of the Hydrology Department at KazNU introduced a problem of obtaining information from Kazhydromet for the research of the regional water situation. It was noted that every piece of information from Kazhydromet costs money and, thus, constraints scientific institutions.

5.1.3 Energy related problems in the basin

All respondents acknowledged that there are energy problems in the region. However, they did not specify the IBB, but referred to administrative units such as Almaty, Almaty oblast or the Southern Kazakhstan[9] in general. Interestingly, that the Official from the Ministry of Industry

[9] Southern Kazakhstan is an economic and geographic region of Kazakhstan, including Almaty, Zhambyl, Sourthern Kazakhstan and Kyzylorda oblasts

and New technologies felt uncomfortable answering the question about energy problems in the IBB and asked to be more precise and ask questions concerning concrete administrative units (ID 4 pers.comm.). This fact shows that although it was mentioned in the previous chapter by ID 8, that representatives from the MINT are also members of the Basin Councils, it seems that these meetings are being attended not by people who have some power in the ministry, but by some low-rank officials. According to most of the interviewees the main energy problem in the region is *instability of electricity access*.

5.1.3.1 National level causes of the local energy problem

Regional electricity deficit was presented as a well-known fact and a problem, which needs to be solved anyway, as "the realization of national plans and development of the region is impossible without additional energy sources and electricity" (ID 7 pers.comm.). This regional deficit of the Southern Kazakhstan was explained by *uneven energy infrastructure and lack of generation capacities* due to the fact explained in Chapter 3. According to ID 2, electricity deficit has always been in the region and "almost every winter people in Almaty face the lack of electricity".

Population factor was underlined as the important reason of energy problems. Large population implies large electricity needs as any development needs electricity (ID 6 pers.comm.). The Southern Kazakhstan region has 40% of whole population of the country and it is also an important economic zone with small and medium business[10], therefore, there is a significant energy demand (ID 4 pers.comm.). Moreover, there is a huge megalopolis of Almaty, which needs for electricity are growing (ID 7 pers.comm.).

According to the official from the MINT, both patterns of *electricity consumption* and *electricity consumption per person are increasing* in the southern region (ID 4 pers.comm.). The Official from UNDP Project "Transboundary Dialogue and Cooperation in the Ili-Balkhash Basin" also agreed that there is annual increase in electricity consumption in the region (ID 2 pers.comm.). As regards electricity consumption per person, it was highlighted by ID 4 that throughout Kazakhstan for the last 20 years it has increased in times due to the high level of automatization and the increase of electric appliances in households. Despite a decline in energy consumption during an economic crisis in 2008 there is 4% increase in energy consumption now within Kazakhstan (ID 4 pers.comm.).

[10] "Kazfosfat", a leading company producing phosphorus production in Kazakhstan, was given as an example of a considerable business company in the Southern Kazakhstan

However, according to the energy expert, the increase of electricity demand is mainly connected with the fact that during the first years after the collapse of the Soviet Union a significant part of the energy infrastructure was privatized by large industrial companies and now they are increasing their production for export (ID 11 pers.comm.). As they have their own energy sources their production is not restricted. ID 11 also explained that introduction of new generation capacities is important as the companies, which play an important role in the national electricity supply, probably in 4-5 years, will use their electricity for their own needs. An interesting fact, revealed by the expert, confirms the importance of industry actors in the energy sector, highlighted in the previous chapter.

The representative of the green NGO "Tabigat" named other reasons of energy problems in the region. A need to develop energy and electricity system was suggested to be fulfilled not by introducing new generation capacities but by conserving energy and increasing energy efficiency. It was also noted that "*energy losses* are crazy both in industry and households" and that "a lot of energy is lost in the transmission lines" (ID 9 pers.comm.). Moreover, *the ignorance of renewable potential* by the Government was criticized, as wind, solar and small hydro potential is not being fully appreciated. However, as it was discussed in the previous chapter, introduction of the renewable energy still seems to be problematic according to energy people.

5.1.3.2 Unresolved problems with the old project

In addition to the problem of energy access, the interviewees from the field of water underlined that problems connected with the existing KHPP are still unresolved. They insisted on the construction of the Kerbulak counter-regulator and underlined the importance of adequate regulation of water discharges from the reservoir.

The need to construct the Kerbulak counter-regulator was emphasized by ID 2 and ID 6. "Kerbulak contra-regulator had to be added from the very beginning to regulate big differences in day and evening water discharges of the KHPP from 280 to 750 cubic km per second and to soften the negative environmental impact on the hydrological regime of the Ili River" (ID 2 pers.comm.). "As regulation downstream by the counter-regulator is lacking, the hydropower plant does not function properly and at the same time its regime does not satisfy downstream conditions" (ID 6 pers.comm.). Interestingly, the official from the MINT acknowledged the

possibility to construct the Kerbulak counter-regulator "if there is a real water problem" (ID 4 pers.comm.).

According to ID 7 it is the responsibility of the Balkhash-Alakol inspection of the Committee of Water Resources within the Ministry of Agriculture to regulate water discharges of the KHPP. The inspection makes up the schedule of water discharges based on the projections of Kazhydromet, agreement of the energy sector, akims and etc. However, it was noted by the interviewee that discharges are not based on anything and "they just open and close". It was noted that there is an urgent need to know how much water is needed for the lower reaches, for the delta zone, thus, to calculate the ecological runoff, as the Lake Balkhash is a main consumer itself. The cause of the inadequate work of the BABI according to Petrakov (2011) can be explained by the lack of human potential of the BABI to deal with a huge work load on the management unit on the local level. In his presentation on the recent water conference, the author of the new Water Code underlined that there are only 27 inspectors in the BABI, who are responsible for the control of 42 water reservoirs, 83 canals and 600 thousand hectares.

5.2 Presentation of the causal-chain analysis

The main water, energy and agricultural problems in the Ili-Balkhash basin and their impacts and causes, identified by the interviewees, are shown in the representation of the causal-chain analysis (Figure 25). Here the identified causes were divided into immediate, underlying and root causes. In addition to the root causes named by the interviewees, the problems and priorities identified during the analysis of the political and institutional settings were also included as root causes. Thus, the figure presents the results of the continuous causal-chain analysis, which started from the overview of WECF issues on different levels and partly took place throughout the research, and shows the root causes on the national level of the main local problems of the IBB in the field of water, energy and food.

The figure reveals several interesting moments. Interestingly that climate change and Chinese factors, the latter in particular, appeared throughout the research and were also indicated as two main factors affecting the future of the IBB by interviewees. They can be included into the root causes as a group of external factors and catalysts together with population and economic growth in both Kazakhstan and China. Another moment is that the impacts of the problems in the IBB contribute to the challenges in Kazakhstan, identified in the chapter 3.The figure also indicates that water, energy and food problems and causes in the IBB

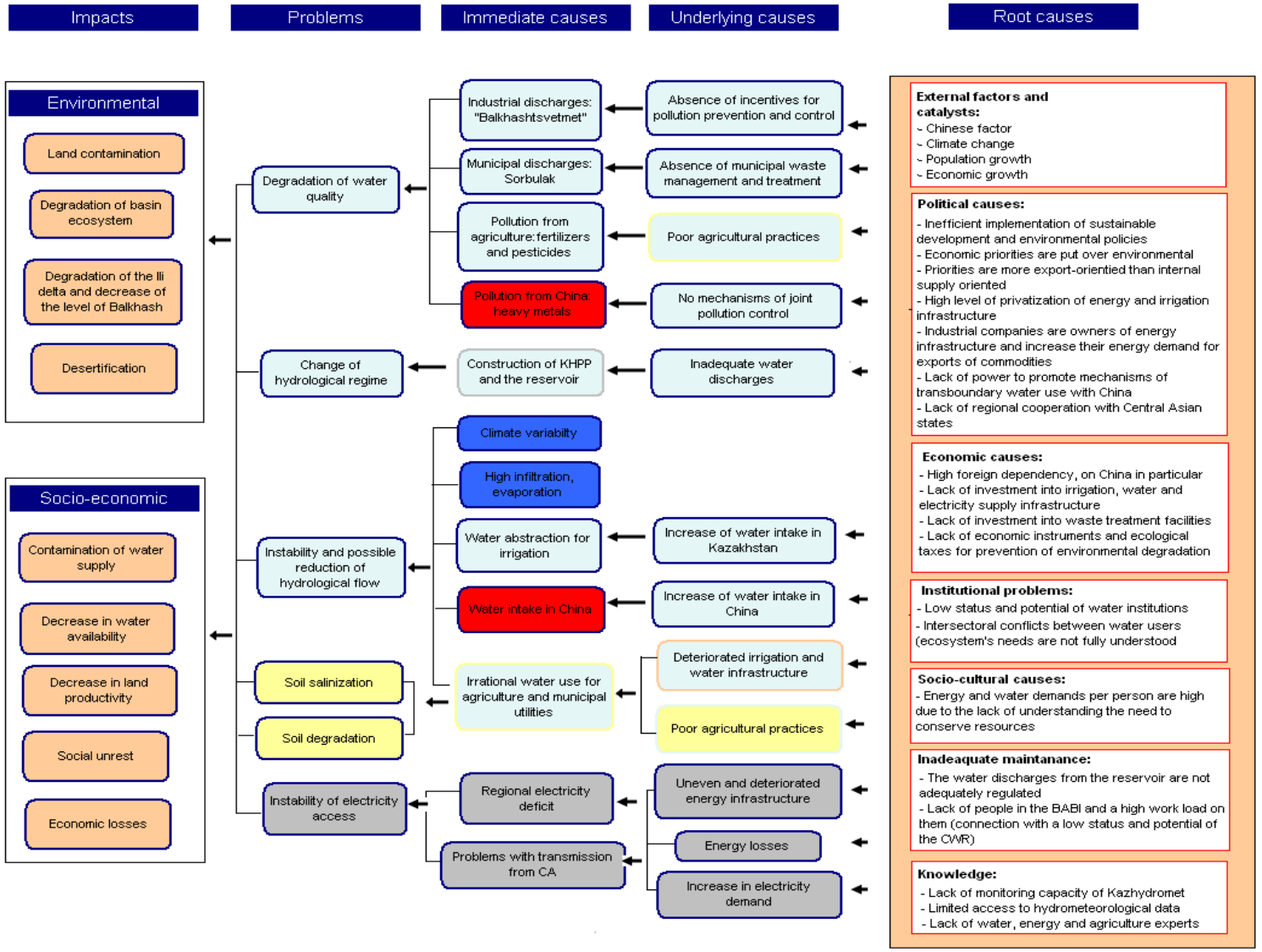

Figure 25. Presentation of the causal-chain analysis of the water, energy and agriculture problems in the IBB

are interconnected. The effort was made to indicate interconnections by differentiation of the color of some frames for causes or problems. However, all interconnections between all water, energy and food problems in the basin were difficult to analyze due to lack of the quantitative and qualitative data and present the identified interconnections due to the limits of the visual representation. Still some interconnections can be mentioned. For example, the water and agricultural problems are interconnected, as they have common immediate and underlying causes such as irrational water use and poor agricultural practices together with deteriorated water and irrigation infrastructure. Another example is the realization of the energy project, the KHPP and its reservoir, which not only affected hydrological regime of the river but also created intersectoral conflicts between hydropower and irrigation, similar to those between Central Asian states discussed in chapter 3.

The most important message of the figure is that all these basin problems are connected to the complex of the root causes, including political, economic, institutional, socio-economic causes and problems of inadequate maintenance and knowledge, which were revealed throughout the research. It is not graphically shown but the analyzed root causes are also highly interconnected between each other or come one from another. It was shown in the previous chapter that political priorities are highly influenced by economic factors. As a result, the country is focused more on exports than on the investment into the infrastructure for the internal supply. In turn, political priorities and directions are clearly represented in the institutional setting. Due to the inadequacy of the political and institutional setting in terms of provision of the equal response to the WECF nexus, water and climate institutions have a low potential and status. In particular the low status of the CWR leads to the low potential of the water management unit on the basin level and results in the inadequate maintenance of water discharges. This understanding of the root causes of the existing problems is important for the indication of possible development pathways for the IBB given the fact that the country follows the way of reaching the national priorities, identified previously.

5.3 Attitude towards the projects in the basin

The analysis of the opinions of the representatives from different groups and from spheres of four components of the WECF nexus on the projects, being realized according to the programme of forced industrial and innovative development, is important. It helps to identify the possible future impacts of the realization of the new projects and their falling into the present

WECF situation in the basin, presented previously in the chapter. In addition, it also shows if the vision of various representatives differs.

5.3.1. Attitude towards the new energy projects

As it was indicated on the map of industrialization in the previous chapter, there are two major energy projects being realized in the IBB. They are the BTPP and the MHPP. The discussion of the altitude towards these energy projects is given in the subsections presenting the main themes identified in the interviews – *New old projects*, *Electricity is needed anyway* and *Chinese presence*. At the end, the controversial opinions of the interviewees present possible negative impacts of the realization of the new energy projects.

5.3.1.1 New old projects

The theme that the new energy projects of BTPP and MHPP are not new appeared in most of the interviews. They were projected for construction during the Soviet period when the KHPP was introduced for operation (ID 2 pers.comm.). Now they are being realized even without any changes in their design (ID 8 pers.comm.). According to the Official from the Institute of Geography, a water-energy expert, the plan to build a cascade of hydropower plants on the Charyn River with Moynak plant for covering changing loads was suggested during his student years (ID 6 pers.comm.). According to ID 6, the MHPP was engineered to be at the upper part after Bestobe reservoir, whereas the Aktogay hydro system was expected to control discharges for the interests of the lower part. It was noted by ID 8 that the decision to construct the MHPP was made again several years ago, it has being constructed for a more than 5 years now and it will be entered into operation by the end of 2011. Regarding the BTPP, it was constructed by 30% already during the Soviet period (ID 11 pers.comm.). The debate about whether to construct thermo or nuclear power plant was also mentioned. According to the Official from the Institute of Geography, first, there was a suggestion to build a thermal power plant, then to construct a nuclear power plant on the constructed ground for a thermal power plant and now it is the thermo power plant again (ID 6 pers.comm.).

5.3.1.2 Electricity is needed anyway

It was mentioned previously that most of interviewees did not doubt regional electricity deficit and increasing need in electricity. It was suggested that due to the urgent problem of electricity deficit authorities can face the problem of lack of electricity even while the construction of the BTPP itself (ID 2 pers.comm.). According to ID 8, in order to solve the problem the Government has suggested several options and solutions to the problem need to be found

anyway. The BTPP is the large energy source and the MHPP is needed to address the peaks in energy use (ID 2 pers.comm.). The progress cannot be denied even it is a serious source of the environmental pollution and destruction, as "when we talk about ecology, we should understand that we have to integrate incongruous things" (ID 7 pers.comm.) and "our every step is already destruction of the environment" (ID 5 pers.comm.).The energy projects of the BTPP and the MHPP can solve the problem of electricity deficit to some extent (ID 1 pers.comm.) and they are necessary to support reliable energy system (ID 4 pers.comm.). These projects have to be introduced as there are no large generating capacities left even in the Northern zone, which is considered to be the only energy excessive region in Kazakhstan (ID 11 pers.comm.). It was noted by the interviewee that ENRC, one of the leading diversified natural resources groups with energy division11, is concerned about facing electricity deficit for their own industrial growth by 2015 without exporting to third parties.

5.3.1.3 Chinese presence

According to the Official from the CWR, the MHPP is the joint project with China (ID 5 pers.comm.). "There was an open tender and Chinese won the tender under the conditions of the minimal costs". The Official admired Chinese progress in general and in the construction of wind power plants and the realization of large hydropower projects, in particular. He also mentioned that "there was a conference recently where our journalist speculated against the construction of the Moynak hydropower plant and Chinese engineers responded that they realized much larger hydropower projects and they would easily deal with our small hydropower plant of 300 MW". However, the success of the MHPP was doubted by ID 8, who underlined that "winning a tender by minimal costs can mean minimal quality and minimal responsibility for the project". The representative from the NGO CAREC stated that "the electricity generated on the MHPP will go to China according to some unofficial sources, as it is built on Chinese money" (ID 10 pers.comm.). The Official from the MINT argued that "there is participation of Chinese money and equipment but there are no agreements on electricity transportation to China" (ID 4 pers.comm.). However, it was also noted by the Official that "even there was electricity surplus, export of electricity to China would be profitable for Kazakhstan". According to ID 8, the construction of the BHPP with huge capacity is not feasible as "we have China as a neighbor and it will suppress any industry".

[11] *The Energy Division of ENRC produces about 17% of electricity in Kazakhstan (http://www.enrc.com/en-GB/Our-Divisions/Energy/)*

5.3.1.4 Possible negative impacts of the realization of the new energy projects

It was acknowledged that the new energy projects will become an additional anthropogenic load for the ecosystem of the IBB. Such impacts as chemical and thermal pollution and acidification of the Lake Balkhash as result of the operation of the BTPP and a possible threat to unique ecosystems of the relict ash-tree copse and the Charyn Canyon from the MHPP were identified and coded throughout the data. According to the Official from the Ministry of Environmental Protection, due to the BTPP "2000 tonnes of ash will fall annually only to the Lake and that will result in the acidification of water and, therefore, in death of life" (ID 3 pers.comm.). The concern that the BTPP will be operated on the high-ash coal from Ekibastuz was expressed. The problem of long transportation of coal with high ash content was the main drawback of the BTPP mentioned in the feasibility study of the project, according to the energy expert (ID 11 pers.comm.). Half of coal transported from Ekibastuz will go as ash into the ash-disposal area (ID 3 pers.comm.). The introduction of the BTPP, the biggest power plant in Kazakhstan on coal, will inevitably lead to GHG emissions (ID 1 pers.comm.). In addition, according to ID 1, ID 2 and ID 3, there will be a problem of ash-disposal. Moreover, there is a big threat of chemical pollution and pollution by warm inflows from the power plant due to generation of waste of the burned coal and the process of cooling (ID 2 pers.comm.).

The project of the MHPP was generally referred as less dangerous compared to the BTPP. According to the Official from the Institute of Geography, there will be an inessential damage to the environment as upper reaches of the Charyn River are presented by a narrow canyon (ID 6 pers.comm.). The transportation of water by the channel from the Bestobe reservoir will have some negative environmental impact mainly on the given segment of the channel (ID 2 pers.comm.). Some possible negative impact on the unique relict ash-tree copse and the Charyn Canyon due to the change of the hydrological regime of the Charyn River was also mentioned by ID 10, ID 7, ID 6 and ID 2. However, the construction of the counter-regulator can solve the conflict between the upper-reaches and the lower reaches with these unique objects (ID 6 pers.comm.). The counter-regulator was referred as an essential part of the project of the MHPP that will help to avoid some problems and conflicts created after the construction of the KHPP without the Kerbulak counter-regulator. However, ID 3 and ID 9 expressed their concern about the seismic activity in the area of the project. The Official from the Ministry of Environmental Protection warned that the local seismic activity of 10 degrees needs to be taken into consideration (ID 3 pers.comm.). The representative of the NGO "Tabigat" underlined possible catastrophic consequences of the current construction of the MHPP on the tectonic fault and

argued against all large water bodies and dams in the mountainous region, where earthquakes have become more frequent (ID 9 pers.comm.).

5.3.2 Differences in the opinions of the interviewees from different groups

Attitude towards the projects of the BTPP and the MHPP varied among the respondents from negative to positive (Figure 26). However, the big group of international organizations and partly group of Science and one NGO expressed ambiguous attitude, which was mainly negative though. The most negative attitude towards the projects was shown by the Official from the MEP and by the representative of the NGO "Tabigat". The Official from the MEP called the BTPP "the most horrible project to be imagined for the Balkhash Lake and the Ili delta" (ID 3 pers.comm.). The representative of the NGO "Tabigat" argued against the construction of the MHPP, as it is being built on the tectonic fault (ID 9 pers.comm.).

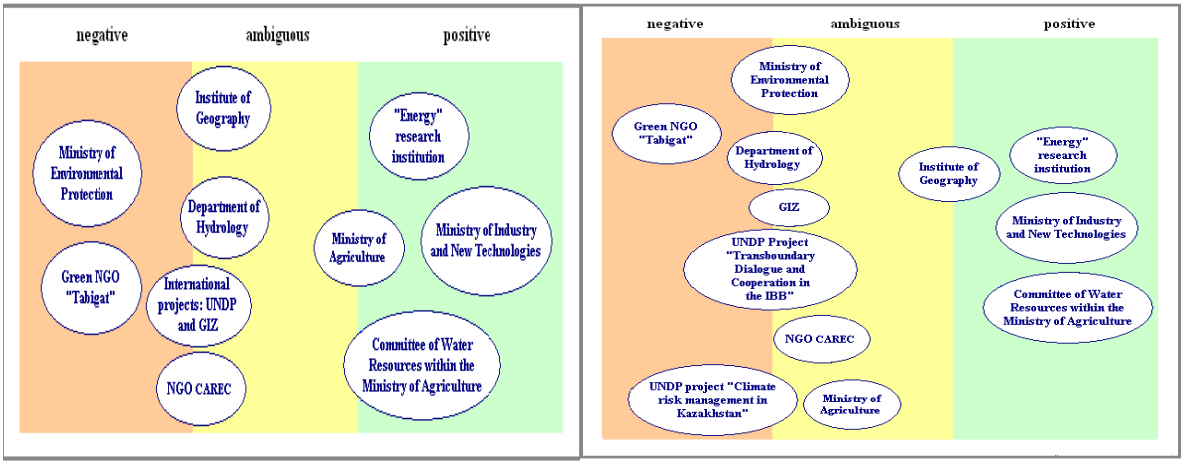

Figure 26 and 27. Attitude of interviewees towards new BTPP and MHPP (left) and the old KHPP (right)

The most positive attitude was expressed by the Official from the MINT as "these projects are needed for the reliability of the very important southern unit of the energy system" (ID 4 pers.comm.) and the expert from the "Energy" Research Institution. Similarly to this opinion, the attitude of the Official from the CWR and the MoA was also mainly positive as the regulation of the runoff by the construction of the MHPP can be used for the environmental purposes and the BTPP also should not create problems "if everything is done well" (ID 5 pers.comm). However, many respondents had a controversial attitude towards the projects. This controversy was explained by various existing trade-offs such as the conflict of socio-economic needs and ecological needs of ecosystems, the conflict between water and energy sectors and the acknowledgement of the need of electricity in the region.

It is interesting to compare the Figure 26 with Figure 27, showing the attitudes towards the KHPP. The opinions of representatives from different institutions have almost the same division. There are also differences in opinions towards the interconnections between water, energy and climate and the falling of the energy projects into the present WECF situation in the basin. Appendix 9 presents a so-called comparative "truth-table" with experts' answers to the given "yes or no questions". It must be noted that answers of the governmental official from MINT and representatives from UNDP projects and the NGO "Tabigat" were opposite. This shows a general conflict of interest between different groups.

5.4 Summary

The existing problems related to WECF in the Ili-Balkhash basin are degradation of water quality, change of the hydrological regime of the Ili river, instability and possible reduction of the hydrological flow, soil degradation and salinization and instability of the energy access. Their root causes are presented by the complex of the political, economic, institutional, socio-economic factors and problems of inadequate maintenance and knowledge. These causes can be organized into one main cause – inadequate response to the WECF nexus. The WECF nexus needs to be addressed in order to mitigate intersectoral conflicts and prevent from the possible future problems.

6. Discussion and findings

6.1 Findings and their implications

Kazakhstan, a newly independent state, is paving its own development pathway. However, the country and the challenges it is facing cannot be viewed out of the regional and global context. Kazakhstan is a part of the global political playground as well as the national water, energy, climate and food challenges are implications of the regional and global WECF nexus. The country is already becoming more involved into international environmental governance. Its policy responses are being shaped to some extent by international obligations and facilitated by international actors. They are actively promoting existing integrated policy frameworks such as a climate change policy and IWRM. As the global links between WECF intensify and countries become more dependent on each other, Kazakhstan will need to make important choices to face the challenges.

Being geographically close and economically tied with the other Central Asian states during the Soviet era, Kazakhstan shares not only the water and energy infrastructure but also WECF challenges with other Central Asian countries. The main WECF challenges are water availability, energy access, climate change impacts and food security. Despite established close interconnections Kazakhstan and other Central Asian states promote a policy of self-sufficiency due to the factor of the transboundary hydropower-irrigation conflict.

In addition to this Central Asian factor, the role of the Chinese factor is increasing in Kazakhstan and replacing the vacuum of regional power after the collapse of the Soviet Union. The thematic line "Chinese presence" was identified throughout the research and is present on the regional, national and local levels. This factor affects different aspects in Kazakhstan in both direct and indirect ways. Direct water intake from the transboundary rivers, without taking into account downstream Kazakhstan, affects water situation in the country and has negative socio-economic implications. Meanwhile, water is the most sensitive component of the nexus in Kazakhstan, having 7 out of 8 water basins transboundary. Indirect influence of China on the future water situation in Kazakhstan can be realized through increasing investment into a number of hydropower projects in the upstream riparian countries of Kyrgyzstan and Tajikistan. Thus, this factor may reinforce the regional conflict. On the local level, according to some interviewees, there are also possible negative consequences for the water situation in the Ili-Balkhash basin due to the construction of the Moynak hydropower plant, which is financed by China. Chinese

investment into Kazakhstan's economy as well as creating demand for primary energy significantly influence the country's economic priorities and make them more export-oriented. Meanwhile, high economic dependency of Kazakhstan on China turns its efforts to promote transboundary water cooperation into a game of unequal partners. In general, transboundary cooperation over water resources both with China and Central Asia presents a serious political challenge for Kazakhstan.

As Kazakhstan is highly dependent on economic gains from exports, political priorities are often determined by economic priorities. The analysis of the political setting revealed that energy and food exports are the main national priorities at the current stage of the Programme of industrial-innovative development within the Strategic development plan of Kazakhstan 2020, the main strategic document on the horizontal policy dimension. It must be noted that industrialization already took place in Kazakhstan during the Soviet era, which brought economic development but led to severe destruction of the environment due to predominance of economic priorities. During the current industrialization Kazakhstan tries to incorporate innovations and implement best practices when launching numerous projects all over the territory. The industrialization can have a positive effect on the energy infrastructure. It can also to some extent decrease the enormous gap between export-oriented and internal supply oriented dimensions in the energy sector by modernization and introduction of new energy projects.

However, according to some interviewees, the introduction of these energy projects is ineffective and unreasonable, and can cause a threat for the environment. They mentioned ineffectiveness of the current tender system, the gap between an initial suggestion of a project and a final result and made the point that all decisions are made at the top. Moreover, it was noted that due to strong lobbying in the energy sector the real needs in energy are distorted and introduction of projects is mainly driven by the interests of powerful players. Lobbying in the agricultural sector was also addressed. It was underlined that the introduction of new agricultural areas in the administrative units is lobbied by akims.

While this "economy-driven" sub-policy of Kazakhstan 2020 is being implemented, the "environment-driven" component lacks implementation and, therefore, in fact, overlooked despite the fact that Kazakhstan has developed a number of progressive environmental policies and is promoting the Green growth initiative on the global level. The programme of industrialization is highly supported by the Government and foreign investors. Moreover, as the

number of sectors involved into the industrialization is increasing, the vertical implementation of the policy within sectors is ensured. At the same time the main "environment-driven" sub-policy, Zhasyl Damu or Green Growth programme, became a sectoral programme within the Ministry of Environmental Protection, which has a low potential for its implementation. Even given the fact that it was implemented, it would not ensure environmental sustainability as it aims to achieve only few narrow indicators. The concept of the transition to sustainable development, another national policy taking environment into account, is also ineffective as there are gaps in its implementation into the political and institutional settings.

Thus, only the sectors directly contributing to the economic development such as energy and food, in particular their export dimensions are eventually prioritized in national policies, whereas water and climate get less attention. According to some interviewees economic priorities always go first in Kazakhstan and not much has changed from the Soviet era. Meanwhile, a proportionate attention to all components of the nexus is crucial to address adequately the WECF nexus and face the challenges.

In fact, all challenges of water availability, energy access, climate change impacts and food security are not addressed properly in the political setting. Despite the fact that programmes on improving integrated water resources management and water efficiency, climate change adaptation and combating desertification are developed, they do not receive significant attention from the Government and again are mainly addressed within the Ministry of Environmental Protection. Although the energy sector is the main current focus of the country, the solution of the problem of energy access is not the first priority now and energy export infrastructure, mainly to China, is more prioritized.

However, in comparison to water even climate change, in particular its mitigation, is recently getting more attention for two reasons. The first is connected with the national political playground. The policy direction of climate change mitigation satisfies both national "economy-driven" and "environment-driven" policies. This leads to the promotion of renewable energy and energy efficiency. In addition, the low-carbon development concept promotes GHG emissions trading. The second aspect is connected with the global political playground. Compared to other policy directions identified to address the WECF nexus on the global level the policy on climate change mitigation is the most actively developing. As Kazakhstan took international quantitative obligations to reduce GHG emissions, national political response to climate change is mainly

developing towards mitigation than adaptation. Thus, on the one hand, the overlay of international and national priorities is reinforcing climate change mitigation in the energy and climate areas and on the other hand, opens the gaps in the field of water and food.

I identified that the water, energy, climate and food, in fact, are not given a proportionate attention in the political setting. It was noted that while climate change mitigation is the main focus on the national level, the experts dealing with the local level consider introduction of the integrated water policy and climate change adaptation more important given the current local realities and needs. Thus, the national and local priorities also differ.

In addition, according to the energy experts policy direction of climate change mitigation may be very problematic to Kazakhstan. The development of renewable energy sources faces serious obstacles starting with the inapplicability of RES to solve the problems of large energy in the industrially developed electricity deficit regions and ending with population's unwillingness to pay high electricity tariffs. In addition, it seems unreal to fulfill the international obligations to reduce GHG emissions by 15% by 2020 given the initial high dependence on coal and plans to introduce new coal-fired generation capacities according to the industrialization programme. Finally, the introduction of emissions trading will probably face a serious protest of large energy and industrial players.

The analysis of the institutional setting revealed that the national ministerial level clearly reflects the political priorities of the country. The Ministry of Industry and New Technologies was created to implement the programme of industrialization and deals with providing internal energy supply, mainly by increasing coal production. The Ministry of Oil and Gas is focused on energy exports and export infrastructure. These two ministries addressing energy issues and the Ministry of Agriculture are considered to be super-ministries, as officially they determine policies in the two priority areas of energy and food. Meanwhile, the Ministry of Environmental Protection, the main body responsible for climate, has a low potential. However, the position of water in the institutional setting is again the lowest as it is presented by the Committee of Water Resources within the Ministry of Agriculture, which is, logically, an institutional inconsistency, as agriculture is the major water consumer in the Republic.

Despite the fact that officially it is the energy and agriculture ministries which are operators of the national policy, holdings "Samruk-Kazyna" and "Kazagro" are the main operators of the

industrialization programme. Inofficially they are more powerful than any other ministry due to high governmental and business involvement. In general, active participation of business, in particular large industrial companies focused on the export of raw commodities, was identified as the specifics of the energy sector in Kazakhstan. Given the fact that due to the privatization of the energy infrastructure after the collapse of the Soviet Union industrial companies became owners of most of the generation capacities, their role is very influential in Kazakhstan. Due to the fact that they are owners of energy sources, industrial companies are experiencing success and increasing their production for export, thus, increasing their own demand for electricity and questioning the provision of the electricity generation for internal electricity supply.

It was also identified, together with industrial business community, the international donors present actors which influence the response to the WECF nexus in Kazakhstan. At the same time farmers and other water users and electricity consumers on the local level are actors that can be affected by the inadequate institutional response. They present the most decentralized level, and, therefore, are the most vulnerable to the challenges.

The analysis of the prerequisites for integration in the WECF institutional setting identified that while the energy sector has a strong integration potential, the institutions in the field of water, aiming to promote cooperation across sectors, administrative boundaries and institutional levels for ensuring sustainable use of water resources, are weak. Energy sector is highly centralized and intertwined with business and industry on very high institutional levels. In addition, the business community in the country created the Kazakhstan Business Council for Sustainable Development in order to fit into the new realities with the global obligations and responsibilities and the framework of sustainable development. In contrast, the institutions of basin councils, created in Kazakhstan with the support of international agencies, have a limited power being only consultative bodies and having the conflicts of functions within themselves. Such a contrast between the institutional capacity of energy and water sectors, which I identified, justifies the theme "Water vs energy people" identified in the interviews.

Through the analysis of both political and institutional settings I identified that the response to the WECF nexus is inadequate, as the components of the nexus are not equally addressed and there is lack of cross-sectoral cooperation. Water, the centre of the nexus, is given minor attention in Kazakhstan. This can have serious implications on the water situation on both national and local levels. Lack of cooperation, identified by the interview analysis, is an obstacle for addressing interconnections of the nexus.

Meanwhile, these intersectoral conflicts together with other political and institutional decisions have serious implications and are root causes of the existing problems on the local level in the Ili-Balkhash basin. The complex of the political, economic, institutional, socio-economic factors and problems of inadequate maintenance and knowledge caused such problems in the basin as degradation of water quality, change of the hydrological regime of the Ili river, instability and possible reduction of the hydrological flow, soil degradation and salinization and instability of the energy access. Although the immediate and underlying causes of these problems are, for example, irrational water use for agriculture and utilities or pollution by the copper-smelting plant, the underlying and root cause are connected with the inadequate political and institutional response to the WECF nexus, predominance of economic priorities, predominance of more export-oriented than internal supply oriented priorities, lack of investment into water, irrigation and energy internal infrastructure and other factors.

6.2 Possible development pathways for the Ili-Balkhash basin

The Ili-Balkhash basin is becoming a focus area of the programme of industrialization, construction of the Balkhash thermo power and the Moynak hydropower plants in particular. The interview analysis identified that the opinions of the interviewees from different groups towards the new energy projects and their falling into the WECF situation in the basin differ significantly. This again shows the difference of intersectoral interests. However, according to many interviewees, there is a possibility that these projects will create new problems in the basin such as chemical and thermal pollution and acidification of the Lake Balkhash as a result of the operation of the BTPP and a possible threat to unique ecosystems of the relict ash-tree copse and the Charyn Canyon from the MHPP.

The realization of these projects was acknowledged as the additional anthropogenic load in Kazakhstan on the top of unresolved internal problems and the increasing external threat. There are still unresolved problems of the Kapshagay hydropower plant, including the inadequacy of water discharges and the absence of the Kerbulak counter-regulator. In addition there are also external factors. The factors of the increase of water intake in China and climate change were identified as two main external factors which can affect the future of the water situation in the basin.

The development pathway leading to the destruction of the basin and increasing tensions over water is possible if there is a combination of extremes of both internal and external factors

together with the realization of the new projects without environmental concerns. This development pathway may aggravate the existing water problems in the basin and lead to the crisis of the Lake Balkhash, similar to that in the Soviet period. This pathway can take place given that:

- Water continues to be ignored in the political and institutional settings in Kazakhstan
- The current water problems in the basin are not addressed
- The problems with the Kapshagay hydropower plant are unresolved
- The construction of the new energy projects does not follow environmental standards
- Climate change is following the worst scenario
- There are no mechanisms of transboundary water use between Kazakhstan and China

However, there is a possibility for another development pathway which can be shaped by the governmental response to the internal factors and external factors and mitigate negative impacts of the previous development pathway. The main policy directions for this mitigation are included into the recommendations.

6.3 Policy recommendations

I consider that it is crucial for Kazakhstan to increase the status of water in the political and institutional settings in order to equalize its attention to the other components of the WECF nexus and address increasing water challenges. For this the implementation of the National plan for integrated water resources management and water efficiency and the Programme on improving integrated water resources management and water efficiency in Kazakhstan up to 2025 need to be ensured, as both of these documents are focused on the increase of the political and institutional status of water. In addition, the enforcement of the Water Code, which incorporates water concerns, needs to be controlled by the Government. Also the increase of the status of the Committee of Water Resources and the creation of a separate agency with an adequate human potential and political power should no longer stay as a pending issue.

I recommended for the Government to facilitate the solution of the problems within the water institutional setting. The conflict between the administrative and basin water management dimensions within the central executive body and between its units on the administrative and basin levels need to be resolved and functions differentiated. The human potential of the Basin Water Administrations and basin inspections is recommended to be increased in number and quality in order to deal with the current enormous workload and responsibility. It is also

important that new water institutions are strengthened, Basin Councils on the basin level and Water Users Association on the local level, as they represent the needs of the group, which is the most vulnerable to the water and climate change challenges. However, it is recommended for the Basin Councils to focus on one of the three functions of planning, implementation and monitoring in order to avoid the conflict of interests within the institution itself. In addition, the control of the implementation of its decisions has to become an important part of the activity of the institution.

Thus, at the moment I consider that centralization of the water sector in Kazakhstan is needed. It is important for two reasons. Firstly, water institutions aimed to promote decentralization of the water decision making are still weak and have the conflict of interests within themselves. And secondly, in order to face increasing water challenges water needs to be put as a national priority in the political and institutional settings first. The institutional and political centralization is currently important to promote mechanisms of transboundary water use with China. For this Kazakhstan's water sector needs to be presented by a powerful centralized institution. On the local level the governmental control of water facilities and the governmental support for private owners of water facilities is recommended to be increased. Governmental investment into the irrigation infrastructure is recommended as it can solve both water and food problems on the local level. However, it must be noted that the decentralization process and the activity of such institutions as Basin Councils is important in order to avoid the total governmental monopoly on the decision-making on water resources and control if governmental priorities are not only economy-driven.

In addition to water, the political and institutional basis for climate change adaptation needs to be improved. As well as the water policy the policy for climate change adaptation is important for the local level, which is the most vulnerable to climate change impacts and risks. For this the implementation of the Programme on climate change adaptation needs to be ensured. In addition, the monitoring capacity of Kazhydromet should to be improved.

It is crucial that local problems are addressed as they add to the national challenges and have implications on the implementation of the national development plans and priorities. For example, soil salinization and degradation decrease land productivity in the Ili-Balkhash basin, one of the main basins, which according to the national agricultural policy has to promote self-sufficiency in the number of crops in addition to wheat. Therefore, the focus of the government should be shifted on the implementation of the local development programmes.

To ensure sustainable industrialization I suggest that the comprehensive process of project justification by teams including experts in all four spheres needs to be developed. The present tender system often basing its decision on the minimal bid should be reconsidered. In addition, the control of environmental standards needs to be increased.

Following of all these policy recommendations is also crucial for the Ili-Balkhash basin, as they address the root causes of the problems in the basin. However, some specific recommendations can be given on the operation of the existing Kapshagay project and the construction of the new energy projects. The construction of the Kerbulak counter-regulator is recommended by the water experts in order to mitigate the problem of the change of hydrological flow and the following destruction of the Ili delta caused by the construction of the Kapshagay hydropower plant and its reservoir. The counter-regulator should be the part of the Moynak hydropower project for avoiding similar problems. In addition, it was recommended by interviewees that the local seismic activity needs to be taken into consideration while the realization of the Moynak project. Regarding the Balkhash thermo power plant, effective ash-collectors are needed for prevention of air pollution and acidification. However, some interviewees recommended improving regional cooperation with the Central Asian states rather than promoting the policy of energy self-sufficiency and constructing new energy projects in the vulnerable basin.

6.4 Recommendations for further research

The current research presents the first step in the analysis of the political and institutional settings of Kazakhstan in terms of its incorporation of the WECF nexus. Therefore, despite the efforts to incorporate as many dimensions as possible in this research, there are still a lot of aspects for the analysis. Each of them can become a focus of the whole research project.

The identification of interconnections between all the actors in the WECF institutional setting can show the level of cooperation between different institutions in the area of water, energy, climate and food. The identification of the focus of international donors by the amount of investment is interesting to analyze as they play an important role in shaping the policy response of the Government to the challenges. This analysis can reveal if international players close the gaps in policy responses or reinforce the national priorities. In addition, the analysis of the WECF nexus based on qualitative methods can also be a challenge for researchers interesting in the issue.

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Appendices

Appendix 1. List of people contacted during the research period

List of interviewees

1. Official from the UNDP project "Climate risk management in Kazakhstan"
2. Official from UNDP Project "Transboundary Dialogue and Cooperation in the Ili-Balkhash Basin", Former Director of the Committee of water resources
3. Official from the Ministry of Environmental Protection
4. Official from the Ministry of Industry and New Technologies
5. Official from the Committee of Water Resources within the Ministry of Agriculture
6. Official from the Institute of Geography
7. Official from the Department of Hydrology at the Al-Farabi Kazakh National University
8. Official from the GIZ transboundary water management program in Central Asia "Policy Dialogue, Sustainability and Environment"
9. Official from the green NGO "Tabigat"
10. Official from the NGO Regional Environmental Center for Central Asia
11. Official from the Ministry of Agriculture
12. Official from the Energy Institute

List of officials who provided some information for research and advised contact people

13. Official from UNDP, IWRM Project Expert, Ex-Head of the Balkhash-Alakol inspection
14. Official from the Ministry of Industry and New Technologies, Office of Renewable Energy
15. Official from UNDP Energy and Environment Unit
16. Official from the Laboratory of Glaciology of the Institute of Geography
17. Zhakyp Dostay, Official from the Laboratory of Water Resources of the Institute of Geography
18. Official from the Laboratory of Water Resources of the Institute of Geography, modeler
19. Official from NGO "Green Salvation"
20. Official from the Department of Kyoto Protocol of the Ministry of Environmental Protection
21. Official from the Ministry of Environmental Protection, Department of Strategic Planning

List of officials who could not give interview

22. Official from JSC "Samruk-Energo"
23. Official from JSC Kazakhstan Electricity Grid Operating Company "KEGOC"
24. Official from Kazakhstan Electricity Association
25. Official from the Laboratory of Water Problems within the Ministry of Environmental Protection

Appendix 2. Groups of respondents and their IDs

Groups	Officials
Government	• Official from the Ministry of Environmental Protection • Official from the Ministry of Industry and New Technologies • Official from the Ministry of Agriculture • Official from the Committee of Water Resources within the Ministry of Agriculture
Science	• Official from the Institute of Geography, water and energy expert • Official from the Department of Hydrology at the Al-Farabi Kazakh National University • Official from the "Energy" research institution[12]
International organizations	• Official from the UNDP project "Climate risk management in Kazakhstan" • Official from UNDP Project "Transboundary Dialogue and Cooperation in the Ili-Balkhash Basin", Former Director of the Committee of water resources • Official from the GIZ transboundary water management program in Central Asia "Policy Dialogue, Sustainability and Environment", ex-manager of the UNDP Project "National Integrated Water Resource Management and Water Efficiency Plan for Kazakhstan"
NGO	• Official from the green NGO "Tabigat" • Official from the NGO Regional Environmental Center for Central Asia

Respondent's ID	List of interviewees
1	Official from the UNDP project "Climate risk management in Kazakhstan"
2	Official from UNDP Project "Transboundary Dialogue and Cooperation in the Ili-Balkhash Basin"
3	Official from the Ministry of Environmental Protection
4	Official from the Ministry of Industry and New Technologies
5	Official from the Committee of Water Resources within the Ministry of Agriculture
6	Official from the Institute of Geography
7	Official from the Department of Hydrology at the Al-Farabi Kazakh National University
8	Official from the GIZ transboundary water management program in Central Asia "Policy Dialogue, Sustainability and Environment"
9	Official from the green NGO "Tabigat"
10	Official from the NGO Regional Environmental Center for Central Asia
11	Official from the Energy Institute
12	Official from the Ministry of Agriculture

[12] The research institution is JSC, however, it was put into the Science group, as its main activity is energy research

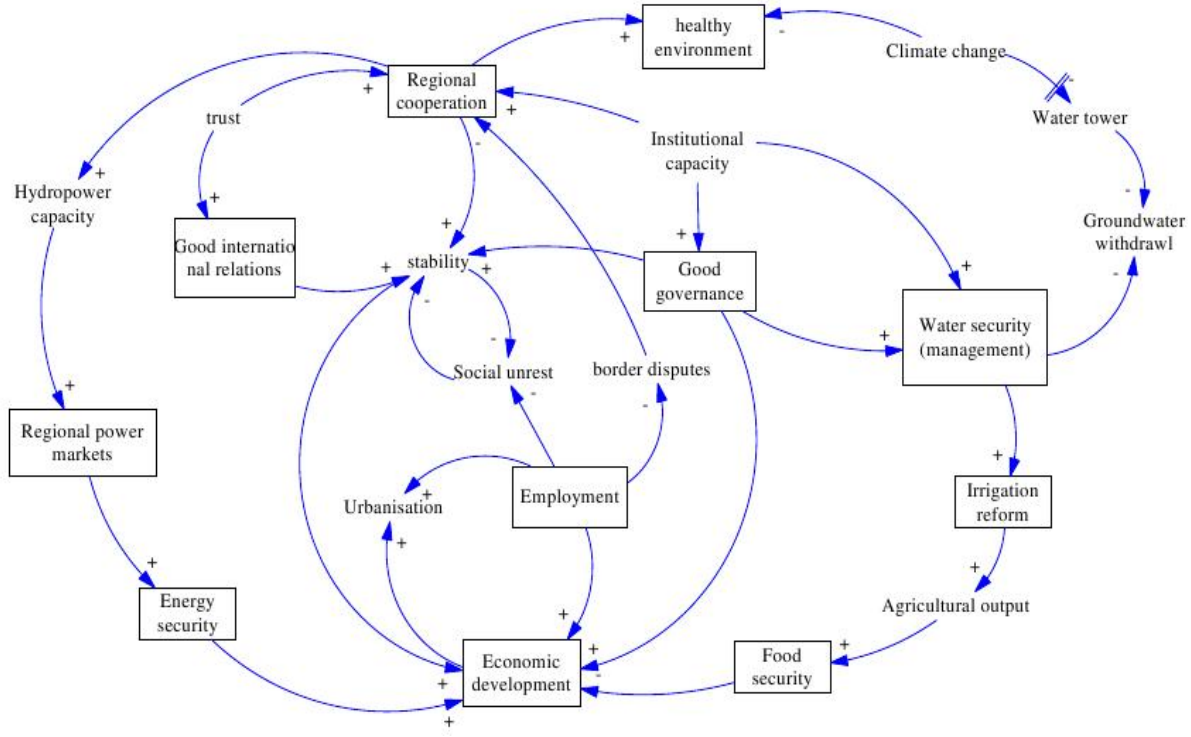
Appendix 3. List of sample questions

Please tell me about your institution and its influence on the Ili-Balkhash basin

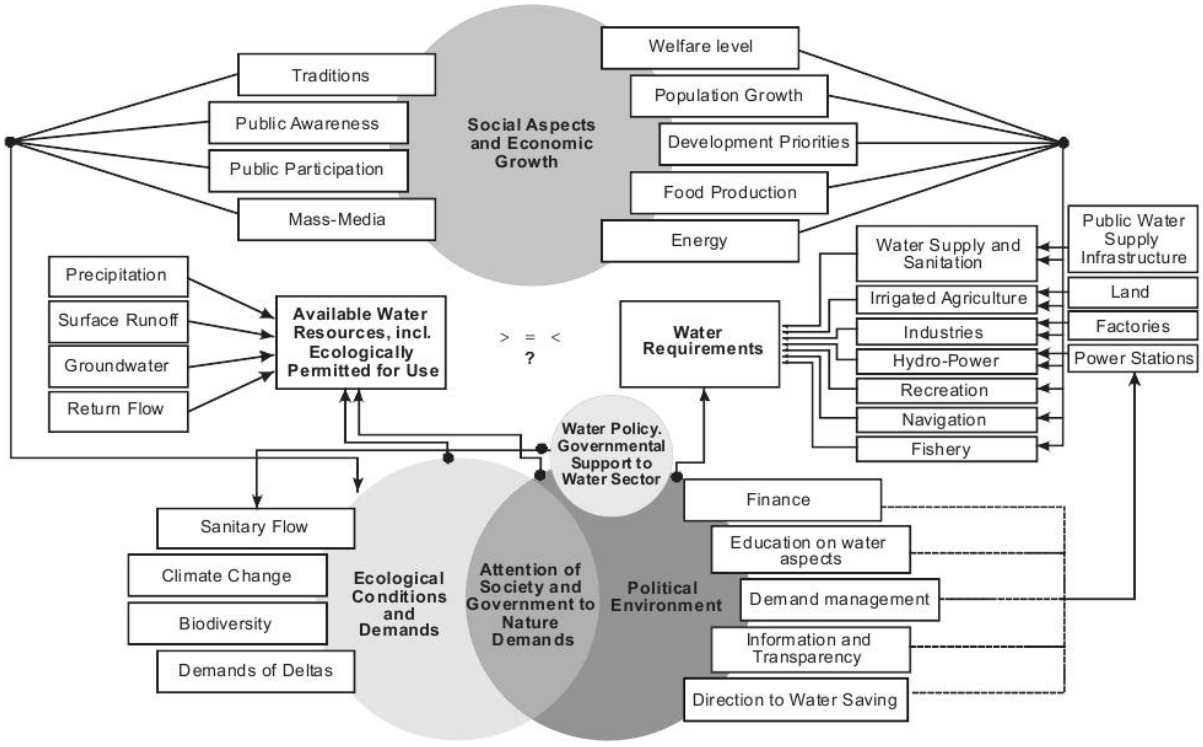
In your opinion:

1) What are main water, energy, climate and food problems in the Ili-Balkhash basin? Are they interconnected?
2) What are their reasons?
3) What is your attitude towards the Kapshagay hydropower plant?
4) What is your attitude towards the new energy projects – Balkhash thermo power plant and Moynak hydropower plant?
5) Can they influence water situation in the basin?
6) Can their effectiveness be affected by climate change or by the transboundary aspect?
7) What are main actors in the field of water, energy, climate and food?
8) What is the level of cooperation between these authorities?
9) How problems in the basin differ from those on the national level?
10) What are your recommendations for policymakers?

Appendix 4. Interplay of factors and drivers in Central Asian region and the system of interacting factors within water resources management process

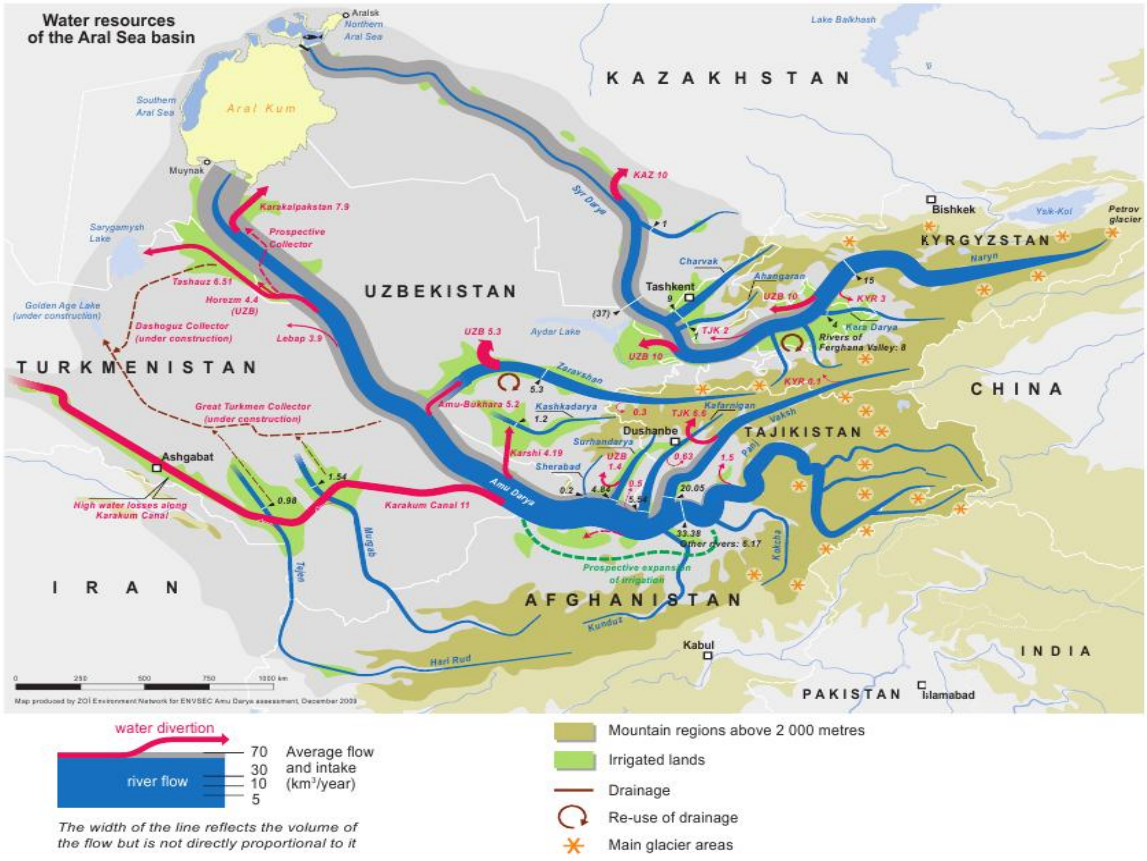


Source: Granit *et al.* 2010

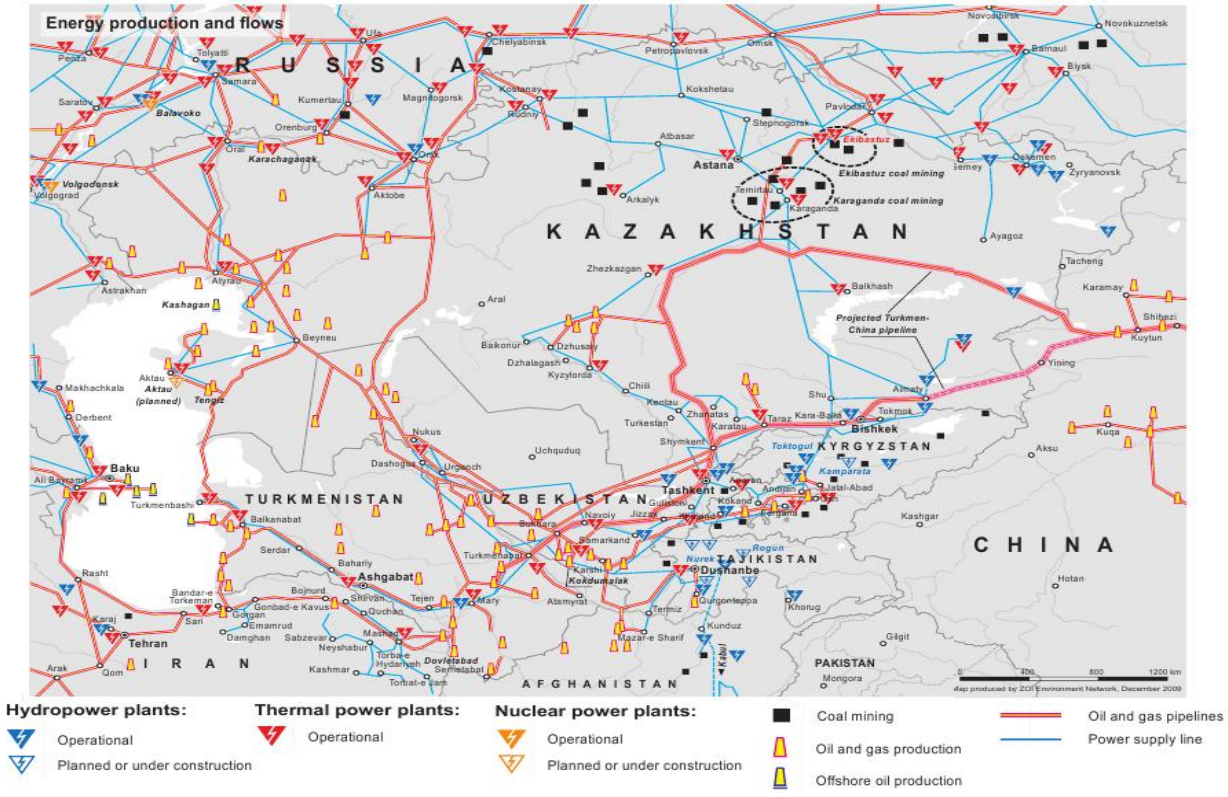


Source: Dukhovny *et al.* 2008

Appendix 5. Water and energy systems in Central Asia



Source: Zoï 2009

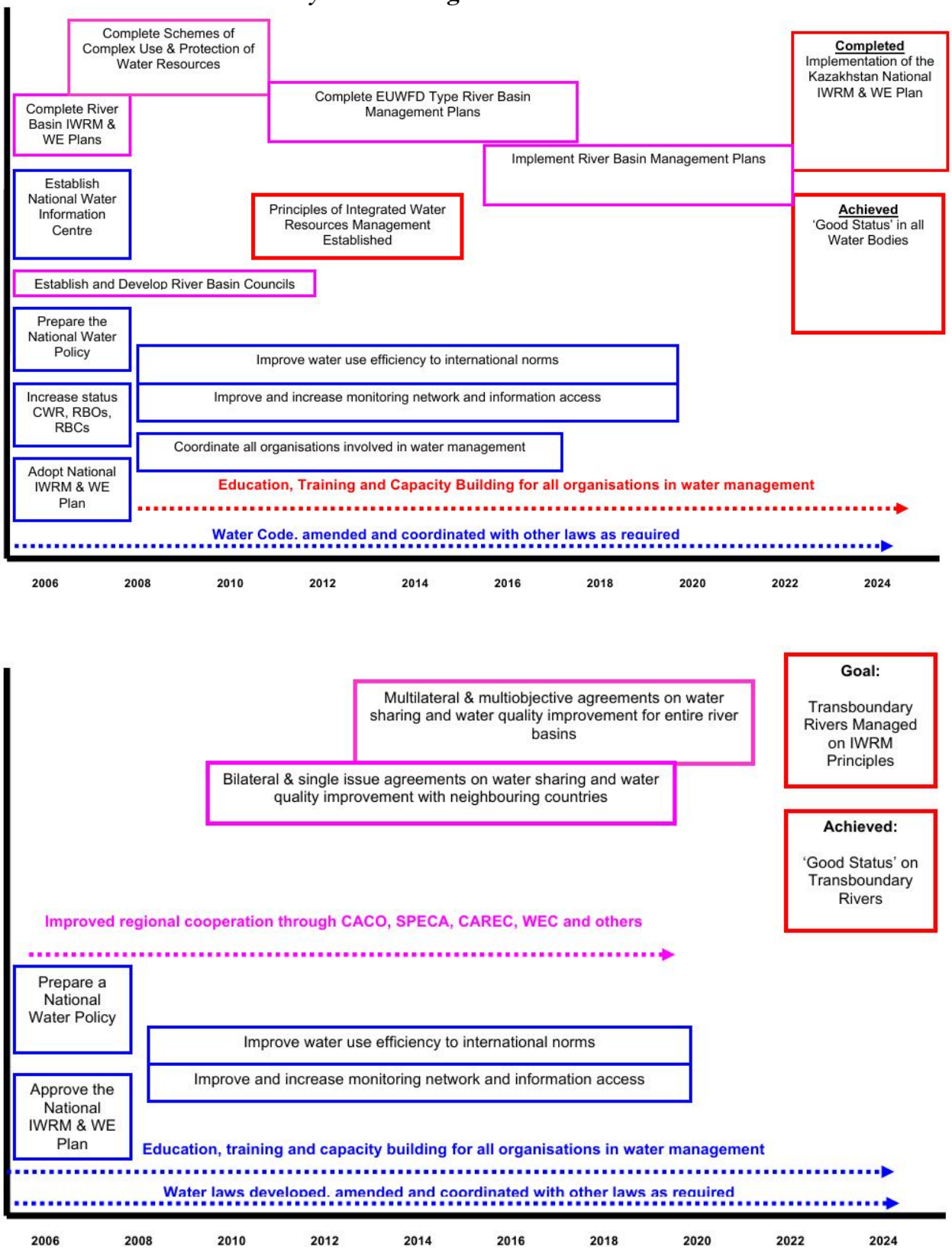


Source: Zoï 2009

Appendix 6. Projected climate change impacts in Central Asia

Source: Zoï 2009

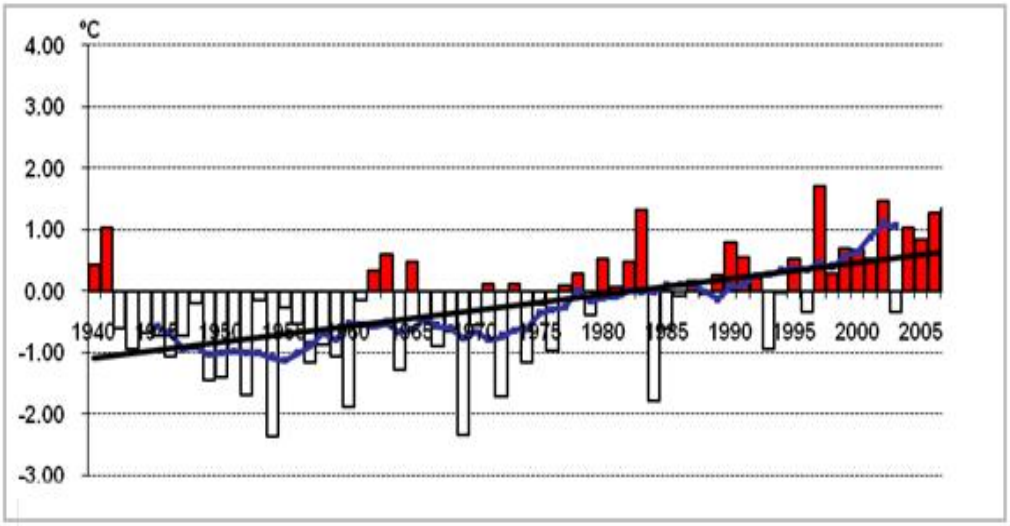
Appendix 7. Vision of the Programme on improving integrated water resources management and water efficiency towards a good condition of water bodies in Kazakhstan and transboundary water management



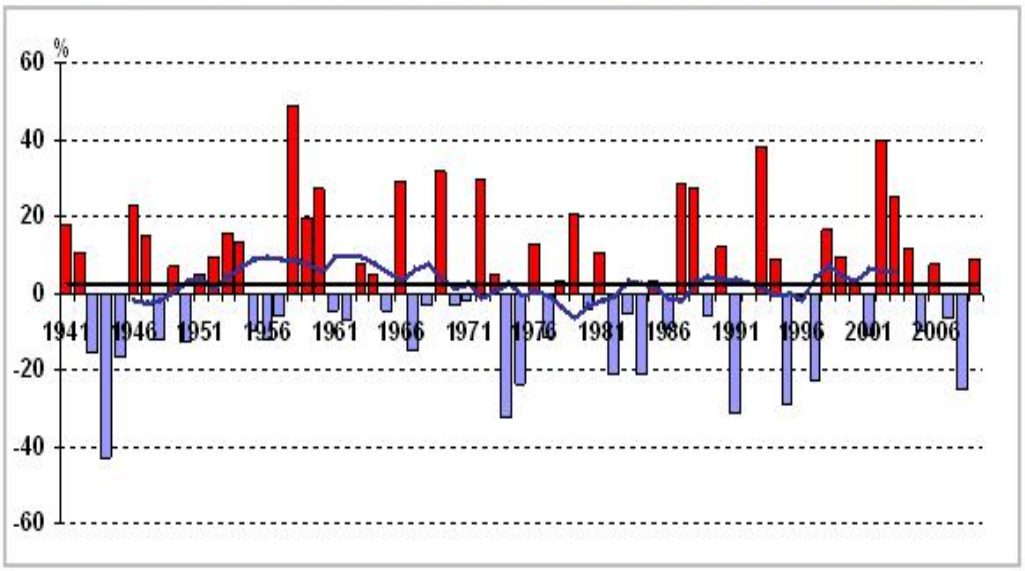
Source: Programme on improving integrated water resources management and water efficiency in Kazakhstan up to 2025

Appendix 8. Time series of air temperature and precipitation anomalies over the territory of the Balkhash-Alakol water basin relative to the average "norm" of the period 1971-2000

Time series of air temperature anomalies averaged over the territory of Balkhash-Alakol water basin



Time series of anomalies (%) of annual precipitation, averaged over the territory of the Balkhash-Alakol water basin, calculated relative to the base period of 1971-2000



Adapted from Kazhydromet 2010

Appendix 9. Comparative "truth-table" with experts' answers to the given "yes or no questions"

Groups	Officials	Are water and energy problems connected in the IBB?	Can the realization of the projects influence the water situation in the IBB?	Does the situation with water and climate influence the effectiveness of the energy projects?	Does the transboundary character of the basin influence the effectiveness of the energy projects?
Government	MEP				
	MINT				
	CWR				
	MoA				
Science	Institute of Geography				
	Department of Hydrology				
	"Energy" Research Institution				
International organizations	UNDP project "Climate risk management in Kazakhstan"				
	UNDP Project "Transboundary Dialogue and Cooperation in the Ili-Balkhash Basin"				
	GIZ transboundary water management program in Central Asia "Policy Dialogue, Sustainability and Environment"				
NGO	Green NGO "Tabigat"				
	CAREC				

- yes - no – to some extent