A thesis submitted to the Department of Environmental Sciences and Policy of Central European University in part fulfilment of the Degree of Master of Science

Evaluating Kazakhstan's transition to a "Green Economy": an assessment of energy transition as a national security issue

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ABSTRACT OF THESIS submitted by:

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for the degree of Master of Science and entitled: Evaluating Kazakhstan's transition to a "Green Economy": an assessment of energy transition as a national security issue

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In order to enter the top 30 developed countries of the world, the Republic of Kazakhstan introduced the "Concept for transition to a green economy" in the year of 2013. The project has been implemented only in 2015 and considers lasting until 2050. Aiming to diversify the economy towards sustainable development using alternative sources of energy, reforming agricultural and industrial sectors and implementing water management plan, Kazakhstan wants to become a leader of promoting the green economy and sustainable development among the biggest GHG emitters. However, Kazakhstan's approach seems too ambitious at the current state, considering that country's dependence on fossil fuels is still serving as a major part of the economy and national security issue.

This thesis will analyze an inventory of major outputs related to an implementation of the transition to a green economy and assess the overlap between the transition concept and energy development in a context of national security policies.

Keywords: Kazakhstan, green economy, energy security, energy transition, EXPO 2017, renewable energy, policy integration

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List of Abbreviations

APG	Associated Petroleum Gas
B/D	Barrel per day
BRICS	Brazil, Russia, India, China, and South Africa
CIA	Central Intelligence Agency
GDP	Gross Domestic Products
GHG	Green House Gases
Strategy 2050	Strategy Kazakhstan 2050: A New Political Course of the Established State
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environmental Program
OECD	Organisation for Economic Co-operation and Development
JSC	Joint Stock Company
NAC	National Company

1. Introduction

Green economy concept has been recently chosen as a development pathway by different countries in the world. Environmental problems, global financial crisis, dependency on foreign energy sources, limited capacity of ecosystems all of that led to find new ways for more efficient economic development. It was important to address those issues not only on global level, but also on local levels in order to help countries to find different development pathways in order to transition to a more sustainable development.

Since its independence Kazakhstan has been transformed from a Soviet Republic to a country with growing population and a dynamic market-oriented economy. Being major oil, gas and coal producer in the region of Eurasia, Kazakhstan's economy is in transition to a green economy based on sustainable development approach that has been defined by Brundtland Report. Since global definition of sustainable development is that it is focused on economic, social and environmental aspects, green economy approach aims to reduce environmental risks, but focuses on social and economic development.

Kazakhstan's Strategy Kazakhstan 2050: A New Political Course of the Established State ("Strategy 2050") and its concept for transition to a green economy introduced in 2013 set ambitious goals to diversify the economy towards a more sustainable development pathway (Strategy, 2012). The goal of the strategy is to enter the top 30 developed countries in the world by 2050. The diversification of the economy is focused on improving water management, the agricultural sector, air quality and most importantly the energy sector. However, with regards to energy, Kazakhstan is highly dependent on its fossil fuel exports and consumption. The Kazakh energy mix is dominated by coal, which results in high levels of GHG emissions. Being a part of international treaties on GHG emission reduction such as the Paris Agreement, Kazakhstan's strategies focus on energy efficiency and the development of alternative energy sources such as solar, wind, nuclear and hydro to decrease emissions and move the energy sector and the economy away from fossil fuels.

2. Problem Definition and Research Questions

2.1 Problem Identification

Kazakhstan is challenged by the intensive use of natural resources and environmental deterioration across the country. Green economy transition and Strategy 2050 have been introduced as approaches to make the country's economic model more efficient in terms of properly using natural resources. However, the country's dependence on fossil fuels both for exports that makes up almost half of the GDP and high intensity domestic energy consumption makes achieving the ambitious targets of the strategy by its proposed deadline very challenging. Since the implementation of the proposed program, more oil and gas extraction projects were approved, which significantly influence the renewable energy development. In addition, a lot of the targets set by the strategy are considered to be ambitious. Kazakhstan wants to secure its current energy sector and tries to develop its accessibility and affordability. All of these factors are suggesting that the country wants to give more priority to the fossil fuels energy development rather than the development of "green" sources, while having legal frameworks that focus on sustainable development.

2.2 Research Questions, Aims and Objectives

The aim of this thesis research is *the assessment of the current state of the green economy transition and its link to the energy sector's development as a national security issue in Kazakhstan.* The thesis research was driven to answer the following questions:

- RQ 1: How plausible is it for Kazakhstan to achieve a green economy as it defined in the strategy taking into account current energy dependence on fossil fuels?
- RQ 2: What are the major successes and barriers of the green economy transition to date?

To answer following question two main objectives have been identified:

- Identify the energy-sector related aspects and goals of Kazakhstan's green economy strategy
- Identify the current status of Kazakhstan's implementation of the green economy related to the energy sector.
- Identify potential areas of improvement and changes that can help policy makers achieve goals that are set in the transition document.

2.3 Contribution

This thesis research can be interesting for several reasons. The green economy that results in improving human well-being, while reducing environmental risks (UNEP, 2011) is a relatively new concept rigorously followed by few countries, so Kazakhstan can provide a valuable example of the green economy's implementation, particularly in developing countries. Moreover, connections between the green economy and energy security have not been extensively discussed in Kazakhstan's context. As energy security is being currently discussed between Kazakhstani and international organizations, it is important to see how the energy industry will transform and what would be an institutional response to address issues related to the green economy transition. Since Kazakhstan only recently decided to switch to a green economy as a new development course, there is no evaluation of the progress of implementation and its limitations. Moreover, there has been no assessment of the connection between the framework and energy industry priorities. This thesis is looking specifically at the outcomes of the concept at the current timeline and focus on discussing implications for meeting the 2020 interim and 2050 long-term goals. It also explores the initial causes of the issues related to the lack of climate mitigation or renewable energy implementation, since it is valuable to see the challenges that country is facing to meet its targets. The discussion contributes to the evaluation of the progress of the green economy and can be interesting as an independent assessment of national policies. The recommendations may be of interest to policy makers to fill implementation gaps.

2.4 Scope and Limitations

This thesis research presents an assessment of the green economy concept that is being implemented in Kazakhstan, and the analysis of the current energy industry to understand the interactions between institutional settings and frameworks in terms of their ability to incorporate environmental concerns into national development priorities and security issues. Thus, the scope of the study mainly focuses on the governmental and national priorities of Kazakhstan towards the development of green economy.

Due to the time constrains and complexity of the issue, it was not possible to explore all aspects of the green economy development in Kazakhstan, thus the focus is only on the most important part of the transition, energy sector. Apart from this, only 5 interviews were conducted due to limited time of the experts at the time of the field research. There were also limitations related to the lack of data on the progress of green economy transition documented by any report. Collected interviews are however providing valuable opinions of actors in the areas of climate mitigation, development, energy, who represent different groups of the Government, international organizations, and private consultants.

2.5 Structure

This thesis research consists of six chapters. Following the introduction, the second chapter provides research questions, aims, and objectives of the thesis, scope, limitations and overall structure. The third chapter is a literature review focused on the green economy concept at the global level and at the national level of Kazakhstan, and also presents an overview of energy sector. This includes the national priorities in energy development and the transition status to a greener energy sources. The fourth chapter highlights the methodology and the research design. The fifth chapter focuses on the results parts from the primary data and secondary data and identifies the main issues in the green economy concept and the energy transition in the current time. Sixth chapter presents conclusion and recommendations.

This chapter summarizes findings and focuses on the possible development solutions for energy security and the green economy development.

3. Literature Review

Chapter three focuses on disclosing the general information on the current frameworks of green economy at the global and national level of Kazakhstan, but also provides information about Kazakhstan's energy sector. This information is important for understanding what stands behind the concept and the framework and how different or similar it is for different actors and how it is being interpreted in Kazakhstan.

3.1 Green Economy

The idea of aligning stable economic growth and protection of the environment is not new. Yet, the concept of green economy gained a newly reinforced momentum in economic, political and academics circles. The interest in sustainable economic growth increased in literature as both developed and developing countries came to realization that traditional state economy model falls short in meeting demand for increased consumption of limited resources. In general, interest in the concept of green economy has started burgeoning in literature since 2008. The global economic crisis and failure of prevailing conventional economic models dictated the need new approaches in new conditions. Scarcity of recourses, food, fuel and other problems were faced and highlighted ubiquitously, triggering the formation of green economy mind-set. Furthermore, taking into consideration the limited capacity of global ecosystem, the idea of sustainable growth grew interconnected with and having profound effects on other spheres, affecting interests of wide range of groups. On both global and state levels, it is vital to address the issues of effective energy consumption and sustainable growth to ensure prosperity of whole nations and other groups, which makes designing new, environmentally-conscious approaches to the economic policy one of the key universal priorities. Yet, a relative novelty of the issue, a lack of universally accepted and unique understanding of sustainable growth, and the deficit in the integrated approach are reflected in the diversity of conceptualizations and policies practiced by different countries

and global actors. The existing literature tends to agree that depending on different characteristics, perspectives and levels of development, states' transition from classic economy to the green is happening at different pace and vary in quality. According to Egorova, Pluzhnik and Glik (2015), developed group of countries approached the transition through enlarging workplaces and developing marketability within the framework of sustainability. Whereas developing countries integrated the concept into their quest for tackling poverty and ensuring stable development (Ibid.). Cato highlights that the main developing countries - such as the BRICS group put great emphasis on efficient natural resources consumption strategy (2009). According to Golub, the boom in energy production and consumption that happened in the last couple of decades had important consequences and implications in the transition, underlining the importance of renewable and reproducible energy production (Golub, 2003 cited in Egorova, Pluzhnik and Glik, 2015). The ideas of green growth became widespread turning into a political catchword, green production and consumption making a visible resonance in behaviours of states, businesses and citizens. Yet, Lorek and Spangenberg underline that the undertaken strategies' implications and outcomes remain vague (2014).

3.2 Global Scene

The ideas about green and sustainable growth are strongly lucrative and acquired widespread relevance, as it responds simultaneously to a number of global existential issues, namely the climate crisis, economic, food and water security. The green economy paradigm promises to take care of the welfare of the ecosystem into account while alleviating various socio-economic burdens and ensuring stable development. The debates around scarcity of resources and economic transition policies have been there for decades. Stern explores the economics of climate change and stresses that global collective economic transition and strong action are required to prevent and manage the effects of climate change and environmental problems (Stern, 2006). Ocampo (2011) argues that green economy

necessitates a holistic approach in order to work efficiently, encompassing economic, environmental and social pillars. The discourse of the green economy focuses radically the public attention to the problems of climate change and depletion of resources. It promotes environmentally friendly and "clean" technologies to decrease emissions and alleviate the effects of the existing environmental harms and exhaustion scarce natural resources (Jänicke, 2012). Interestingly, according to Bowen and Fankhauser, the discourses of green growth have strategic merit: "from a strategic point of view, green growth allows environmental protection to be cast as a question of opportunity and reward, rather than costly restraint" (2011). Bina and La Camera explore the "green turn" – institutional policy responses on international, regional and national levels to environmental and financial "double crisis" (2011). Georgeson, Maslin and Poessinouw argue, "the green economy concept also has the potential to ensure that, when national, regional and international implementation plans are designed, the UN Sustainable Development Goals and the post-2015 development agenda can overcome inherent conflicts between the goals" (2017). The environment –economy nexus requires rigid functional and business innovative policies, which affect the entire economy, including production. Janicke maintains "growth results from the investment in the upgrading of the entire production system to environmental and resource-saving processes and products" (2012). The policies and strategies driven by the green economy idea are implemented and related discourses are popular in many countries today. Bailey and Caprotti emphasize the importance of multilateral institutions' "political support, strategic coordination, and assistance for new technologies and business and user practices", yet also highlight the significance of national policies and other actors' agendas (2014). There is a complex mosaic of overlapping policies at different levels, which affect the implementation of green economy. The green economy has started to constitute a noticeable part of the global economy: for example in 2015 the global investment in alternative and environmentally friendly energy has been $348.5 billion (Bloomberg New Energy Finance, 2016).

The green economy concept's emergence and prominence can be traced back to 1989 – it emerged in Pearce et al.'s *Blueprint for a green economy* designed for the for the UK Department for the Environment. International multilateral organizations put considerable efforts to promote it widely, specifically a turning point is considered to be the 1992 UN Rio Conference on Environment and Development, "which turned 'sustainable development' into an internationally recognized concept and normative goal" (Bina, 2013). Barbier (2013) argues that the Rio+20 Conference, which took place in 2012, drew the world community's attention to inevitable and critical environment-related problems. He also stresses the artificiality of the separation between economic development and environmental policies, and argues that it serves as an important premise for the green economy model (Barbier, 2013). In general, the 2008 financial crisis certainly triggered the world's interest in sustainability and green growth of economy: "green growth provides a more attractive and sustainable alternative to coming out of the global crisis than going back to brown growth" (Van der Ploeg and Withagen, 2012). Green economy gained momentum in international politics and in policy making: "the combined forces of global economic recession, humanly induced environmental change and stark social inequalities have led to international calls for a radical transformation of current development practices and transitions towards a green economy" (Davies, 2013). The United Nations Environment Program (UNEP), initiated in 2008 is another trendsetter in green economy promotion and implementation. It went beyond the previous agendas and broadened its framework to include social issues into the concept of green economy. There is no consensus and no universal definition of a green economy, the most common understanding shared in the academic literature refers to the working definition proposed by the UNEP's reports – "one that results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities" (2011). UNEP operates to help the main economic powers such as China, the USA, Russia, Japan, Germany, and the United Kingdom to transition into green economy (Egorova, Pluzhnik and

Glik, 2015). According to UN's conceptualization, green economy requires holistic approach, which incorporates economic, social and environmental objectives. According to UNEP's report, the incentives in the economic system needs to be reformulated so that the products and services are environmentally friendly and do not cause social damage. The new approach necessitates a prevention of social or environmental harms by ensuring that the economic system is integrate the balance of environmental and social costs and benefits (UNEP, 2011). It has become evident that the economic systems, which does not account for the balance and overlies on natural resources induce environmental devastation. The green economy's main objective is to address the fundamental problems of environmental degradation and at the same time ensure human beings' well-being and social equity (UNEP, 2011).

The green economy implies primarily the economy based on the green energy, which stand on four pillars – renewable alternative energy sources, energy efficient infrastructure and transportation, using clean and environmentally aware technology, and recycling (Radovic-Markovic and Nikitovic, 2015). Borel-Saladin and Turok (2013) examine the concept of the green economy definitions provided by UNEP, the Organization for Economic Co-operation and Development (OECD) and the World Bank. They conclude that green economy might require intricate set of solutions and policies which need to be carefully combined to lead to results, yet green economy concept offers a large set of tools needed to alter the economic activity for improved environment and more socially inclusive system. The authors note that, "the question at the heart of the green economy is whether it is possible to correct environmental degradation and social inequality through the current economic system, i.e. the very system that gave rise to these problems" (Borel-Saladin and Turok, 2013). They also critique the assumptions of the green economy: the assumptions might be over-optimistic and over-simplistic challenging the green growth. Furthermore, the ideas might be aligned to the current system, blocking the potential for growth. Yet, Borel-Saladin

and Turok conclude that the green economy does provide effective tools for substituting non-renewable energy consumption with low-carbon technologies and alternative energy. They also admit that "the vision of the green economy is bold and the goals and ideals lofty" (Borel-Saladin and Turok, 2013). It recognizes the environmental issues of the global scale in the context of economic crisis and at the same time focuses attention on social issues and their solutions. The success of implementation of the concept depends on actors and states: their willingness to incorporate effectively and operationalize the tools the model offers is very important. Ferguson explores the discourses of the green economy and the green growth, and delineates them and practices through which the ideas are implemented (2014). He argues that the ideas of the green economy and the green growth need to be separated. The concept of the green economy itself is advocated by Ferguson, as it is free of growth-positive to growth-negative framing (Ferguson, 2014). He also recognizes three categories of discourses related to the concept – weak, transformational and strong green economy. It gives a space to grapple with implementation level and assessment.

Most of the time, the implementation of the green economy is usually tied closely to the idea of sustainable development. The 2012 Rio+20 conference's aims were not only tackling global environmental issues such as reducing emissions, decreasing reliance of non-renewable sources of energy and maintaining ecosystems – it also intended to determine and discuss new approaches and ways to develop and grow, ensuring sustainable and efficient use of the existing resources and economy. The transition to the green economy attracted increased attention of businesses and governments, considerable amount of investments flow into green economy building. The transition process to the green economy varies based on settings and countries, but refocusing in technologies were highly ubiquitous – clean or green environmentally-friendly technologies and means of production offer solutions to global issues and a competitive profit as well. There are considerable differences in national green economy strategies across developed and developing countries.

3.3 National Level

Developing countries often focus on development pathways that would reduce dependency on natural recourses, dealing with carbon emissions, increase climate resilience, tap into emerging climate financing, and eliminate existing environmental dangers such as ensuring stable developmental planning.

Kazakhstan as a country with a transitional economy also lately started encouraging implementation of the green economy. It adopted *Strategy "Kazakhstan 2050: A New Political Course of the Established State" ("Strategy 2050")* and its concept for transition to a green economy policy in 2013. The country is at the stage of transitioning to a green economic path and this process is affected by many distinct factors, which is based on state green economy management understanding. Kazakhstan has important ecological problems that "other states never faced before" (Diyar et all, 2013). Semipalatinsk nuclear polygon which used to be a nuclear tests sight is a Soviet legacy and has considerable amount of industrial wastes which still affects the environment – "over 23 billion tons, where 9 billion ton of anthropogenic mineral formations are the heritage from old Soviet industrial enterprises' activities that are to be disposed somehow" (Diyar et al, 2013). The environmental contamination has serious negative effects on population's health; the country is in the second place among Central and Eastern European and Central Asian countries in terms of organic contamination (Decree, 2013). Furthermore, Kazakhstan's water problems are one of the key issues in its transition to the green economy; it is dependent on border water sources. Diyar *et al*. highlight that "Experts and ecologists alarm us about the global climate change consequences such as lack of water, drought, desertification that might happen within 20-30 years in Kazakhstan" (Diyar *et al.,* 2013). Moreover, due to historical and other factors, there are considerable regional imbalances and economic development disproportionally concentrate around large cities and main natural resources extraction sights. The green economy is one of the ways to sustain the stable development of the country's

economy and deal with its ecological and environmental issues, while keeping threats and risks in check. As many other innovative initiatives, the green economy implementation in Kazakhstan is included into the framework of other developmental strategies.

At the moment, *Kazakhstan 2050* proposed by the President of the state in his address in December of 2012 is the main development strategy of the country that serves as an umbrella to all the national concepts. It should be noticed that the model of the *National Strategy for Sustainable Development* serves as a foundation for long-term *Strategy Kazakhstan 2050*. Kazakhstan in its strategy focuses on the development that would completely change the past economic model of the developing country. Strategy promotes the new course of the economic policy that focuses on sustainability and efficiency and widespread social, economical reforms to make Kazakhstan position itself among top 30 countries in the world based on their development.

Strategy 2050 highlights seven main priorities such as economic pragmatism based on profitability and competiveness, support of entrepreneurship, social guarantees, modern education and training, further development of Kazakhstan's democracy, foreign policy development. Concepts of transition to a green economy and infrastructure development are aligned with the first priority related to the economic pragmatism (Strategy 2050, 2012).

Particularly, the *Green Bridge Program* was developed to operationalize the policy ideas: "it was developed subject to requirements to integrate the efforts of regional processes in the field of environmental protection and development under coordination of the UN ESCATO and EEC to preserve ecosystems common to Eurasian region and to strengthen internal potential under the framework of the *Zhasyl Damu (Green Development) National Program* and also proposed as Astana initiative on the 6-th Conference of Ministers on Environment and Development of Asian and Pacific Region" (Diyar *et al,* 2013). This project might help the country to realize projects, which combines renewable energy utilization, production of bio products and foodstuff of high value, as it the land recourses, despite

degradation are not contaminated by chemicals. Nevertheless, implementation of the concept and realization of the projects takes time, especially in developing countries, which are oriented to natural recourse extraction and imports. The transition to the green economy takes decades and needs maintenance. Kazakhstan is not an exception in this respect.

3.4 Transition to a green economy concept's goals

The transition to the green economy implemented in Kazakhstan in 2015, being a part of the *Green Bridge Program* and *Strategy 2050*, is a tool to transition current economy model to a more sustainable. This transition document include main priorities that are based on the need to efficiently use natural resources, improve the overall well-being of the population based on the mitigation of pressures on the environment, and create a new pool of infrastructure (Strategy 2050, 2013).

The concept is believed to be implement in in three stages:

2013-2020

- The government will be optimizing the natural resources' use, the improvement of overall environmental performance, and the creation of "green" infrastructure;

2020-2030

- Based on the established "green" infrastructure, the national economy will focus on the careful use of water, stimulation of the development of renewable energy technologies, and the construction of highly energy efficient structures;

2030-2050

- The transition of the economy based on "Third industrial revolution's" principles.

According to the national document the transition is implemented in the areas of use of water in the sustainable manner, the development of sustainable agriculture, waste management, conservation of ecosystems, reducing air pollution, and in the energy sector (Strategy 2050, 2013). Prioritizing the energy sector in the purpose of this research, the

concept would focus on developing energy efficiency and energy saving, development of electric power industry, and the use of renewable energy sources.

Strategy Kazakhstan 2050 states that there is a strong political momentum for a change to set ambitious targets such:

Sector	**Target description**	**2020**	**2030**	**2050**
Energy Efficiency	Reduction of energy intensity of GDP from levels of 2008	25% (10% by 2015)	30%	50%
Power sector	Share of alternative sources in electricity	Solar and wind: not less than 3% by 2020	30%	50%
	Share of gas power plants in electricity production	20%	25%	30%
	Gasification of regions	Akmola and Karaganda regions	Northern and Eastern Regions	
	Reduction of current CO2 emissions in electricity production	Levels of 2012	-15%	-40%

Table 1: Concept for Green Economy Transition's Targets (Strategy 2050, 2012).

3.5 Kazakhstan's Energy Industry

Kazakhstan, being the second largest economy among the Post Soviet Union countries, is a net exporter of energy. The development of the energy sector is a priority for the country, since almost half of its GDP comes from the energy exports. Carbon sources' richness initially has helped Kazakhstan to recover after the collapse of Soviet Union and still provides main input to the country's GDP (Cohen, 2008). However, high-energy intensity and old power stations left from soviet past cause and result in major energy losses and insufficient energy supply. Being a major oil, gas and coal producer, Kazakhstan's energy mix is based exclusively on fossil fuels with a minor contribution from hydropower that serve only 3% of the current energy consumption (figure 2).

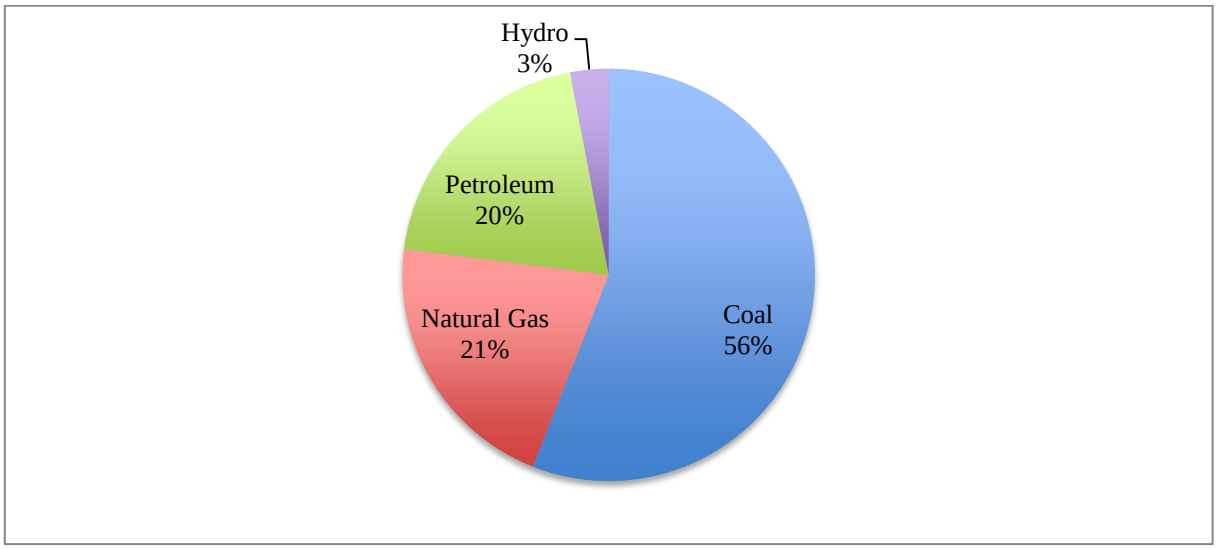

Figure 1: Kazakhstan's Energy Consumption by fuel (U.S. EIA, 2014).

Coal

Kazakhstan is estimated to be the second largest coal producer in Eurasia after Russia, producing about 120 million tonne per year (Vorotnikov, 2013). Mines are mostly located in the center of the country close to the cities Karaganda and Ekibastuz. Most of the country's thermal coal is used domestically to supply the 56% of the energy demand for CHP. The government has also indicated its ambition to increase the production of coal to 151 million tonne per year by 2020 in order to expand its export to neighboring countries, like Russia and

China (Rowland, 2016). Most of the Kazakhstani power plants are CHPs that are left from the Soviet past. Main generating capacities that are coal-based plants are located close to the coal reserves in the North, but lacks gasification in the region due to poor infrastructure. Whereas southern part is connected to the Central Asian Power Grid, but suffers electricity supply due to high-energy consumption.

Oil and Gas Industry

Being an oil producer since 1911, Kazakhstan has second largest oil reserves, sixth gas and third coal reserves among former Soviet Union republics (EIA, 2017). Since its independence, industry of Kazakhstan is dominated by the energy sector. It was estimated that in 2016, country's total production of petroleum and other liquids was 1.698 million barrel per day (EIA, 2017). Kazakhstan had proved to have more than 30 billion barrels of crude oil in its reserves, which is the second largest in Eurasia and twelfth largest in the world (EIA, 2017). Currently, Kazakhstan has 172 oil and 42 gas fields around Caspian sea (EIA, 2017). The continued growth of the production of oil is mostly due to three major oil fields in the Kazakhstani West: Tengiz, Karachaganak and Kashagan. The Kashagan is the fifth largest oil field in the world in reserves, has been resumed after years of delay and expected to produce more than 370,000 b/d at a full capacity (table 2). It is located offshore, in more than 13,000 feet below the seabed and in the very high pressure.

Field Name	**Participating companies**	**Start year**	**Liquids production**
Tengiz(&Korolev)	Chevron, ExxonMobil,KazMunaiGaz, Lukoil	1991	570 thousand b/d is a total liquids production in 2016
Karachaganak	BG, ENI, Chevron, Lukoil, KazMunaiGaz	1984	206 thousand b/d of total liquids production in 2016
Kashagan	KazMunaiGas, Eni, ExxonMobil, Shell, Total, CNPC, Inpex	2016	370 thousand b/d is liquids processing capacity, with current development

			potential production

Table 2: Kazakhstan' major oil fields (EIA, 2017).

Kazakhstan's natural gas reserves are almost 1.3 trillion m3 in the west of the country's fields. The estimates suggest that the reserves would last about 75 years and then face the depletion (EIA, 2017). Kazakhstan's gas is mostly dominated by associated petroleum gas (APG), meaning that most of the gas is produced with oil and some of it is being injected back for the oil recovery (figure 2).

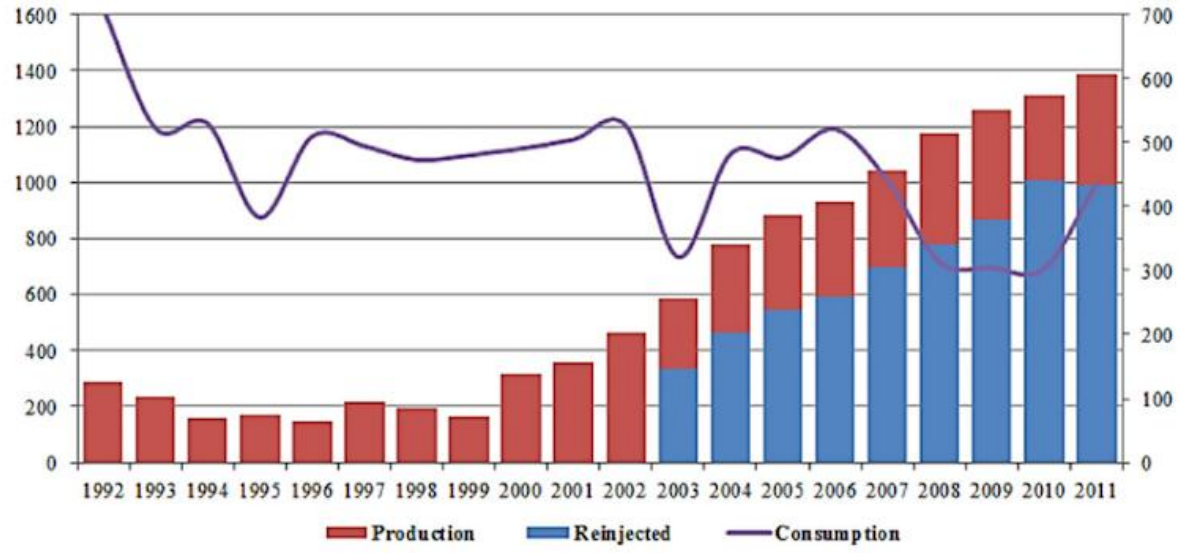

Figure 2: Natural gas production, consumption and reinjected volumes (BCF) (Agency on Statistics, 2013).

Lack of infrastructure prevents the gasification of the country, since the demand centers are not close to the production sites, thus country depends on imports in order to meet growing consumption.

Nuclear Power Potential

Kazakhstan has 12% of the proven uranium reserves. Since 2009 Kazakhstan became the leader in the uranium production, supplying more than 39% of world's uranium in 2016 (Kazatomprom, 2017). Country was a valuable uranium source for the last 50 years, supplying more than 22,000 U per year. JSC NAC "Kazatomprom" is the owner and operator

of the 17 mine projects in Northern, Southern and Southwestern regions of Kazakhstan with half of the projects having foreign equity rights. Strategy 2050 proposed the construction of Nuclear Power Plant in Kazakhstan to achieve the target of getting 4.5% of energy mix from nuclear in 2030 (Strategy 2050, 2012). The government's development plan included $7.8 billion by 2015, and about $64 billion by 2030 of investment in electricity production and grid (Kazatomprom, 2014). In the middle of 2014 JSC NAC "Kazatomprom" signed an agreement with Russian "Rosatom" to build a nuclear plant, from 300 to 1200 MWe capacities, near Kurchatov, Western region of Kazakhstan, however, the plan has been postponed due to "lack of the immediate need" (Kazatomprom, 2016).

Solar and Wind

Solar Energy

Kazakhstan has a big solar potential in the southern part of the country, having high insolation about 2200 to 3000 h of sunlight per year (Shayakhmetova, 2017). The most of the solar activity is the southern regions of Kazakhstan (Figure 2).

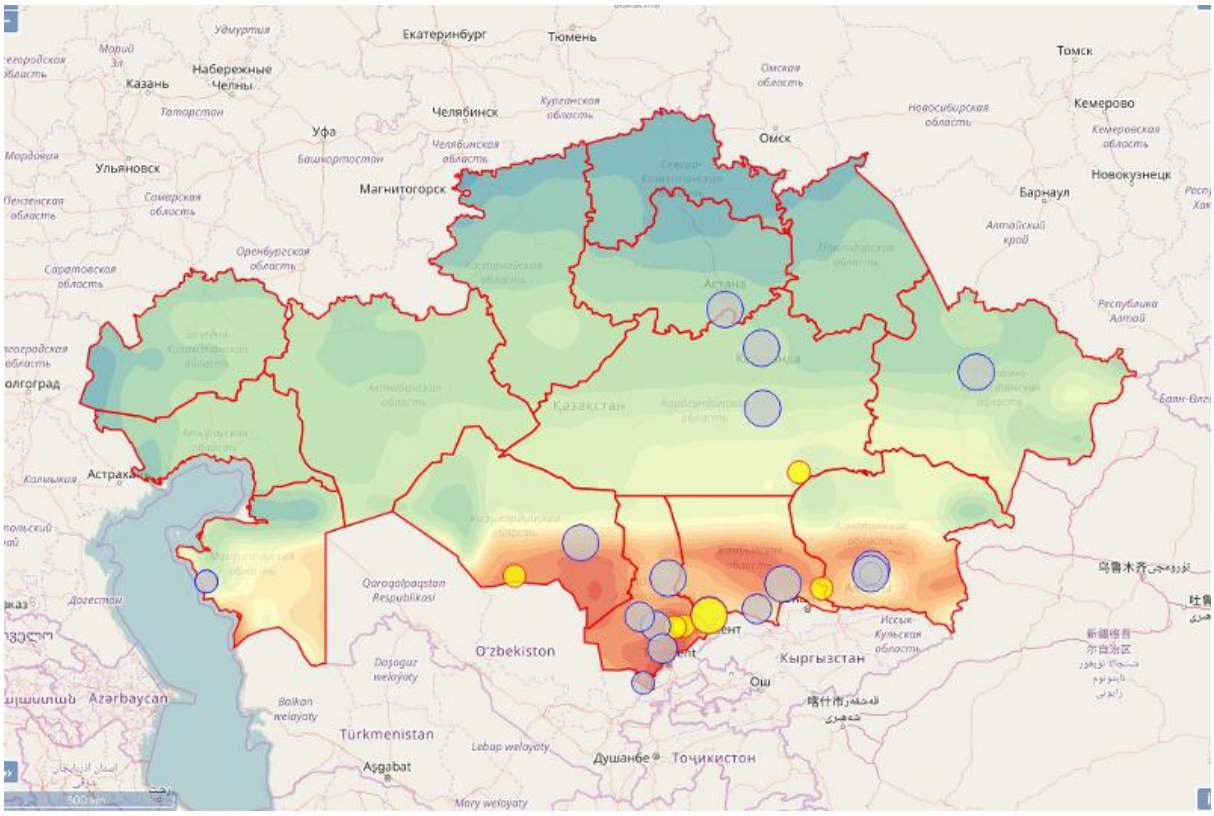

Figure 3: The mean annual solar radiation (Shayakhmetova, 2017).

It has been estimated that both concentrated solar thermal and solar photovoltaic (PV) have potential in Kazakhstan. There is already has been a construction of a 2 MW solar PV plant near Almaty and six solar PV plants that are currently generating the power near Kyzylorda, the southern of Kazakhstan with a capacity of 300 MW in total.

There is no known plans to have concentrated solar thermal plant to install, however the government targeted to generate 1.04 GW of renewable energy capacity by 2020 (Strategy 2050, 2012).

Wind Energy

Kazakhstan is estimated to have an enormous wind power potential, having about 4-5 m/sec of wind in almost 50% of its territory (Terehovics *et al.,* 2016). Most of windy places are located in the region close to the Caspian Sea in the west, closer to the center in Akmola region and some places in the South.

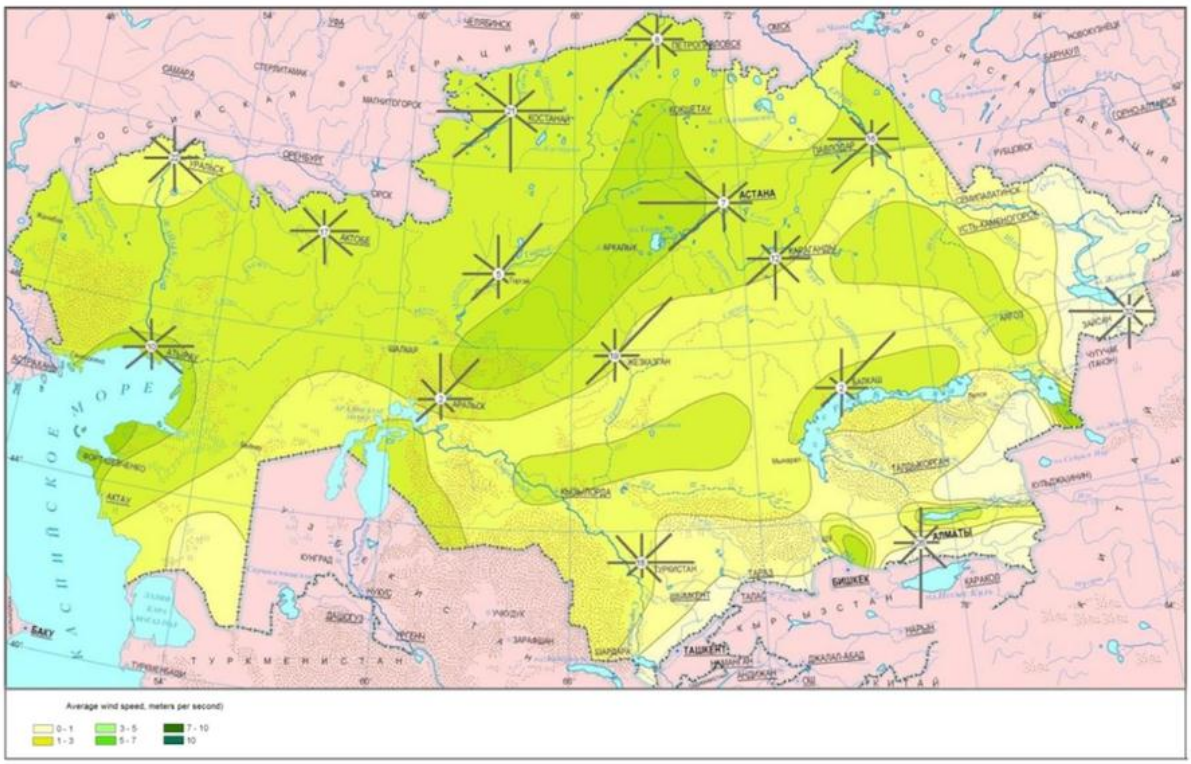

Figure 4: Map of the wind potential areas in Kazakhstan m/s (KRIG, 2013).

It is estimated that wind potential can be developed to 760 GW at the full capacity across the country (UNDP, 2011). At the current time, the first wind plant is under construction at Yerementau in the Akmola region with a capacity of 45MW (Knight, 2013).

Hydro Power

The most developed renewable energy source in Kazakhstan is hydropower. Hydropower accounts for 13% of the total generating capacity (NRGI, 2014). Kazakhstan has about 15 large and 7 more small hydropower plants around the country, which accounts for only 3% of the total energy mix of Kazakhstan (EIA, 2017). Country's main hydropower resources are located in the eastern and southeastern parts on the rivers Irtysh, Ili and Syrdaria. Bukhtarma is currently the biggest station with 675 MW generating capacity in the eastern part of Kazakhstan (World Energy, 2017). Presently the Moinak station with the capacity of 300 MW is under construction.

Biomass

With abundant resources of agricultural lands, Kazakhstan has a potential to generate various bioenergy services. Country produces crops as wheat, maize, barley buckwheat and rice. However, biomass wastes are poorly used, and mostly as feedstock. Organic wastes can have a potential in Kazakhstan, since more than 400,000 households keep horses, cattle or sheep farms. Estimated energy potential can be as much as 35 billion kWh per year (Energy Partner LLP, 2014).

Astana EXPO 2017

In 2013, Kazakhstan won a bid to host Astana Expo 2017 with the theme of "Future Energy". Theme aimed to create a platform for the countries, companies and non-governmental organizations to discuss the safe and sustainable access to energy and practical energy solutions. The intention to host an EXPO was highly linked to the idea of Kazakhstan entering the top 30 developed countries of the world. "Future Energy" theme was chosen to

highlight the importance of growing energy consumption, fossil fuels impacts on the environment and dependence on conventional energy sources that can lead to crisis and country's dependences on one another. More than 100 countries and 30 organisations are participating at the EXPO showing new technologies and energy solutions that address energy challenges associated with growing energy demand and fossil fuels' dependence.

Kazakhstan as its pavilion presented the central element of the EXPO, spherical building called "Nur Alem". Having consisted of 8 floors, each floor is dedicated to a specific energy source such as space, sun, biomass, wind, water and kinetics that are both information abundant and technologically developed.

Moreover, there are thematical pavilions, for example, the pavilion of the world of nuclear energy, where companies like Rosatom, Kazatomprom are presenting their nuclear power plants projects, information on the development of nuclear energy and new technologies.

Best practices area is also included at the EXPO, which showcases the new start up projects and strategies on sustainable energy production, use, storage and consumption. 24 projects were chosen to show solutions on climate change combat and access to affordable and sustainable energy (Astana EXPO, 2017).

Overall, EXPO 2017 is hosted by Kazakhstan with an intention to provide a dialog between countries and showcase the importance of use of energy solutions in the future.

3.6 Energy Security of Kazakhstan

As the concept of energy security is being wisely used, there is no precise definition of the term, however 4 main indicators can suggest about country's energy security. Availability, accessibility, affordability and acceptability are the 4 pillars of energy security (Kruyt, 2009). Availability of the energy sources is one of priorities for the world with growing population and growing energy demands. Today, fossil fuels as oil, coal and gas supply more than 80% of the energy demands in the world (Yergin, 2011). Kazakhstan is not an exception in this

case, having its energy mix comprised mainly from fossil fuels. Having resources and being major oil and gas producer, it is estimated that resources of oil and gas would last for more than 5-6 decades (Karatayev, 2014). Yet, more of the oil fields and the access to them is being opened everyday.

In terms of accessibility of the energy by households and industry, more than 70% of the energy is being used by industry and households are using only 15% and the rest goes to agriculture (Karatayev, 2014). Kazakhstani's industry serve an important role in country's development producing raw materials and selling them to neighbouring countries, however most of the facilities are left from Soviet union, thus are high energy intensified. As energy sources are being unevenly distributed across the country, the accessibility of the energy is challenging for the places that have no coalmines or energy facilities near them. Kazakhstani North, for example has coal powered plants and has access to electricity, whereas southern part has an access to Central Asian Electricity Grid and depends on foreign supplies of gas from near pipelines that transfer gas of neighbouring countries to one another (Karatayev, 2014). Moreover, severe climatic conditions, especially during the winter months create challenges in heating systems. According to committee of statistics, only 24% out of 46% of households in rural areas have district-heating systems (2015). International Energy Agency states that Kazakhstan is on the second place in the world by residential coal consumption per capita, having only 17 billion people (2015).

Affordability of the energy is also challenging for rural areas, since income distribution is uneven and can vary by seasons depending on availability of job (Kerimray, 2016). However, energy prices are low, since most of energy comes from coal that is domestically produced. Yet, by IEA standards, large dependence on coal can be defined as lack of access and affordability of cleaner sources as gas or renewables (2015).

Acceptability of energy in Kazakhstan is also highly correlated with its accessibility and affordability. Having 100% of electricity supply, Kazakhstan experience challenges with

having cleaner energy sources distribution, since most of the low priced energy comes from coal. Households have no intention to pay more for cleaner sources if they cannot afford it by the low income that they have. Similar to that, industry and agriculture would use most affordable energy sources in order to pay less for production taking into account current economic development.

Overall, energy security in Kazakhstan is important for the country, even though it has all natural resources and do not depend on foreign imports. Local challenges that Kazakhstan faces with its energy security affect social and environmental aspects that have to be taken into account.

4. Research Design and Analytical Framework

4.1 The complex character of the research

Since the concept of green economy is complex and interconnected with other issues of the development of the economy, all the aspects are being usually discussed in the different pieces of international literature and national documents. Furthermore, the link between green economy transition and energy industry priorities in Kazakhstan in the current situation has not been discussed in any of the national documents or institutional frameworks of Kazakhstan. Thus, this research aims to explain how green economy concept is possible to be implemented in the near future considering the dependence of Kazakhstan on fossil fuels, and what policies are already shaping the country to address the position of energy security in the political and institutional settings

4.2 Research Design

The research design of this thesis is based on the interpretative group of methods that focused on understanding phenomenon such as green economy. These design and method focus on analytically disclosing the practices that can generate outcomes. This specific research includes four stages: problem identification, preparatory review, field research and analysis of the outcomes from all three stages. The first stage of the research was the problem and research design identification. The following preparatory review stage included the review of the relevant literature based on the problem definition, the identification of the scope of the research and the identification of the main actors (interviewees). The third stage of research was the field research that took place in Kazakhstan, Almaty and Astana cities. Primary data was collected by conducting interviews and attending “Ministerial Conference and the Eight International Forum on Energy for Sustainable Development”. Such event helped to understand new priorities of Kazakhstan towards the use of renewable energy and

green economy transition. Issues on climate mitigation, green economy transition, EXPO on Future Energy in Astana were among the topics that were raised during the interviews.

4.3 Methodology

This thesis research combined several methods of data collection and analysis. Data collection included qualitative interviews, an extensive literature review related to the green economy concept and transition, energy security and the review of national policy documents. The analysis and discussion were based on the qualitative analysis of interview results, the analysis of national strategic documents and various green economy and energy transition frameworks.

Qualitative research method was chosen since it emphasizes the deeper meaning of human experiences aiming to generate the opinions and expose observations on particular topics such as phenomenology or symbolism (Bogdan and Taylor, 1987).

4.4 Data Collection

Primary Data

Primary data for this this research are the interviews with experts from different groups of areas of climate, development, energy, and etc. The essential part of the research is this qualitative data due to several reasons. Green economy and energy security are relatively new concepts for Kazakhstani public and qualitative research is the best approach to look at the issue. Also, Kazakhstan lacks international studies done in the areas of policy making and frameworks implementation in the given context. In addition, taken interviews with various experts from different groups such as the Government, international organizations, private consultants helped to explore different perspectives on the issues. In particular, the provided data showed the insights of the concept implementation, its progress and its gaps. Also, interviews helped to identify the cooperation level between the government, international organizations, and main actors in the area of energy security, and climate mitigation.

Sample Selection

At the beginning of the research sample selection was based on the purposeful sampling that would only focus on interviewees from whom it would be possible to get more information since the implementation of the concept is only being conducted by the government. The search for representatives from main groups has been done prior to the field research and not all the main actors were able to respond to the interview request. As a result, 5 interviews from three groups of the government, international organizations and private consultants are present as a final sample. Even thought the qualitative sampling is less concerned about the size of a sample, unlike the quantitative, not all the governmental officials could be interviewed thus the sample size is smaller than expected.

Format of the Interviews

Interviews were held in person during the research trip to Astana and Almaty, Kazakhstan and two more interviews over Skype for international organization representatives. Semi-structured interviews were held, meaning that questions were prepared in advance. The list of sample questions is placed in the Appendix 1. The interviews varied from 15 to 30 minutes, depending on experts' schedule on time available.

Anonymity

Since most of the interviewees preferred to stay anonymous, their names would not be mentioned, but to be referred as officials from respective institutions. Using the coding method of interviews, the table of interviewees with their ID numbers was created (Appendix 2).

4.5 Analytical Framework

The comprehensive overview of green economy in the global level is important to look at the local approach of Kazakhstan to the concept's implementation, its priorities and goals (Figure 1). The following analysis is then being linked to the energy development in

Kazakhstan, its priorities and institutional settings. This analytical approach is important to identify challenges of the green economy concept's implementation through the look on the energy priorities of Kazakhstan, since the development of both strongly correlated.

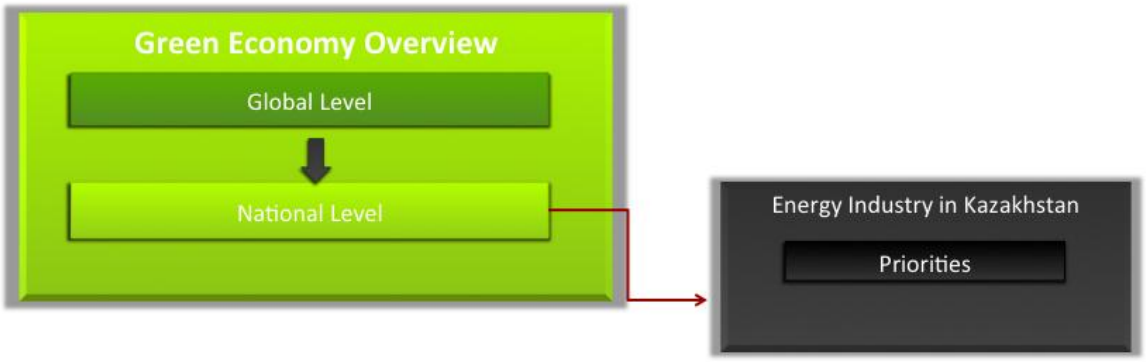

Figure 5: Analytical Framework

4.6 Data Analysis

Secondary Data

Secondary data was based on the existing published articles and books, national documents, strategies, programs and concepts of the Republic of Kazakhstan. Such collection of published materials contributed to the overall research and helped to identify the energy security issues and gaps in the green economy concept.

Primary Data

Qualitative data was collected through interviews that were recorded. The qualitative data collected during interviews was in Russian and English languages and from Russian language it was first transcribed and then translated into English. As a main approach to qualitative analysis, the thematic analysis was applied. Thematic analysis includes codes in the context of the text. The coding strategy was based on the questions that were asked. Since 6 main questions were asked, 6 main themes were picked and then extrapolated to the smaller keywords within the each theme presented.

5. Discussion

5.1 Findings

Based on the extensive literature review and the primary data findings, Kazakhstan's current state is full of challenges in terms of the green economy transition that cannot be viewed without the global context. Kazakhstan is becoming a part of international treaties that shape country's political and institutional development pathway. Green economy concept described by the Kazakhstani strategy is closely correlated with the global concept of the green economy. As it focused on sustainable development where economy is shifted towards using cleaner sources of energy and sustainable use of natural resources, Kazakhstani green economy also sets similar goal.

As country depends on economic gains from exports, the political and institutional settings are highly determined by economic priorities. The analysis of the current energy development revealed that oil production heavily lies on three major oil fields, Tengiz, Karachaganak and Kashagan. Recently, Tengizchevroil consortium decided to expand its production by 260 thousand b/d more by 2022 (EIA, 2017). The Kashagan field that has been opened in 2016 for an operation is expected to produce more than 370,000 b/d at a full capacity (EIA, 2017). All of these factors suggest the important role of the oil sector in comparison to the renewable energy sources' development.

Furthermore, the transition concept sets highly ambitious targets, and meeting such obligations of 30% and 50% of use of renewable energy by 2030 and 2050 seems questionable as according to experts and current news, the extraction of fossil fuels would be increased. Moreover, coal production is set to increase, and more of the projects on oil and gas extraction are already in the process. These all suggest that the development of renewable energy is facing several obstacles.

According to some interviews, the construction of nuclear power plant, that was scheduled to be finished by 2020, could take some of the energy dependence from coal and

petroleum, however its construction is undetermined and has been postponed (Interviewee 3). The construction of the wind plants and solar plants are also underway, however as pilot versions with small capacities. Interviewee 4 and 5 mentioned the there is a gap in collaboration between the ministries and highlighted that all decisions are made at the top. Moreover, it was noted through the research that while projects on expanding the oil and gas exploration are being adopted, the "environment-driven" legislations are being postponed due to lack of need (Interviewee 1).

According to the Interviewee 1, as the reduction of GHG emissions is set as a target in the green economy transition, the climate change mitigation approaches and the development of Emissions Trading Scheme (ETS KZ) are not included in the concept and are only being monitored by the Paris Agreement and NDC. In addition, interviewee highlighted that the development of oil, gas and electricity sectors are more important due to the growing energy consumption compare to the reduction of GHG emissions.

Visiting *Ministerial Conference and International Forum on Energy for Sustainable Development* has also exposed valuable opinions on transition to a sustainable energy system. Forum has addressed key priorities for the world related to the energy use, focusing on understanding the role of natural gas as a part of the transition, energy efficiency in industry, buildings, use of renewables and their development, and reduction of an environmental footprint. According to the Astana Ministerial declaration, based on the outcomes from forum, ministers and associated officials agreed to several goals such:

1. Invest in education in order to build a capacity that would solve energy challenges as world moves forward,
2. Promote and participate in the dialogues between the countries on energy efficiency, finances, and development of renewables.
3. Develop frameworks to promote investments in renewable energy development and deployment by developing countries.

4. Increase private sector's involvement in use and finance of renewable energy projects.

Forum has highlighted that there are challenges in transition associated with luck of attainment of energy targets, remote areas have no attention from central government to have an affordable access to energy, low maintenance of infrastructure, focus of the governments on high cost of renewables and not on their benefits.

Since there are a lot challenges with the development of renewable energy, Kazakhstan require a lot of investments into the development of the sector. It was revealed that the proven reserves of fossil fuels are estimated to deplete in the next 5-6 decades, and the development of the nuclear power can be an advantage in terms of having a conventional source of energy that has minor emissions and environmental impacts compare to coal and gas. Energy prices are considerably lower in Kazakhstan than in any other develop nation with use of domestic coal, but households are experiencing challenges with affordability of cleaner sources of energy and accessibility of gas. Also, interviewee 5 mentioned that it is important for country to focus on the gasification and the development of infrastructure related to the gas access for the regions with no energy access. Akmola region with the capital of Kazakhstan, Astana does not have gas and the growing demand of the newly built capital is a major factor that highlights the importance of the government to prioritize the gasification in the region.

In terms of energy efficiency, interviewee 2 stated that the energy efficiency strategy 2020 and its targets have been postponed due to the lack of infrastructure and that more of the importance needs to be taken into account reforming the system. Interviewees highlight the importance of the current situation considering the ambitious targets that can be achieved only with major investments and the governmental will. Kazakhstan's resources are unevenly distributed across the country, which creates a challenge in terms of their use and transportation.

Climate change mitigation has also been discussed as major instrument that can help an energy transition. ETS KZ as a part of Paris Agreement and NDC is ineffective at this

current time, since it has been postponed until the January 2018. Interviewee 1 and 4 have emphasized the importance of ETS KZ as a major instrument that can drive the energy transition towards more renewable energy sources, since it has targets that require the energy intensive industries to decrease emissions. However, it is also true that there are gaps in ETS KZ's implementation into the political and institutional settings, since the system needs to be modified. Moreover, interviewee 4 states that ETS KZ needs to be linked to major EU ETS in order to meet the standards of global levels of GHG emissions reduction. It would be beneficial for Kazakhstan to gain experience from other ETS.

Interviewees have also highlighted that the International Exhibition "EXPO 2017 on Future Energy" that is hosted in Astana has created an important platform for the dialogues between the countries on importance of renewable energy. Kazakhstan has presented 8 floors pavilion showing various projects that are being implemented and will be implemented in the future related to the transition to the green economy. However, interviewees were also sceptic about the importance of having such event at this time, considering the lack in renewable energy development in Kazakhstan.

According to interviewees, economic priorities in Kazakhstan go first since the development of the country is more important considering our dependence from neighbouring countries in terms of energy exports.

6. Conclusion and Recommendations

6.1 Conclusion: Transition Drivers and Perspectives

Structural changes in energy systems related to the introduction of renewables are highly dependent on their drivers and perspectives. National energy transition is case of the Kazakhstan has to be driven by multiple variables such environmental deterioration, air quality, population growth leading to high energy consumption, and a decrease of oil and gas reserves in the future. Moreover, co-evolution of techno-economic, sociotechnical and political perspectives needs to be traceable in the current implementation of the projects. Unfortunately, it has been revealed that green economy transition concept has a low potential for its implementation. Given the fact that it is in force and different strategies are in place to achieve goals of the strategy, based on the data analysis most of the goal are seem to be unachievable or partially achievable to its propose deadlines. National policy on the transition takes into account the environment aspect as GHG emissions reduction, however does not provide the support to the only one effective climate mitigation approach as ETS KZ.

In fact, all challenges associated with renewable energy development lies on the dependence from exports and use of cheaper fossil fuels that are abundant in the country. Despite the fact that programmes and strategies on improving energy efficiency and energy savings are in place, they do not adequately address the energy security issue, since the development of renewables is slow and the amount of non-renewable sources would deplete in the next few decades, the issue would become really important.

While the government is focusing on promoting renewables, there are still barriers to address the issues related to a transition to a green economy. The financial cost of renewables is nowhere to compare with current low priced electricity. Absence of national program on renewable energy development and action plans can be seen as institutional barriers. Also, oil and gas sector is still successful in terms of its development having projects on expansion of major oil fields being approved by the central government.

6.2 Recommendations

On the basis of the extensive literature review and qualitative interviews, several recommendations can be made in connection with green economy transition concept in the given context.

1. The development of the alternative energy sources is crucial for the country's independence from its own fossil fuels, thus Kazakhstan to prioritize the development of alternative energy sources as soon as possible for multiple reasons. First, the prices for the crude oil are decreasing and the demand for fossil fuels would decrease over time. Second, the growing production of non-renewable sources is leading to its full extraction and the resources depletion in the next 3-4 decades. Kazakhstan will be driven to transition to a different energy sources. The potential for solar and wind energy farm is huge in Kazakhstan, which can be a valuable asset toward the development and use of renewables.
2. It is important to develop infrastructure for gasification, the transmission grids, to have a full energy access for the country. Kazakhstan has to focus on decarbonisation, however in comparison with coal, gas can be a valuable resource to decrease emissions and also use cheaper energy source.
3. It is crucial for Kazakhstan to increase the status of renewable energy development as nuclear, wind, and solar energy sources. Since Kazakhstan is hosting the EXPO on Future Energy, the new solutions and technologies are accessible as international delegations and world's leading organizations have brought their projects to Kazakhstan's capital. More dialogue on collaboration and transfer of technologies has to be in place.
4. Climate change mitigation efforts need to be improved and has to be focused on GHG emissions specifically from major oil fields and coal-powered stations. Since ETS has been postponed, it is important to renew the system and strength it to see the results.

5. Given increasing electricity demand and rapid economic growth modernization of existing facilities is needed in addition with construction of new ones.

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Appendices

Appendix 1. List of sample questions

1. *Could you please tell me about your position?*

   In your opinion:

6. *What is Green Economy transition for Kazakhstan?*
7. *How is your work related to the green economy concept's implementation?*
8. *There are 3 stages of the concept's implementation and the first phase is close to its deadline, in what stage of implementation is your field?*
9. *There is less than two years left for end of the first phase, would country be able to achieve its preliminary goals?*
10. *Is it plausible to host EXPO 2017 on renewable energy at this current time?*
11. *Do water-food management need to be included in the transition along with energy or can be seen as separate issues?*

Appendix 2. List of Interviewees

Interviewees' ID	List of Interviewees
1	Official from JSC "Zhasyl Damu"
2	Official from JSC "Energy Power and Energy Saving development Institute"
3	Official from JSC NAC "KazAtomProm"
4	Official from "Carbon Limits", Norway
5	Official from "Climate Focus", Netherlands