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DIVESTING FROM FOSSIL FUELS IN CENTRAL ASIA

Factors affecting Renewable Energy Transition in Kazakhstan, Kyrgyzstan, Tajikistan

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Executive Summary

Renewable energy *is becoming more and more popular over the years and even states that produce and depend on fossil fuels are starting to invest in this kind of energy. The main reasons behind that shift are identified as the* ***effects of climate change*** *exacerbated by the burning of fossil fuels, accompanied by the rapid* ***depletion of fossil fuels****. The* ***purpose*** *of this research project is to* ***explain*** *the* ***factors*** *that promote or hinder the* ***renewable energy transition*** *in dependent on* ***oil and gas countries****.* ***Endogenous*** *and* ***exogenous*** *factors are therefore assessed, such as* ***geomorphology, political stability*** *and* ***investments*** *in order to identify their contribution to the transition process and provide an* ***indication*** *about the* ***future development*** *of this transition. In order to do so, this research focuses on* ***Central Asia*** *and* ***three case study countries*** *from the region have been selected,* ***Kazakhstan, Kyrgyzstan and Tajikistan.*** *Thus, the* ***main factor for those countries' transition is sought*** *and a* ***projection*** *of the* ***future development*** *of this process is endeavored. A* ***qualitative comparative analysis*** *is conducted, based on* ***literature review, data and statistical information*** *from* ***national*** *and* ***international organizations a****nd* ***agencies*** *have been used.*

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1. Introduction

Energy from fossil fuels was and still is the basis of economic growth and prosperity of states (Barbir et al., 1990); however fossil fuel combustion bears several environmental costs. Fossil fuels are responsible for most Greenhouse Gas emissions, including 74% of carbon dioxide, one the most important Greenhouse Gases (Moriarty et al., 2011). Currently almost 80% of the global primary energy consumption comes from fossil fuel combustion and this intense use of those natural resources seems to exacerbate the effects of climate change (Withagen, 1994). Furthermore, natural resources such as fossil fuels are not infinite and they are gradually depleting, making their use unsustainable.

These facts enhance the arguments that the current use of fossil fuel reserves has to be significantly reduced and that other alternatives to cover our energy demands should be sought (Shafiee et al., 2009). The only alternative to fossil fuels that can provide us with the energy we need, but does not bear the safety and health implications nuclear energy does, is energy generation from renewable, non-depletable sources. These sources are divided into continuously available sources, such as biomass, hydro, and geothermal energy, and intermittent sources such as wind, solar and the various forms of ocean energy (Moriarty & Honnery, 2011).

The availability and the infinite nature of renewable sources together with the growing environmental problems and high global oil prices have led many stakeholders to start divesting from fossil fuels and to start investing in renewable energy sources instead. This has paved the way to renewable energy transition, which is basically a process of moving away from fossil fuels for energy production and using low carbon and even de-carbonized sources (Mc Killop, 2011).

This process has globally been intensified especially during the last decade of the 20th century. It was then when it became evident that the current fossil fuel use should be reduced or at least halted worldwide, leaving a certain amount of fossil fuel reserves unused, if the worst effects of climate change are to be avoided (Moriarty et al., 2010). This process was initiated by individual countries but soon international organizations such as the International Renewable Energy Agency emerged in order to promote and co-ordinate investments in renewable energy. The number of countries taking part in those organizations' programs is impressive, but the most striking fact is that even countries that produce fossil fuels are actively taking part in the process aiming to increase their renewable energy share.

One group of countries that has endorsed the renewable energy transition process is the Central Asian countries. These countries are rich in energy sources, both fossil and renewable sources, and they are trying to diversify their energy generation, despite the fact that they have long been based on their fossil fuels for their energy generation needs (Xuetang, 2006). They are newly independent states, they just have 25 years of independent history, and they try to adapt themselves into the western type of economic development and democratic functions. Their economies are characterized as *economies in transition* and they have a unique political system, a mixture of western democracies with Asian influences (Olcott, 2000). That is what makes the studying of this region interesting. These countries develop in their own way; based on western economic and political standards, therefore they are different from the typical industrialized democracies that undergo renewable energy

transitions. Furthermore there have been few studies examining the renewable energy transition of the region, as the majority of studies on Central Asia focus on its vast hydrocarbon reserves and their further exploitation. Hence this study tries to fill in a gap in existing literature about renewable energy transition in Central Asia and its republics, which are far from the typical western industrialized republics.

The aim of this study therefore is to examine and explain which factors promote or hinder the renewable energy transition process in Central Asia. A region of the world rich in hydrocarbons with huge potential in renewables and with renewable energy projects underway. Three Central Asian countries serve as case study countries for the purposes of this research, the Republics of Kazakhstan, Kyrgyzstan and Tajikistan. *Endogenous* and *exogenous* factors such as their geomorphology, their political stability and the Foreign Direct Investments in their economies are examined and used not only to explain the transition process in states dependent on oil and gas production regions with huge renewable energy potential, but also to project the future development of renewable energy.

2. Research Question and Sub-questions

The main research question that this study endeavors to answer is:

- *Which factors explain the renewable energy transition course in Kazakhstan, Kyrgyzstan and Tajikistan?*

Some sub-questions that this paper also tries to answer are:

- *What is the renewable energy transition level of these countries?*
- *What is the role of geomorphology into the transition level?*
- *To what extend does the sociopolitical regime in the countries affect the transition?*
- *What is the role of foreign investors in the renewable energy transition in these countries?*
- *Which implications do these factors bring to the future of the renewable energy transition in those Central Asian states?*

3. Analytical framework

Renewable energy transition is the process of moving away from fossil fuel use in energy production by using low carbon or de-carbonized energy sources to cover our energy needs (Mc Killop, 2011). These sources can be the sun, the wind, ocean energy, geothermal energy, biomass and hydropower. Indeed, according to the existing literature and data, Central Asian countries, among them Kazakhstan, Kyrgyzstan and Tajikistan, are already using their hydropower and they have plans and projects on developing other renewable energy generation sites (Iacomelli, 2006).

For the purposes of this research the renewable energy transition is categorized as dependent variable, as it is the key concept this paper investigates and tries to explain. The renewable energy transition process in this paper is measured by looking at share of renewables in the energy mix of the three Central Asian republics. More specifically, the electricity generation mix is examined and the percentage of renewable sources used for electricity generation is the indicator that will let us identify the level of renewable energy transition on which Kazakhstan, Kyrgyzstan and Tajikistan are. The greater the percentage of renewable sources used for electricity generation the more advanced the transition is.

Renewable energy transition though, is not a simple process and it can be influenced by geographic, economic, political, social and other factors. The present research categorizes the factors that influence renewable transition as independent variables and distinguishes them in endogenous and exogenous. Endogenous factors are factors related to characteristics of the countries themselves, such as their geomorphology or their socio-political regime and exogenous factors are factors related to characteristics attributed to these countries from outside the countries, such as investment level from foreign investors.

According to the existing literature the most prominent factors influencing renewable energy transitions are the geomorphology, the political stability of a country and the Foreign Direct Investments in a country. This research focuses on these factors and investigates which of them are the most important when it comes to renewable energy transition. Moreover this research examines whether those factors promote or hinder the renewable energy transition in Central Asia and particularly in Kazakhstan, Kyrgyzstan and Tajikistan.

The first *endogenous* factor that influences the course of renewable energy transition is *geomorphology*. Literature suggests that the geographical potential is the most obvious determinant of the amount of power from renewable energy sources likely to be deployed in a country (Toke et al., 2008). There are different types of renewable energy sources and the sitting of renewable power plants can determine the development of the renewable energy capacity of a country (Wolsink, 2007). Thus, in order to explain the present course of the transition and assess its future course in Kazakhstan, Kyrgyzstan and Tajikistan, these countries' geomorphology is investigated. The landscape formation of these countries helps us explain the current renewable energy share and gives a sign about the future development of renewable energy, regarding its potential exploitation.

Existing literature indicates that "*politics is the constant companion of socio-technical transitions, serving alternatively, and often simultaneously, as context, arena, obstacle, enabler, arbiter, and manager of repercussions*" (Meadowcroft, 2011), (Meadowcroft, 2007). Based on this argument about the significance of politics in transitions, this paper examines the *political stability* as an *endogenous* factor affecting renewable energy transition. Political stability is the durability and integrity of a current regime and according to Fishman (1990) "*regime is the formal and informal organization of the centre of political power and its relations with the broader society".* This paper thus examines the political stability in its socio-political context as defined by Fishman. Regarding the formal and informal organization of the centre of political power, this study examines the formation and the function of the three *branches of government*[1] in Kazakhstan, Kyrgyzstan and Tajikistan and their relations with society. Additionally in order to examine the relations of society with their governments, this study looks into population characteristics of these countries and the *social cohesion* within the countries. According to OECD (2012) "*A cohesive society is a society that works towards the well-being of all its members, fights exclusion and marginalization, creates a sense of belonging, promotes trust and offers its members the opportunity of upward mobility*". This paper examines social cohesion by researching the level of ethnic diversity within the countries, namely the existence of *ethnic minorities* and their relations with the rest of the population and the government (Sturgis et al., 2013). All these affect the internal political stability of a state which can be shattered by social unrest incidents. Hence this paper also investigates the occurrence of *political crises* or *turmoil* in Kazakhstan, Kyrgyzstan and Tajikistan the last 25 years to measure political stability.

Last but not least, literature suggests that investments on renewable projects influence the renewable energy transition processes (Meadowcroft, 2009). Hence this study also accounts for investments as a third factor that affects the renewable energy transition. More specifically Foreign Direct Investments on renewable energy sectors are examined as they are the most prominent types of investments that influence the transition. FDI is of particular importance for the development of the energy market of many countries as it brings technology, know-how and management practices to other countries and it opens up new opportunities. "*FDI is defined as cross-border investment by a resident entity in one economy with the objective of obtaining a lasting interest in an enterprise resident in another economy. The lasting interest implies the existence of a long-term relationship between the direct investor and the enterprise and a significant degree of influence by the direct investor on the management of the enterprise"* (OECD, 2008). Hence this study categorizes FDI as an exogenous factor as the investments come from outside the countries of the projects. The amount of US dollars invested the last decade from foreign investors in renewable energy projects in Kazakhstan, Kyrgyzstan and Tajikistan is used as an indicator.

At this point we need to acknowledge that the factors this paper examines regarding their influence on the renewable energy transition process are not the only factors influencing this process. Renewable energy transition is a complex process and there are other factors like the technical capability of a country or the public support towards the renewable energy transition process. The factors that this paper examines though seem to be the most prominent in the transition process, based on the existing literature. In addition, there might be an interaction

[1] Executive, legislative and judicial branch

among some indicators; however that is not a problem in our research, as we try to explain a very complex issue and this interaction is an integral part of social and political concepts.

4. Methodology

This is a qualitative research which tries to understand the factors that promote or hinder the renewable energy transition process in the three central Asian republics of Kazakhstan, Kyrgyzstan and Tajikistan. A comparative analysis and assessment of the factors presented in the previous chapter is conducted which tries to explain their importance in the transition process by also indicating the future development of the energy transition on these states.

Central Asia has been selected as the region in focus due to the great significance this region gained the last decades regarding its natural resources among regional and international actors. This long forgotten by the international community region, has been rediscovered since independence from the former USSR, due to its vast hydrocarbon reserves and renewable energy sources (Iacomelli, 2006). Investors from all over the world and especially from Russia and China are actively taking part on various economic activities the last years in these countries (Balci et al., 2010). Five states are situated in the region, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan; all five were part of the former Soviet Union and according to studies they are rich in hydrocarbons and other energy resources (Dorian, 2006). Apart from its natural resources the region has been the transit point from east to west and therefore a major trading hub between East Asian markets and European markets. Central Asia is gradually becoming again a significant trade route for the continental trade between Europe and China, especially through efforts of reviving the old Silk Road (Balci et al., 2010).

For practical reasons, this paper cannot research all five states, so three states have been selected Kazakhstan, Kyrgyzstan and Tajikistan. These states share a common history and they have cultural and social similarities. Their level of economic development and energy use is different though, as well as their political structure and their geomorphology. Kazakhstan is the biggest and wealthiest country among the five in the region with large open spaces, and Kyrgyzstan and Tajikistan are the two smallest and poorest countries of the group with high mountains (CIA, 2015). Moreover the differences on their renewable energy use and their slightly different socio-political regimes made these three countries the most interesting case study countries from the region. Finally, all three countries exploit at some extend their renewable energy sources, along with their hydrocarbon reserves, but they also have plans of expanding their renewable energy capacity.

An empirically driven research has been conducted through an extensive literature review of the various economic, political social and environmental papers, books and articles regarding Central Asia. Statistical sources and data from the selected countries' statistical and governmental agencies have been used, accompanied with data from international organizations, banks and think tanks, like the World Bank, the United States Energy Information Agency, Santander Bank, International Crisis Group, United Nations Development Program, United Nations Conference on Trade and Development, Organization for Economic Co-operation and Development. Newspaper articles and magazines like Time

magazine, EurasiaNet, Astana Times, Azernews, Foreign Policy, and Al Jazeera have also been used as secondary sources for the purposes of this paper. All sources and data have been in English, apart from some statistical information in Russian. The non use of sources in Russian did not pose any restrictions on the research, as there was adequate amount of information and data in English. All data that has been used concerned the last 24 years, from 1991 until today.

5. Findings and Discussion

5.1. Dependent variable: Energy market mix

This chapter examines the energy mix of Kazakhstan, Kyrgyzstan and Tajikistan as dependent variable, and particularly the *electricity generation mix* of these countries. The dependent variable was measured on the basis of *renewable energy share in electricity mix* and that gives us information on the renewable energy transition level these countries are. The total electricity net generation and consumption of the countries, as well as the per capita electricity consumption have been measured to provide us information about the electricity sector on those three countries and its future prospects. These indicators helped us distinguish between leaders and laggards on renewable energy transition. Additionally, a comparison of the renewable electricity mix of those three Central Asian countries with some European countries that are leaders in the renewable electricity generation has been made in order the level of transition that these countries are to be better understood. Three European countries, namely Sweden, Norway and the Netherlands, which are leaders in renewable electricity and have similar population, electricity generation and consumption patterns with our Central Asian case study countries have been chosen for the comparison.

5.1.1. Kazakhstan

Kazakhstan is a fast growing country that its economy develops and expands steadily. According to World Fact-book (CIA, 2015), in 2014 the Kazakhstani Gross Domestic Product (GDP) in Purchasing Power Parity (PPP) was $420.6 billion, while the per capita GDP (PPP) was $24.100. Services, industry and agriculture contributed to the total GDP by 65.6%, 29.5% and 4.9% respectively. The major source of employment in Kazakhstan is heavy industry with main focus on the production of oil and gas. The country has substantial oil deposits in the Caspian Sea region. In 2007 it was estimated that Kazakhstan had 3.2% of the global oil and gas reserves (CIA, 2015).

Regarding Kazakhstan's total net electricity generation, the U.S. Energy Administration statistics (2015) and table 1 show that there has been a steady increase on the electricity generation since 1999, which topped at 86.586 billion kWh in 2011. On the same table we can observe that there has been a similar increase on the total electricity consumption in the country, which reached 76.210 billion kWh in 2011. According to World Bank (2015) and Table 2 the increase on the total electricity consumption after 1999 was followed by an increase on the per capita electricity consumption, which reached 4.893 kWh per person in 2011.

Table 1: Total Electricity Net Generation/Consumption in Kazakhstan

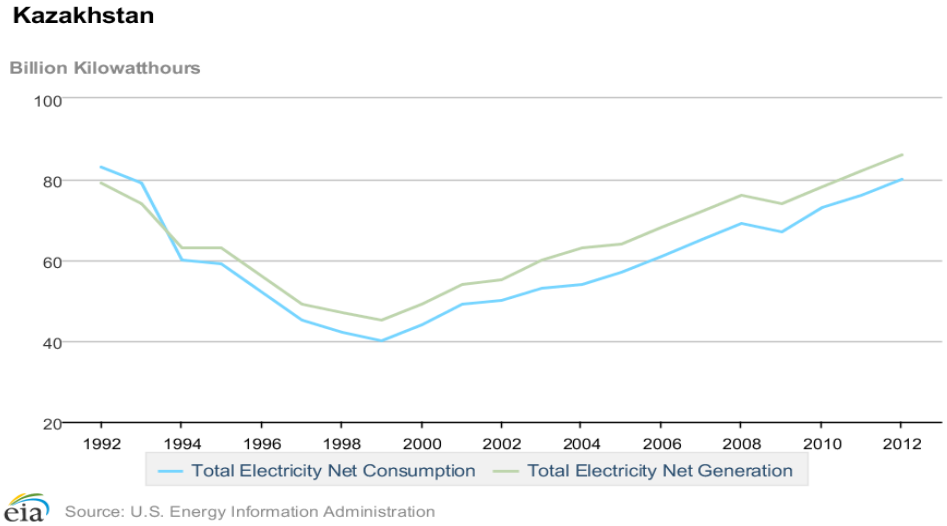
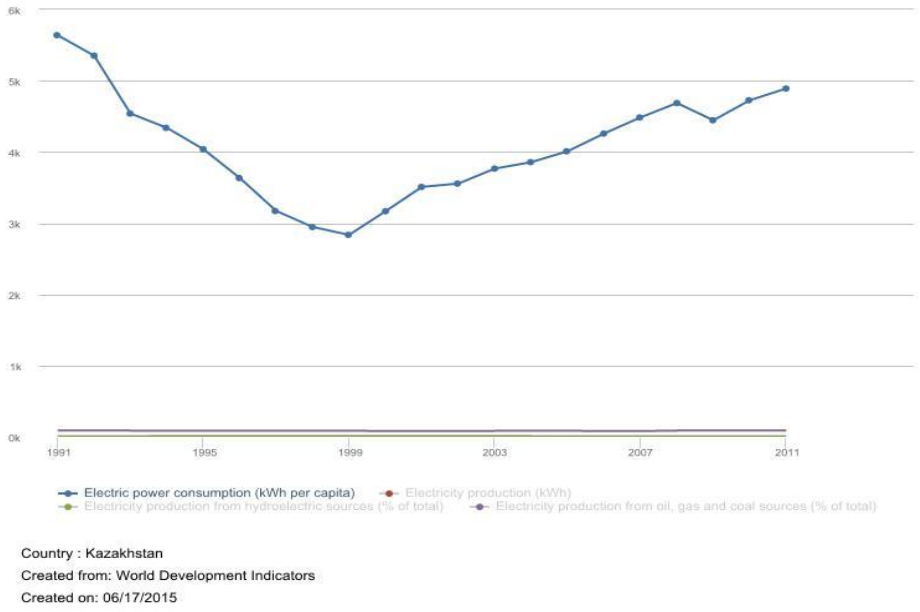
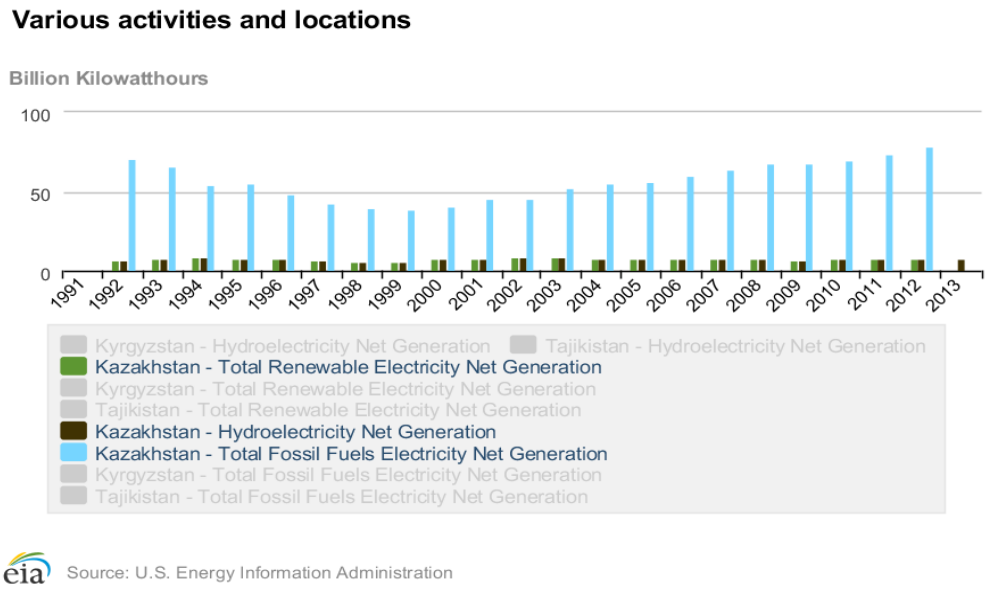


Table 2: Per Capita Electric Power Consumption in Kazakhstan



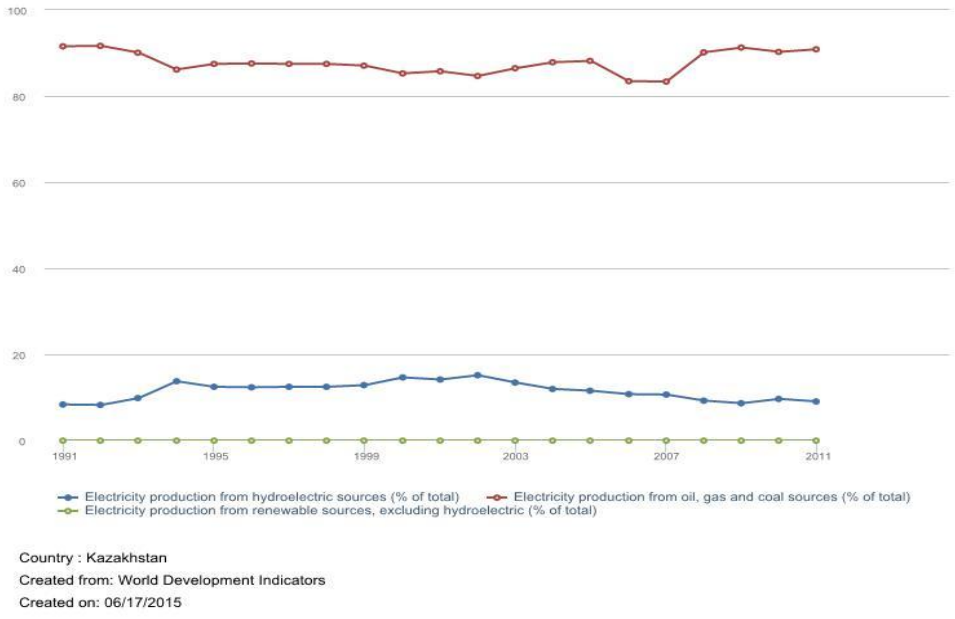
The increase in Kazakhstan's electricity production and consumption patterns however, cannot be linked to an expansion of its renewable energy sources capacity. Kazakhstan is well endowed with energy sources, especially fossil fuel sources. As table 3 shows these resources contributed to the increase of the total fossil fuel electricity generation in the country after 1999. Regarding the total renewable electricity generation figures though, there has been an increased after 1999, but this increase is less compared with the increase on fossil fueled electricity generation.

Table 3: Total Fossil Fuel and Renewable Electricity Generation in Kazakhstan



As Table 4 depicts, after 1999 the total renewable electricity generation kept fluctuating between 9%-15%. The rest of the electricity generation in the country was coming from fossil fuels and it fluctuated between 84%-91%, as we can see on the same table. It should be highlighted at this point, that the electricity produced from renewable energy sources in Kazakhstan comes from hydro-powered sources, as the country has not developed yet any other renewable sources for electricity production.

Table 4: Sources of electricity production in Kazakhstan (% of total)



The Kazakhstani government introduced its renewable energy and energy efficiency policies for the first time in 1997 with the Law on energy savings[2] (EBRD, 2010), although it has been exploiting its hydro resources since the soviet era. However, no strategy aiming to the diversification of the country's energy sources was presented until 2012. Then a long-term strategy on the diversification of the country's energy sources was adopted and it set an ambitious goal of generating 50% of all power from alternative energy sources by 2050, including renewable sources (Jafarova, 2013). In addition Astana adopted in 2013 a new law[3], which promotes technology-specific feed-in tariffs for selected renewable energy technologies, such as biomass, solar, wind, geothermal and hydropower up to 35 MW (Republic of Kazakhstan, 2013).[4] Furthermore, a plan to develop alternative and renewable energy sources was adopted by the government the same year. This plan sets targets for the country's renewable energy capacity expansion. By 2020 up to 1.040 MW more should be produced, including 793 MW from wind, 170 MW from hydro and 4 MW from solar sources (UNDP, 2015).

As it can be derived from the above data, there is a developed Kazakhstani renewable energy sector and the government has plans for its further expansion. If we compare Kazakhstan with European country with similar population and total electricity production, we can see that it does not lag much behind regarding its share of renewable electricity in the total electricity generation. According to the World Bank data (2015) in 2010-2011 for example, almost 9%-10% of the Kazakhstani electricity production came from renewable energy sources, while for the same years the Netherlands produced around 12-14% of its total electricity from renewable sources. The difference seems to be not big, considering the fact that Kazakhstan is a relatively new established state with lower economic capacity.

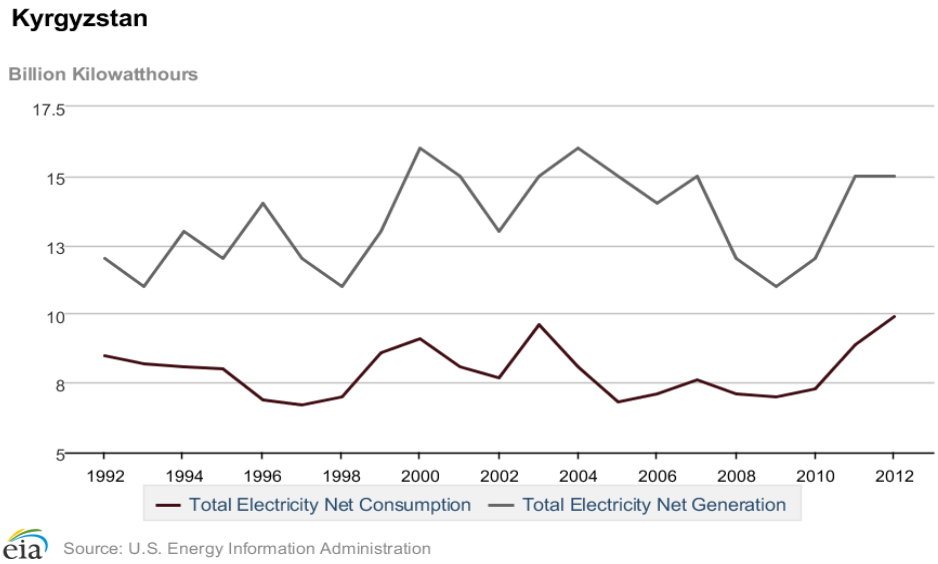
5.1.2. Kyrgyzstan

Kyrgyzstan is a country with an economy in transition and with huge electricity needs for its energy consuming industry. The Kyrgyzstani GDP (PPP) for 2014 was estimated in $19.290 billion, while the per capita GDP (PPP) reached $3.400. The country's economy is based on agriculture and extraction of minerals, while its exports include among others uranium, natural gas and electricity (CIA, 2015).

As table 5 presents, a fluctuation above 10.000 billion kWh can be observed in Kyrgyzstan's total electricity production. On the same table we can see that the total electricity consumption has been similarly fluctuating below 10.000 billion kWh.

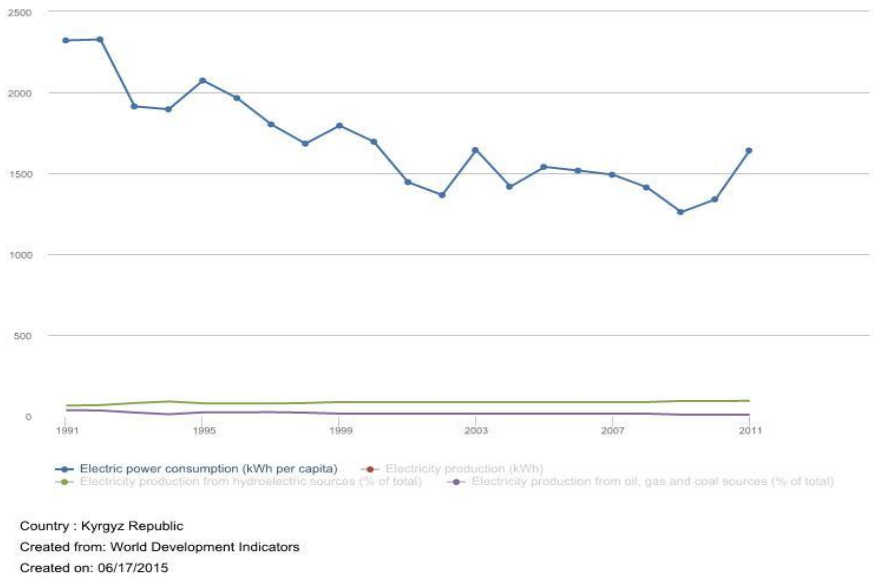
[2] the Law on energy savings was amended in 2006 by the Kazakh government
[3] Law of the Kazakh Republic "*On Supporting the Use of Renewable Energy Sources*"
[4] The cost of the programme is estimated at KZT 1,100 billion/ €5.3 billion

Table 5: Total electricity Net Generation/Consumption in Kyrgyzstan



The per capita electric power consumption in the Kyrgyz republic was declining since independence, but after 2010 followed the increase in the total electricity generation and production in the country. According to World Bank statistics and table 6, an average Kyrgyz citizen in 2010 was consuming 1.339 kWh, while in 2011 he/she consumed 1.642 kWh.

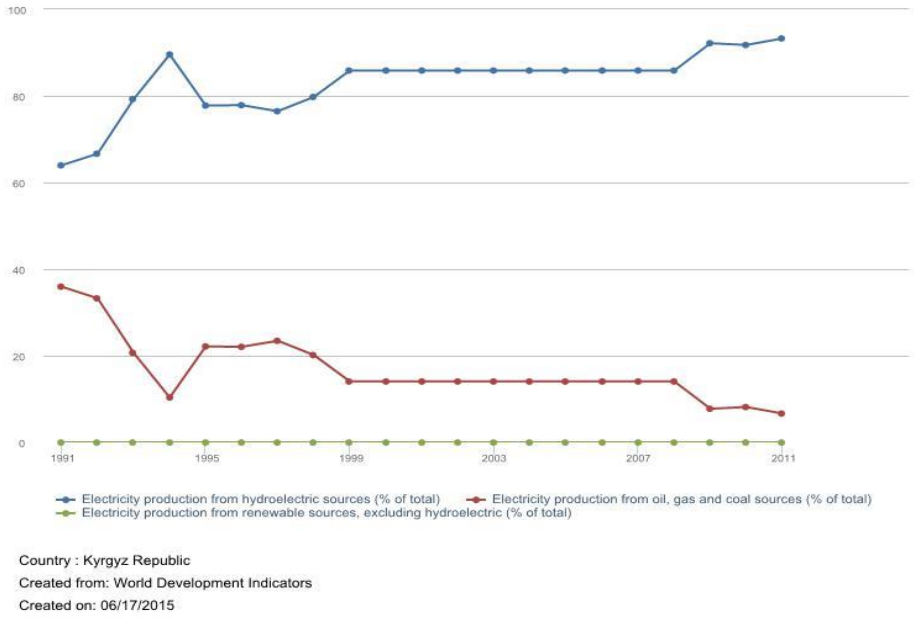
Table 6: Per capita electric power consumption in Kyrgyzstan



As it can be observed, Kyrgyzstan produces more energy than it consumes which is a result of its abundant renewable energy resources, especially hydro energy resources. Kyrgyzstan's electricity production has been based on the exploitation of its huge hydro power. According

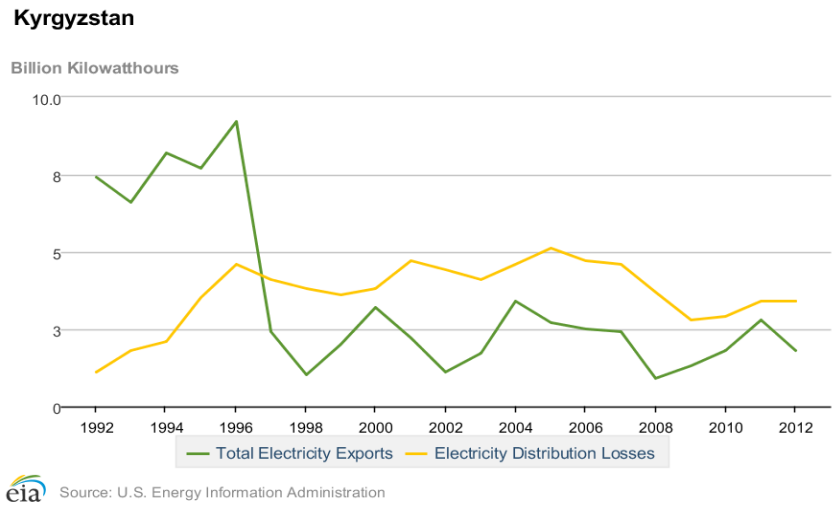
to World Bank (2015) and table 8, 93% of the total Kyrgyzstani electricity production in 2011 was produced from renewable energy sources, while roughly 7% was produced from coal, oil and gas sources. It must be highlighted though that all the renewable electricity in Kyrgyzstan is produced from hydro sources, as there have not been any other renewable energy sources exploited for electricity production.

Table 7: Sources of electricity production in Kyrgyzstan (% of total)



The abundant hydro resources result n high electricity production and the government uses its electricity surplus as a product of export to neighboring countries such as Kazakhstan and Uzbekistan. However as table 7 depicts a considerable amount of energy is lost because of the country's old and inefficient distribution system and grid. While in 2011 for example almost 2.795 billion kWh of electricity surplus was exported, the distribution loses calculated to have reached 3.400 billion kWh.

Table 8: Electricity exports and distribution losses in Kyrgyzstan

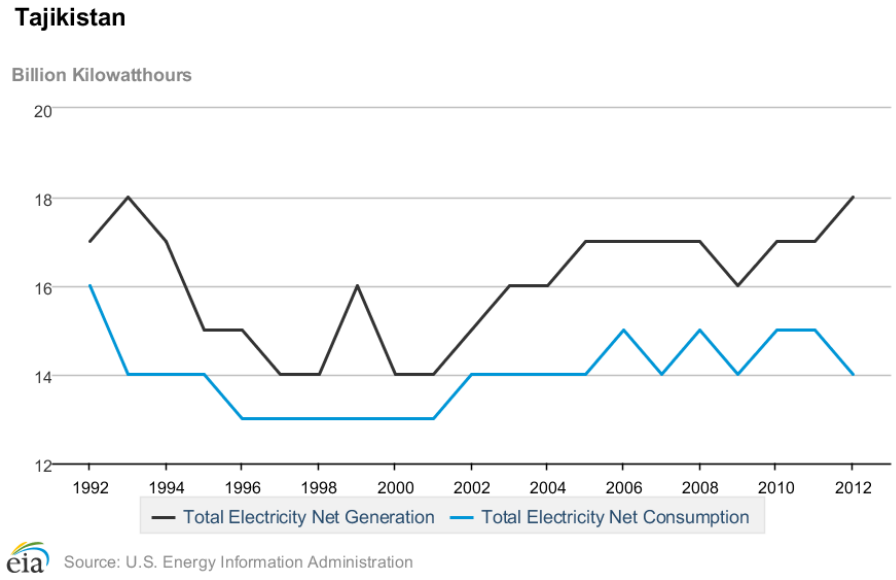


From the above information we can conclude that in terms of electricity production from renewable sources, Kyrgyzstan is doing excellent by producing more than 85% of its total electricity generation from hydro sources the last decade. In fact Kyrgyzstan is very close to Norway, a European country leader in renewable electricity generation with similar population and electricity production/consumption patterns with Kyrgyzstan, in terms of electricity production from renewable sources. According to World Bank (2015) the renewable electricity generation in Kyrgyzstan for 2010 was 91% of the total electricity generation, while in Norway it reached 95%. Bishkek wants to further develop its renewable electricity generation, so it emphasizes on the development of other renewable sources for electricity production as well as the modernization of its old and not efficient distribution system (Energy Charter Secretariat, 2007).

5.1.3. Tajikistan

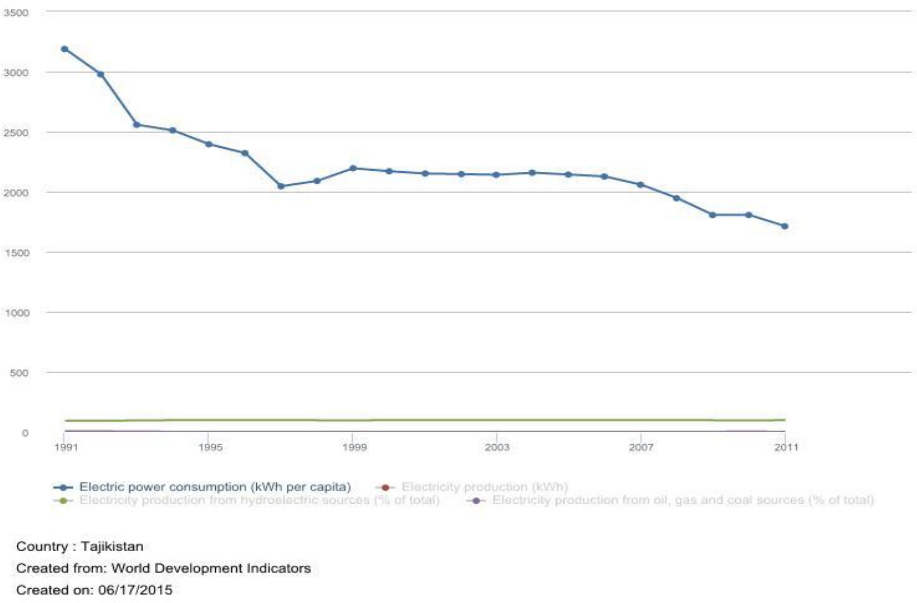
Tajikistan is another country with and economy in transition and with huge electricity needs for its heavy industry. According to table 9 and World Bank statistics (2015), Tajikistan's net electricity generation has been fluctuating since independence between 14.000 billion kWh and 18.000 billion kWh. The country's net electricity consumption has fluctuated also below 15.000 billion kWh.

Table 9: Total Electricity Net Generation/ Consumption in Tajikistan



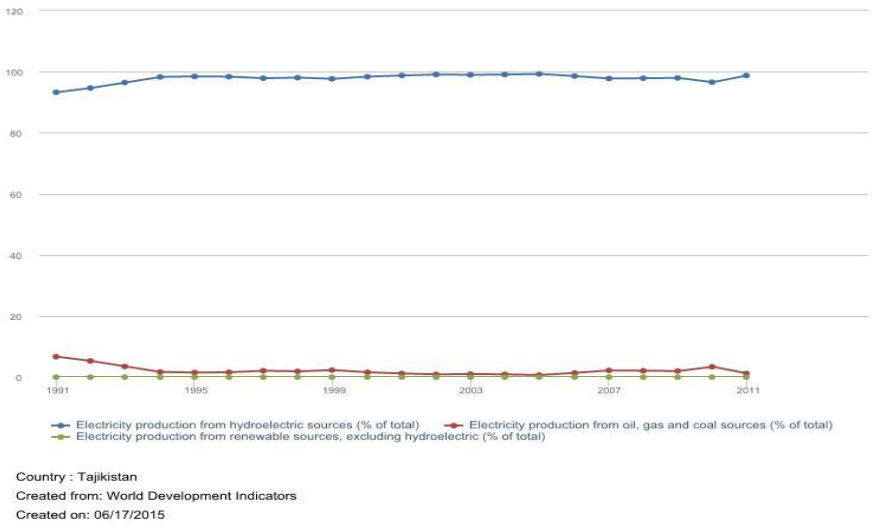
In terms of per capita electric power consumption, the fluctuation in the total electricity generation and total consumption in the country affected also the per capita consumption, which kept dropping since independence. The average Tajik citizen in 1992 consumed around 3.250 kWh but in 2011 he ended up consuming 1.714 kWh, as Table 10 illustrates.

Table 10: Per capita electric power consumption in Tajikistan



When it comes to Tajikistan's renewable electricity generation, the country's electricity generation is dominated by hydroelectricity. Since the Soviet era, the central government determined the energy policy for Tajikistan towards electricity production from hydro sources, after having seen the republic's rivers as prime locations for hydroelectric dams (Curtis, 1997). Already from 1992, almost 95% of the country's electricity had been produced in hydroelectric plants. The country possesses vast reserves of hydropower resources, ranking 8th in the world in terms of their total volume, while it currently uses only 5% of the total estimated volume of these resources (UNCEDE, 2007). The country's electricity production from coal, oil and gas sources has been minimal, less than 5% of the total production, as it is illustrated on Table 11.
Tajikistan has not yet developed any significant infrastructure for electricity generation from non-Hydro renewable sources.

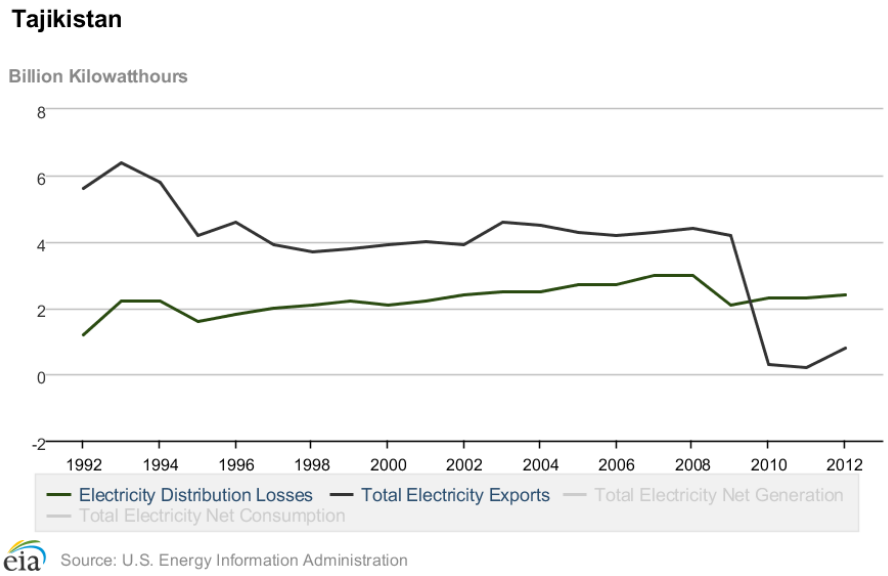
Table 11: Sources of electricity production n Tajikistan (%)



The government in Dushanbe tries to develop the country's energy potential and on that cause it channels more than 15% of its total annual national budget to support the country's energy development (UNCEDE 2014). The Ministry of Energy and Industry is in charge of energy policy, including implementation policies, energy efficiency policies and the enhancement and promotion of renewable energy sources (UNCEDE 2014). Tajikistan's energy policy is based on the National Development Strategy and other by-laws endorsed by the Government[5].

The Tajik Republic is doing excellent regarding its electricity generation from renewable sources. It actually scores higher than Sweden, a European country with similar population and electricity generation figures. In 2010, 97% of the Tajik electricity generation came from hydro sources, while in Sweden just 65% of electricity was generated from renewable sources. The problem with Tajikistan though is that it has extremely wasteful energy consumption pattern along with huge distribution loses. Moreover the energy generated by hydropower stations is of seasonal nature and depends on the river run-off. The lowest energy generation level is observed during autumn and winter periods while electric energy demand at this period is the highest. At the same time in summer electric energy supply is the most reliable and the energy surplus is the biggest, a fact that leads to electricity exports to neighboring countries (UNECE, 2014).

Table 12: Electricity exports and distribution losses in Tajikistan

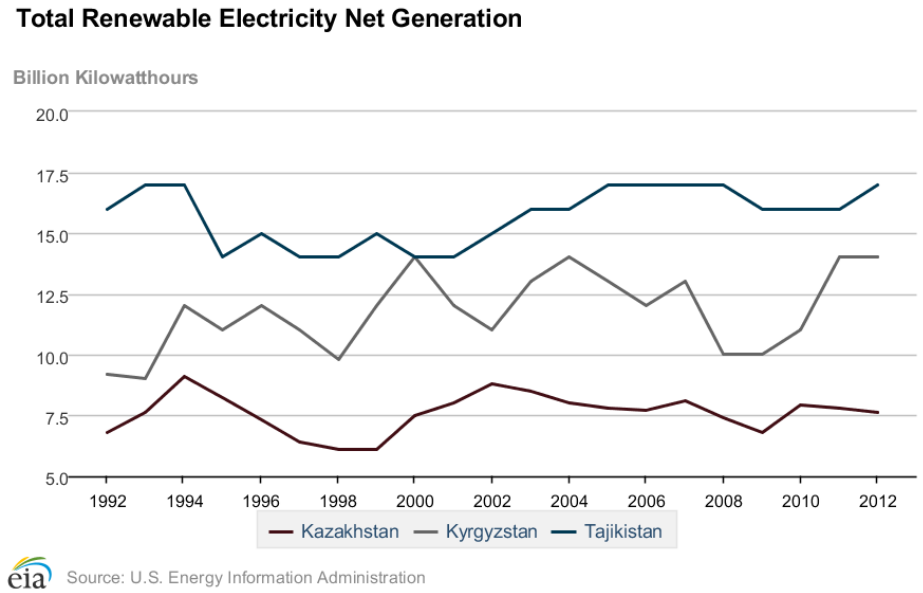


Chapter conclusions

This chapter's conclusions can be summarized on Table 13, where we observe that all three countries are on the renewable energy transition track, Tajikistan is the leader, followed closely by Kyrgyzstan and then Kazakhstan lags behind them,. All three countries exploit their hydro sources for electricity generation and they all have plans of exploiting other renewables for their electricity generation.

[5] Law of the Republic of Tajikistan "On Energy", November 2000, law of the Republic of Tajikistan "On Energy Efficiency" of May 2002

Table 13: Total renewable electricity net generation in Kazakhstan, Kyrgyzstan and Tajikistan



There is a variation though on the percentage of electricity generated from hydro sources in each country. Our leader, Tajikistan produces more than 95% of its electricity using hydro sources, Kyrgyzstan is following course with 90% electricity from hydro and Kazakhstan is the laggard with just 10% of electricity generated from hydro sources. The fact that Kazakhstan, the biggest and wealthiest state among the three, lags behind is not surprising, because Kazakhstan has been using its vast fossil fuel reserves. Its government recently realized that its economy suffers from an overreliance on oil and extractive industries, the so-called "Dutch disease" (CIA, 2015). Hence Kazakhstan has embarked on an ambitious diversification program, aiming at developing various sectors with a special focus on energy sources. The fact that Tajikistan and Kyrgyzstan are leaders on the renewable electricity production is not surprising as well, as they both are upstream countries with huge hydro reserves. What is interesting though is the fact that they are leaders, despite the political instability and subsequent ethnic clashes in both republics since independence, which left most of their infrastructure damaged.

5.2. Independent Variables

This chapter examines the extent to which *endogenous* and *exogenous* factors in the researched countries play a role in their renewable energy transition course. This chapter looks into *geomorphology*, *political stability* and *foreign direct investments* as factors influencing renewable energy transitions and tries to assess how and to what extent these factors affect the actual transition. Tajikistan is the leader in renewable energy transition, Kyrgyzstan is following close and Kazakhstan is the laggard and this chapter tries to explain this variation.

5.2.1. Geomorphology

The first factor which is analyzed for its contribution to the renewable energy transition process in our three Central Asian states is their geomorphology. How those countries' geography explains the variation on their renewable energy transition course and what is their renewable energy potential according to their geomorphology, are the question tried to be answered by this chapter. It has to be stressed out that this chapter will examine the renewable energy potential of hydro power, wind power and solar power in each state, as these are the sources that are most influenced by the geomorphologic factors in those countries. Biomass is not directly affected by geomorphology, all three countries are landlocked countries therefore there is no ocean energy available and geothermal is affected more by geology than geomorphology.

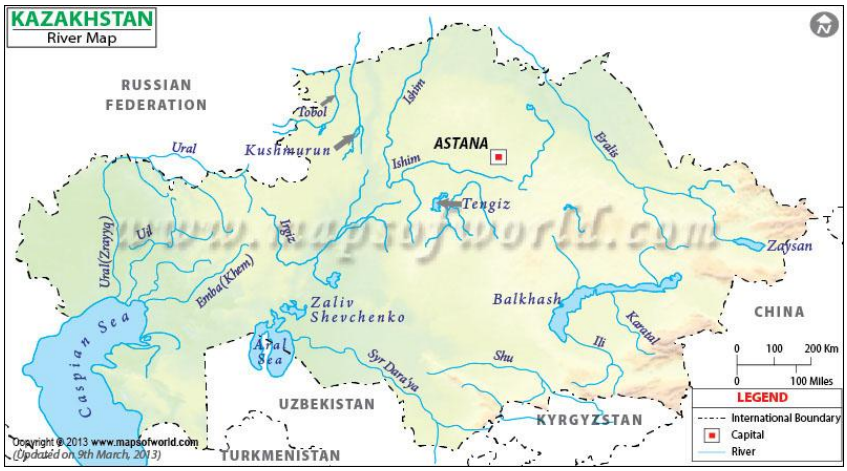
5.2.1.1. Kazakhstan

Hydro power

Kazakhstan is a landlocked country with vast plains covered by a dense river network as Figure 1 illustrates; that river network gives the country a good hydropower potential. That potential is getting bigger in the south and east of the country where the Kazakhstani geography is more mountainous. Big rivers such as the Irtysh River, the Ural River, the Syr-Darya River and the Balkhash Lake River form big basins enclosing smaller rivers, where several Hydro Powered Plants (HPPs) operate. One of such plants is The Moinak HPP which was constructed at Charyn River in 2011 and has generated 1.27 billion kWh of electricity within 2 years from its construction, but there are plans of expanding the dam's infrastructure in order to increase its capacity (Kalymov, 2013). Small HPPs[6] are also of particular importance for the southern regions that face electricity deficit, as it is estimated that HPPs constructed at small rivers will generate about 8 billion kWh of electricity annually. That would help meet the electricity demand now covered through electricity imports from Kyrgyzstan.

Kazakhstan's hydropower potential is estimated at around 170 billion kWh per year, while the technically feasible potential is estimated at around 62 billion kWh, but the economically feasible is just 27 billion kWh per year. Currently only 7–8 billion kWh per year is effectively being used (Energy Charter, 2013).

Figure 1: River map of Kazakhstan

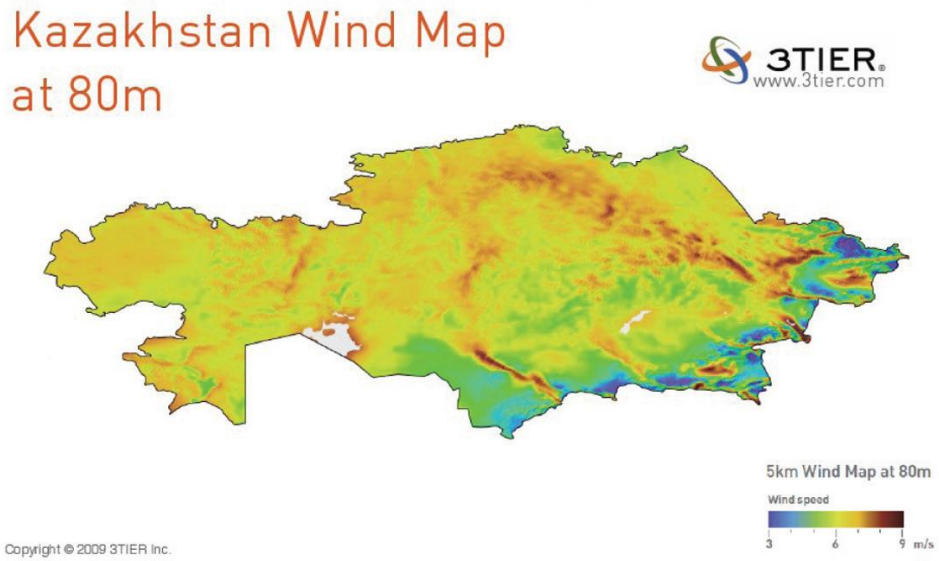


[6] Small HPPs are plants with a capacity below 35 MW.

Wind power

Kazakhstan's geographical location in the wind belt of the northern hemisphere where strong air flows can be found enables Kazakhstan to develop its wind power engineering. As Figure 2 depicts in most of its regions the annual average wind speed exceeds 6 m/s, making these regions ideal for the development of wind power infrastructure. The wind potential of the Jungar Gates alone for instance, a mountain pass in the Chinese borders, can provide about 1.3 trillion kWh of electric energy per year. However there is little exploitation of wind power in Kazakhstan. Only one Wind Power Plant (WPP) has been operating in Kazakhstan[7] and the energy it produces is insignificant to be counted in the total electricity generation figures. The Ministry of Industry and New Technologies of Kazakhstan has selected 10 sites for construction of large wind power plants with total capacity up to 1.000 MW, which could provide 2–3 billion kWh of electricity per year (Energy Charter, 2013).

Figure 2: Wind map of Kazakhstan

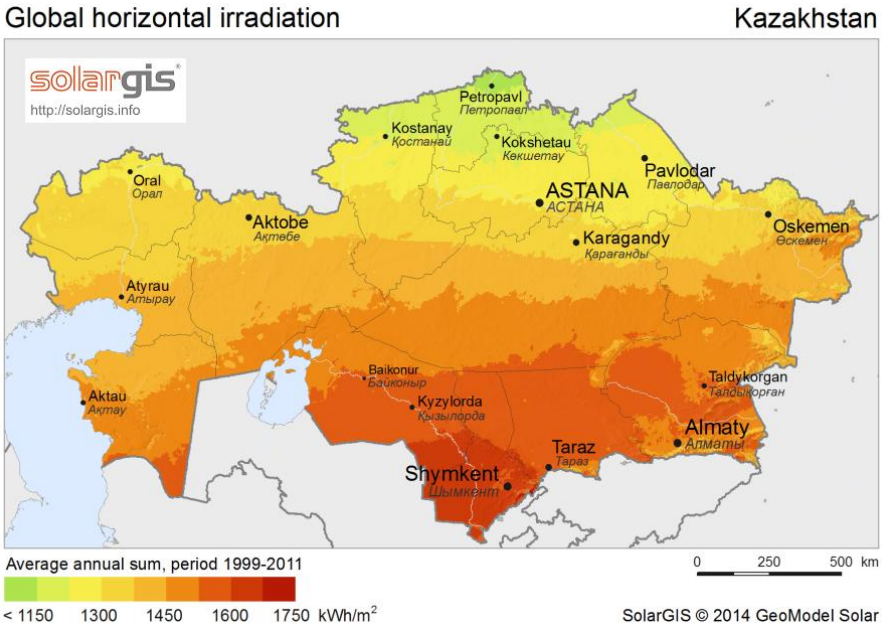


Solar energy

As figure 3 portrays, Kazakhstan has areas that could be suitable for solar power exploitation, particularly in the south of the country, receiving between 2.200 and 3.000 hours of sunlight per year, which equals 1.300-1.750 kW/m² per year (Karatayev et al., 2014). Both concentrated solar thermal and solar photovoltaic (PV) have potential. There is a 2 MW solar PV plant near Almaty and six solar PV plants are under construction in southern Zhambyl province with a combined capacity of 300 MW. In addition to solar PV, concentrated solar thermal is advantageous, given the fact that it does not require water for operation, so it can be used in desert and semi-desert areas. Moreover the materials required for its construction, such as steel, glass and concrete, are produced in Kazakhstan. There are no current plans to install a concentrated solar thermal plant although the government plans to create 1.04 GW of renewable energy capacity by 2020 (Karatayev et al., 2014).

[7] since 2011 the Kordaiskaya WPP is in operation in the Zhambyl Region

Figure 3: Solar radiation map of Kazakhstan



To summarize this subsection it seems that the Kazakh republic has good potential in renewable energy sources. Hydro potential has been used for electricity production for decades but there is still unused potential. The infrastructure though is old and many plants are reaching their technical lifecycle. The most promising source though seems to be wind, as Kazakhstan has vast regions with steppes where the wind power is more than adequate for electricity generation. Solar energy has also great potential, but further plans should be made for its exploitation.
The vast river network and the available hydro technology the past years explain the percentage of hydropower used in the Kazakhstani total electricity mix. Wind and solar exploitation require technology that has been developed more recently than hydro technology; consequently the country's very good potential in those sources due to its geomorphology has not yet been exploited.

5.2.1.2. Kyrgyzstan

Hydropower

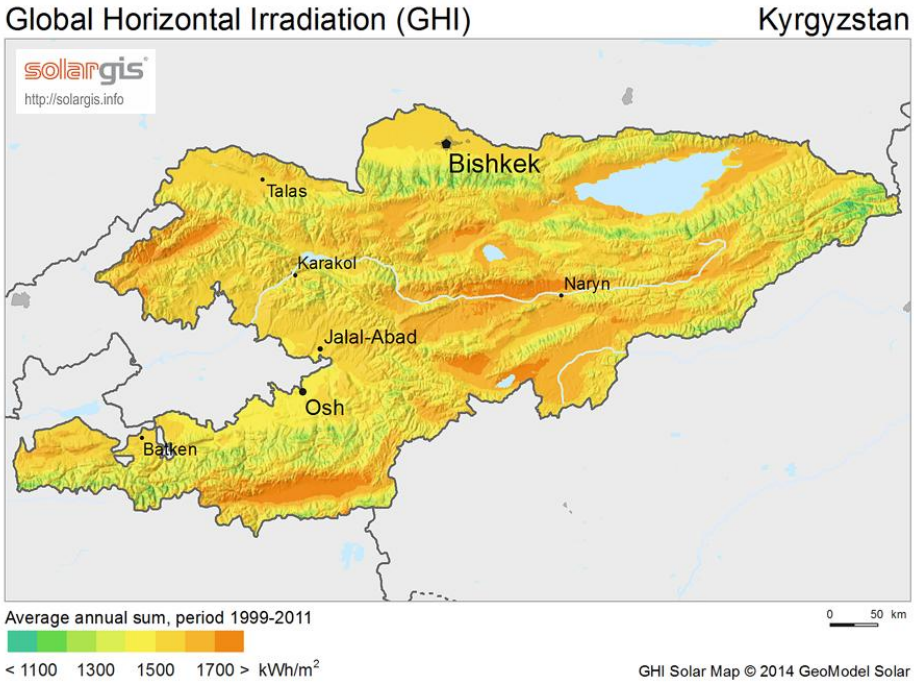
Kyrgyzstan is a landlocked mountainous country with several rivers. Hence it has abundant hydro resources. The World Bank (1997) highlights that Kyrgyzstan has large hydro potential, estimated at 163 TWh/yr, but only 73 TWh/yr is technically feasible and from that only 48 TWh/yr economically exploitable. The Naryn river basin has the best hydropower potential in the country, while it is possible to construct several hydropower plants at more than 100 locations. Large HPPs are already in use at the Naryn River with a total installed capacity of 2.770 MW. However, there is a 2.200 MW potential for further development of the river's upstream hydropower (Energy Charter, 2007).

During the 1950s and 1960s there were projects on small HPPs for the exploitation of their hydro potential, but when the large HPP on the Naryn River came into operation, most of these projects were abandoned. Lately, The World Bank has identified 19 possible locations for small HPPs with a 120 MW total installed capacity and 530 GWh mean annual production.

Solar energy

Kyrgyzstan has stable and adequate solar energy resources due to its altitude and its climatic conditions and in spite of its high latitude. The country has around 2.600 sunshine hours per year and as Figure 4 shows a radiant energy of 1.500-1.800 kWh /m2 /yr in most of its regions (Energy Charter, 2007). Kyrgyzstan has also industrial installations producing crystalline silicon, a material useful in solar energy development.

Figure 4: Solar radiation map of Kyrgyzstan

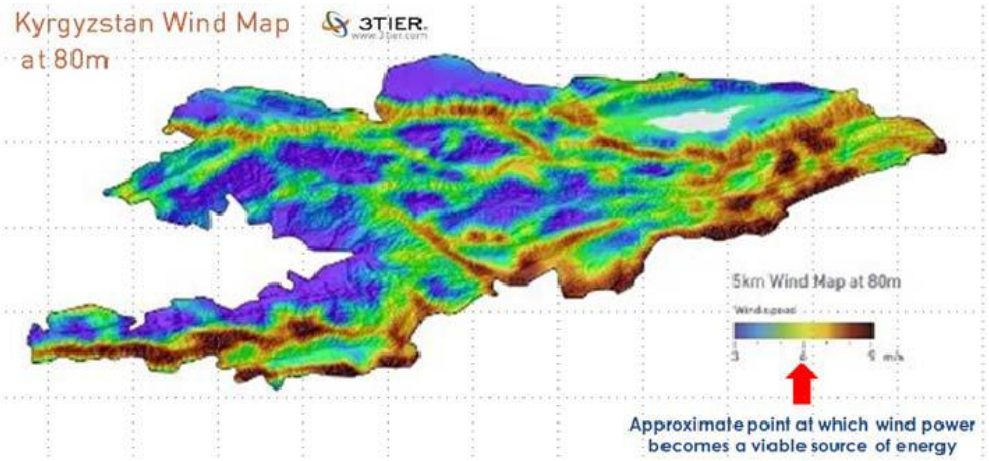


Wind power

The Kyrgyz republic does not have strong winds, despite its mountainous map relief and therefore there is currently no operative wind energy capacity in the country. As Figure 5 illustrates, most of the Kyrgyz regions do not have the wind power to develop viable wind power installations. Wind energy is used for generating electricity to individuals through small wind turbines, which generate 1-5kW of electricity in areas where the wind strength is of 8-10m/s, as for instance in some mountain passes and valleys (Energy Charter, 2007). The

Issyk-Kul region is the place with the greatest number of windy days, up to 120 days, whereas in other places there are only up to 40 windy days. The annual duration of wind energy is 5.000-7.000 hours, with energy density of the wind flow at around 2.000 kWh/ km^2. Still, these particular areas are the most remote and least accessible ones, which put significant challenges to their exploitation. There seems to be a technical potential of 2.500 MW installed capacity, but the feasible potential is uncertain. (UNDP, UNEP 2014).

Figure 5: Wind map of Kyrgyzstan



To sum up this subsection for Kyrgyzstan, we can conclude that Kyrgyzstan's greater potential is hydro and this explains the development of the Kyrgyz hydroelectricity sector and the high levels of electricity production from hydro sources the past years. Its mountainous map relief does not only provide high hydropower though, but high solar energy as well. Solar has a good potential in the country, while wind does not seem to have that good potential apart from some isolated regions. There are some economic and institutional barriers, however, that may halt the development of those energy sources. For instance, the country is not able to mobilize the needed investments for their development; there is no feed-in tariff for electricity from renewable energy sources and no particular legal framework to support such projects (Energy Charter, 2007). Hydro-power on the other hand has been developed, despite the fact that Kyrgyzstan has to provide water for irrigation in the neighboring downstream countries (Karimov et al., 2013). Some further HPP construction has taken place since independence, but high investment costs caused the projects to be put on hold. Moreover, Kyrgyzstan's market is relatively small and the country already produces more electricity than it consumes. Any major investment to further exploit its hydropower potential can consequently only be justified by electricity exports. Southern Kazakhstan and Uzbekistan are the available markets for Kyrgyzstan, but a larger regional cooperation involving exports to Pakistan, Afghanistan and China is also possible.

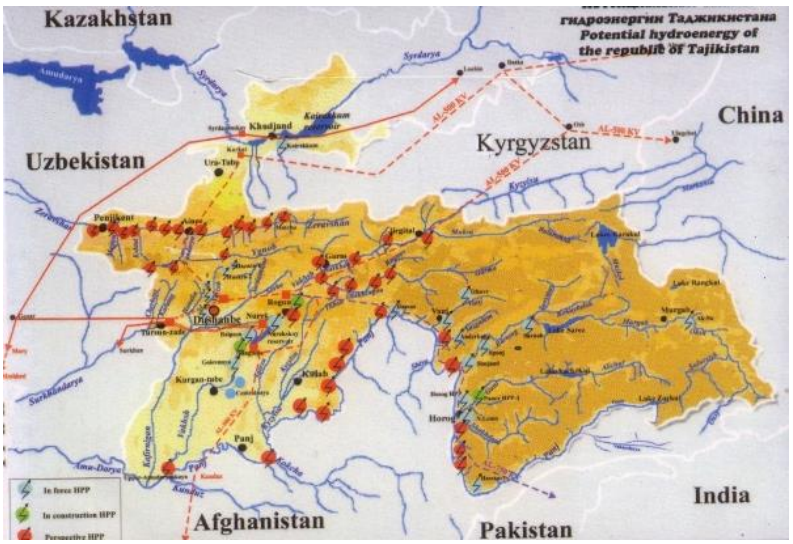
5.2.1.3. Tajikistan

Hydropower

Tajikistan's encloses in its geomorphology high mountains with glaciers from where lots of rivers spring and several valleys where these rivers run. This geomorphology explains the high use of hydropower in the country's electricity generation. Although the country has rich water reserves, 1 million people that live primarily in rural areas have little or no access to adequate electricity or other energy supplies during wintertime, (UNECE, 2013). Thus the main challenges for Tajikistan's energy sector are: an increase on the energy supply through better exploitation of hydropower and renewable energy sources such as wind and solar, an improvement in the energy efficiency of its hydropower plants.

Tajikistan's economically feasible hydropower potential is estimated at 264 billion kWh per year, and so far only about 6% of that has been used (Energy Charter, 2010). On the basis of a research on large and small rivers, concluded that the exploitation of only 10% of the hydroelectricity potential of the small rivers in the mountainous zones would satisfy the current needs of almost 70% of the rural settlements and agricultural farms. The last years 29 small HPPs are being constructed, which will add another 11.600 MW in the country's installed capacity (UNECE, 2013).

Figure 6: Hydropower map of Tajikistan

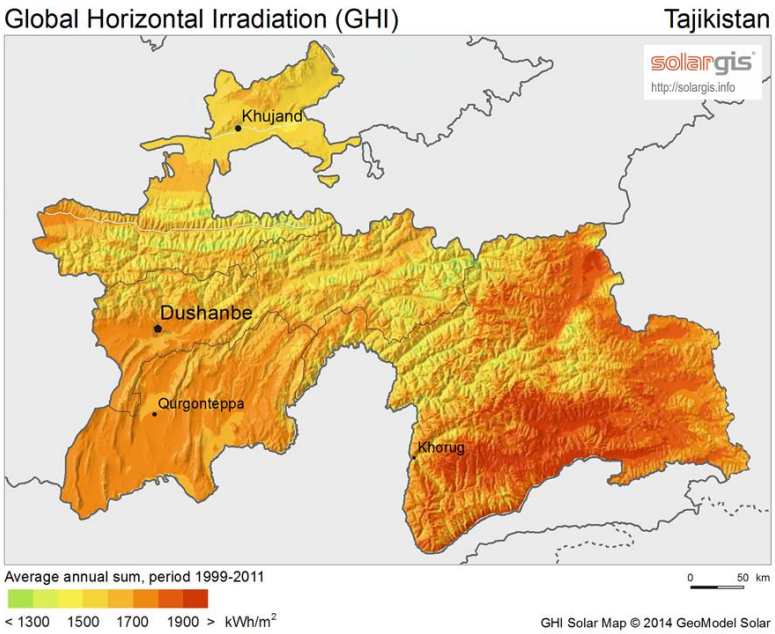


Solar energy

The estimated potential of solar power in Tajikistan is approximately 25 billion kWh/year. As figure 7 illustrates, the majority of the country's territory receives enough solar radiation to produce more than 1.700 kWh/m^2 per year. Until today the solar energy potential of Tajikistan has not been exploited, but it is estimated that the use of available solar energy

could satisfy 10%–20% of the national energy demand. Local experts estimate that the climatic conditions are favorable for solar power generation, especially in mountain areas in East Pamir, where hydropower potential is limited (Energy Charter, 2010).

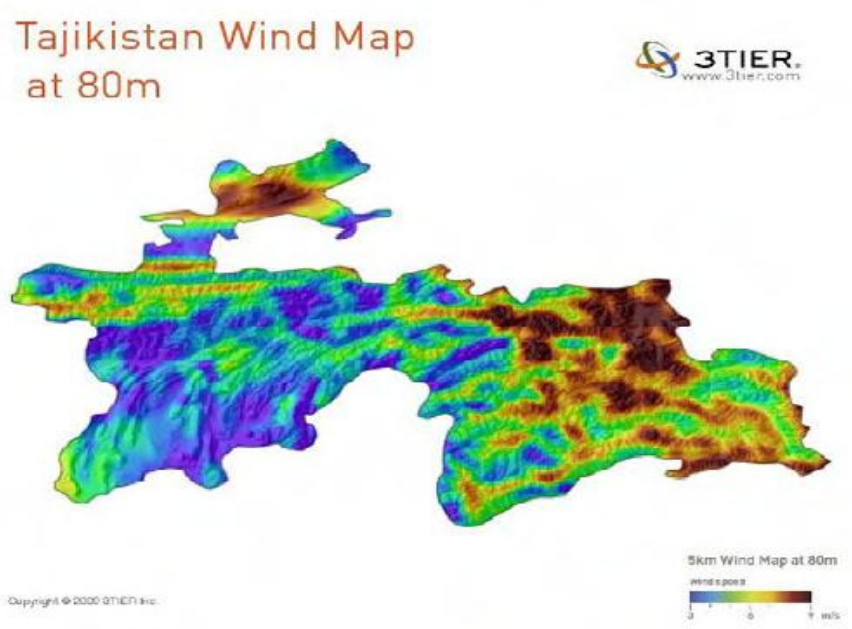
Figure 7: Solar radiation map of Tajikistan



Wind power

Wind power potential in Tajikistan has not been studied well. Local experts claim that wind energy could be commercially viable in certain regions where the average annual wind speed is around 6-7 m/s, as Figure 8 presents (Energy Charter, 2010). In 2010 the system operator Barqi Tojik constructed 4 pilot wind power plants in the country (UNECE, 2013).

Figure 8: Wind map of Tajikistan



To conclude this subchapter, Tajikistan's biggest energy source is hydro due to its mountainous geomorphology. Its hydro has also a vast potential, more than any other Central Asian state. Solar has good potential too, but not as high as the hydro potential of the country and wind has some potential but that potential is found in isolated areas. Hydro is exploited already, but a further exploitation of this source could provide electricity access to many rural areas and it will even will sufficient for electricity exports to neighboring countries.

Chapter conclusions

To sum up this chapter, we can draw useful conclusions about the influence of geomorphology in the renewable energy transition of Kazakhstan, Kyrgyzstan and Tajikistan. It seems that all three countries have great potential in hydro, solar and wind due to their geomorphologic characteristics and that these characteristics helped them develop their sources with the biggest potential. The mountainous states, Kyrgyzstan and Tajikistan, have greater potential in hydropower, which they are already exploiting; that explains why Tajikistan is the leader in hydro-powered electricity share in the total electricity generation mix, while Kyrgyzstan follows suit. Kazakhstan on the other hand has developed its vast hydrocarbon resources and in a lesser extent its good hydro sources. Therefore it is the laggard in the renewable electricity generation. It is evident than landscape facilitated these countries to develop their hydro resources and will allow them to further exploit these resources. Geomorphology though does not seem to play an important role in the further development towards the renewable transition course. It explains the current transition level of the states and it indicates the future path for the transition Kazakhstan will most likely develop its wind and solar potential the next few years, while this might take longer in the other two countries. For Kyrgyzstan and Tajikistan the promotion of the renewable energy transition will allow them to diversify their electricity generation sources and it will allow them also to export electricity to hungry for energy neighboring countries such as China. Kazakhstan will diversify also its energy sources and it could tackle its internal inefficiencies regarding electricity generation. These two effects can stop the electricity imports in the country. However there are other factors that seem to be more crucial for the continuation of the renewable transition course.

5.2.2. Political stability

This chapter focuses on a political factor that according to bibliography affects the renewable energy transition as a process, the political stability in a country, in other words the durability and the integrity of a government. Political stability is affected by the sociopolitical regime in a country; hence the formal and informal organization of political power and its relations with the broader society are examined. Regarding the formal organization of power this study examines the formation of the three branches of government in those countries and the government's interaction with society, while for the informal organization this study examines the social cohesion in the countries. Social cohesion is investigated by looking into the ethnic minorities and their relations with the rest of the population and the government. These indicators together with social unrest incidents and turmoil show how stable the government is and therefore are researched in this thesis. The time frame in which the

political stability of Kazakhstan, Kyrgyzstan and Tajikistan is examined is the last 25 years, since these countries independence from the Soviet Union.

5.2.2.1. Kazakhstan

The Kazakh republic is the most political stable and economically robust state in central Asia, according to international observers (ICG, 2013), (Schatz, 2009). However, there are two characteristics of the Kazakhstani sociopolitical system that can shatter this ostensibly stable and robust state. The first is the formation and function of the government, while the second is the societal structure of the country. These two factors can affect the political stability and the economic development across the country, including the resource-rich provinces (ICG, 2013).

Regarding the governmental formation, Kazakhstan is a presidential republic established in 1991 after the dissolution of the Soviet Union. Since independence Nursultan Nazarbayev has been the President of the Kazakh Republic, his rule though has been criticized as being too authoritarian as there is an almighty presidency with little power outside the executive branch (ICG, 2013), (Bowyer, 2008). The 1993 Kazakhstani constitution set distinctive executive, legislative and judicial branches of government, but at the same time the constitution itself established a powerful executive branch, where the presidency amassed a lot of powers and the legislative and judicial branches are under the presidency's total control. The head of the state is the President[8] and the President appoints the Prime Minister and his Deputies. The President also appoints 15 of the 47 members of the Senate and 9 of the 107 members of the Mazhilis.[9] The Supreme Court's judges are also proposed by the president of the Republic on recommendation of the Supreme Judicial Council (CIA, 2015).

In the post-independence government structuring Nazarbayev had already the power to influence the writing of a new constitution, which provided justification for the one-man rule that developed in the early 1990s (CIA, 2015). Thus the president has the final say over the legislature, while new bills and amendments are undertaken at the request of the presidential administration or its government (ICG, 2013). The parliament has been stripped away from many of its powers which were transferred to the presidency. Moreover parliament is controlled by just one ''*dominant ruling party''*, making the republic nominally multiparty democracy (Bowyer, 2008). Opposition started to appear in 2002, but it is in reality too weak to from a proper opposition. Despite these facts in the last presidential election in 2015 Nazarbaev won 97.7% of the votes, while in 2012 parliamentary elections, the president's Nur Otan party won again the majority of the popular vote (CIA, 2015).

As far as the government's interaction with the society is concerned, many scholars argue that after independency central Asian governments have settled to authoritarianism and corruption, as informal clan-based networks dominated the political life (Collins, 2002). International Crisis Group (2013) argues that President Nazarbayev "*did not just amass formal power such as control over parliament and national economy, but he simultaneously*

[8] The president is elected by a direct popular vote for a five-year term

[9] These 9 members are indirectly elected by the Assembly of People of Kazakhstan, a 350-member advisory body designed to represent the country's ethnic minorities, whose members are appointed by the President.

accumulated informal power over the political and financial elites". He and his close associates are alleged to have access and control over Kazakhstan's energy resources and other natural wealth. Nazarbaev appears to be the only guarantor of the Kazakh elites privileges acquired in form of capital and wealth and "*the final arbiter to whom elites appeal when serious conflict arises between rival groups*" (ICG, 2013).

According to watchdog organizations such as Global Witness (2010), the President and his associates appear to have total control over profitable sectors of the Kazakhstani economy, including energy resources. Anyone able to navigate himself into this system can enjoy great rewards. China is doing very well in that and other big players in the energy sector seem to manage the uncertainty the Kazakhstani political system bears due to authoritarianism and corruption. Smaller entities though, which could facilitate the Kazakhstani's government aim to diversify its economy from fossil fuels, cannot afford that risk (ICG, 2013).

Apart from the governmental formation and its relation with the society, social cohesion is examined as well in terms of ethnic minorities' presence. Kazakhstan's population in 2014 was estimated at around 18.000.000 (CIA, 2015), with more than half of the population being Kazakh, while Russians form the second biggest ethnic group in the country. The rest consists of Uzbeks, Uyghur's and other ethnic groups as it is depicted on figure 9. Islam is the prevailing religion in the country, with almost 70% of the population practicing it.

Figure 9: Ethnic diversity and natural resources

Source: Le Monde diplomatique

But even among the ethnic Kazakhs there are some differences. The condition of almost one million Oralmans, ethnic Kazakhs from Uzbekistan, Turkmenistan, Mongolia and China who were invited to return in Kazakhstan by the government under the state repatriation program

that began in 1991, is particularly pressing for the Kazakh government. The majority of them comes from rural regions and does not speak Russian; a fact that not only leads them to unemployment but also gives them few chances for integration with the local communities (ICG, 2013).This situation is very worrisome as it could affect the political stability, the governmental durability, within the country.

It looks like Kazakh nationalism is raising and tensions among Kazakhs and other ethnic groups such as Russians, Chechens and Chinese will rise in Kazakhstan. Nazarbaev seems to prevent any serious tensions with its total control over the political and social life of Kazakhstan, but the future seems uncertain. There may have not been any major social unrest incidents in the country since independence, apart from a confrontation between striking oil workers and security forces in the city of Zhana-ozen in 2011, which resulted in the deaths of at least 14 unarmed protesters (Al Jazeera, 2013). Nazarbaev is in his 70s and he has not appointed yet his successor and there are fears that the latent nationalist sentiments may be an easy way for a new president to define his credentials and reach ethnic Kazakhs squeezed out of the political arena under Nazarbayev (ICG, 2013).

To sum up this subsection, in Kazakhstan, as in Central Asia as a whole it seems that politics are playing a role in many aspects of life. The political systems in the region have been influenced by both their Soviet past and their ethnically segmented nomadic pasts with decentralized traditions, which resulted in many anti-state feelings (Schatz, 2009). The socio-political regime established in Kazakhstan has been characterized authoritarian with the most powerful and the most influential person in the country being the President. The president looks like he is dominating the country's political and social life. He seems to have a total control over his country's resources, including renewable energy sources, which he shared with the local elites in order to secure their alliance and therefore there were no incidents of social unrest or turmoil since independence.
In a state where a 73-year-old president dominates politics and tightly controls the economy, where the word of top officials provides protection for economic assets, the president's disappearance would affect the existing status quo (ICG, 2013). Furthermore the seemingly growing nationalistic feelings among the Kazakh population is also worrisome for the political stability in the country. In case political instability prevails in Kazakhstan that would jeopardize the ongoing plans of expanding its renewable energy capacity which has been steadily growing since independence and the assuming of power by President Nazarbaev.

5.2.2.2. Kyrgyzstan

Kyrgyzstan was the only state in post soviet Central Asia that was characterized as truly democratic by international observers (Collins, 2002). In 1991 though, when Kyrgyzstan gained independence from the Soviet Union, the situation within the country was not favorable for the establishment of democratic functions. There were clan and tribal divisions with deep historical roots stretching back before the Soviet era and there was a weak sense of national identity. Moreover there were ethno-national divisions among different ethnic groups

and an uneven economic development based on the exploitation of natural resources (Collins, 2002).

In terms of the governmental formation of the Kyrgyz Republic, the republic resembles a western democracy. Askar Akayev, the elected president of the Kyrgyz Republic shortly after independence, he initiated a political and economic reform program aiming at the democratization of the new state. He introduced a constitution modeled on the United States constitution; he pushed for the adoption of a legal framework to establish democratic institutions and called on civil society to become the basis of a new democratic culture (Collins, 2002). Those first years of political transition experienced basic freedoms of speech, press, and assembly, but also witnessed the creation of an independent judiciary, legislative and executive powers, together with the adoption of legal protection for property rights. Between 1991 and 1995, there were free and fair elections and quickly active civil and political societies emerged, albeit largely restricted to well-educated citizens living in the big cities (Collins, 2002). There was an actual segregation of powers among the three governmental branches.

As independence in Kyrgyzstan was progressing though, the government's politics proved increasingly tangled. Over time it became apparent that President Akaev preferred dealing with administrators subordinate to him rather than with legislators. In the mid 1990s the government started showing signs of affiliation to corruption and mismanagement and the parliament sought to extend control over the executive branch to combat that. A particular rallying point was the allotment of development concessions for the republic's natural resources, especially gold mining. Akayev was not publicly accused of being involved in the gold scandals, but numerous rumors accused the Akayev family, especially his wife, for corruption. President Akayev relied heavily on both his and his wife's powerful clan in order to hold on power (Collins, 2002). This cost him however popular legitimacy and he starting attacking the press and civil society, turning Kyrgyzstan into a semi-liberal democracy and after 2000 a hollow electoral democracy. By 2002 clan networks penetrated all three branches of government[10] and the Kyrgyz Republic became a weak autocracy (Collins, 2002).

In Kyrgyzstan as in post soviet Central Asia generally, politics are not about ideology or policy. It is rather about bargaining among some major clans for the control of economic assets, including natural resources. In Kyrgyzstan Akayev initially tried to maintain a balance in the distribution of those resources among competing clans, but later he tried to expand control over more resources. As a result other clans were enraged leading to tensions between rival clans and Kyrgyzstan's tiny democratic opposition for a share of the pie (Collins, 2002).

All this discontent towards Akayev's practices burst after the 2005 elections. Nationwide demonstrations in spring 2005 resulted in Akayev's ouster from power. But even after Akayev left, the Kyrgyzstani parliament did not become a forum for democratic discussion of issues, rather remained a medium protecting its members' private interests (Radnitz, 2006). After Akayev's ouster the former Prime Minister Kurmanbek Bakiev won the 2005 presidential election, but he quickly tried to manipulate parliament to accrue new powers for the presidency. In 2009 Bakiev won re-election in a flawed for international standards

[10] The greatest example of this kind of politics was when Akayev got the chance and appointed a distant kinswoman of his to chair the constitutional court.

presidential campaign, but in spring 2010, violent protests in Bishkek led to Bakiev's ouster too. He fled the country and after new elections in late 2011 Almazbek Atambaev won and was inaugurated President of the Kyrgyz Republic, marking the first peaceful transfer of presidential power in Kyrgyzstan's independent history (Radnitz, 2006).

Regarding social cohesion Kyrgyzstan has a population of about 5.600.000[11] which consists of almost 70% ethnic Kyrgyz while around 15% is of Uzbek ethnicity. Russians make up for roughly 8% of the Kyrgyz population, while the rest consists of 80 other nationalities among them Dungan, Uyghur and Kazakh (CIA, 2015). 75% of the Kyrgyzstanis is Muslim, while 20% is Russian Orthodox. The rest 5% is of other religion. In the Kyrgyzstani population there are also lots of refugees from the civil war torn Tajikistan that moved during the 1990s into southern Kyrgyzstan and the Fergana valley, one of the most densely populated and the most heavily agriculturally exploited regions in Central Asia (Curtis, 1997). This region is shared by Kyrgyzstan, Uzbekistan and Tajikistan and it has been a point of contention among the three adjoining states. Members of various ethnic groups who have inhabited the valley for centuries have managed to get along However, the potential for ethnic conflict is ever present as the country borders zigzag in the valley regardless the nationality of the people living there (Curtis, 1997). Many residents harbor strong irredentist feelings, believing that they should be citizens of a different country and among them the thousands of Uzbeks living in Kyrgyzstan.

What concerns political stability and social unrest now, the yearlong authoritarian rule of Akayev created popular discontent and resulted in the 2015 Tulip revolution. Akaeyv's successor, Bakiev continued the authoritarian rule of his predecessor until he was overthrown also in 2010. A crucial role though in Bakiev's ouster played an incident that later turned into a riot between some ethnic Kyrgyz and ethnic Uzbek youths in the southern city of Osh. The riot turned quickly into ethnic violence in neighboring areas, leading to hundreds of dead, thousands of refugees and severe damages, especially among the Uzbek community (ICG, 2012).

To summarize this subchapter, we can conclude that there is a sociopolitical crisis lurking in Kyrgyzstan. The past governments proved to be authoritarian, despite their democratic organization and they proved to be prone to corruption and client relations with society. Moreover Bishkek's exclusionist ethnic policy steadily pushed the large Uzbek minority towards a breaking point (ICG, 2012). The growing discontent of the Uzbek minority, along with a crisis of governance can make Kyrgyzstan an instable place again. Since the political revolt and bloodshed of 2010, southern politicians moved fast and effectively to seize the advantage and ask for more share and control over the country's resources. This exacerbates the north-south split in Kyrgyz society and future clashes cannot be ruled out. This will have a huge impact on the country's economy and on its energy sector. In that case, the renewable energy transition process will be halted again, as it has been during the years of crisis. Before and after the crisis and the revolutions, renewable energy was steadily advancing, a fact that indicates that the transition is connected to political stability in Kyrgyzstan.

[11] based on 2014 estimations

5.2.2.3. Tajikistan

Lat but no least the socio-political regime of the republic of Tajikistan is analyzed. Many observers have characterized the Tajik republic as a failed state (Tharoor, 2001) and others claim that it is the most problematic state in the Central Asian region (ICG, 2011).

Regarding the governmental structure of the country, under the law of its constitution, the republic of Tajikistan has a national government with nearly all administrative powers centered in executive branch, which consists of the Presidency and the Council of Ministers, all of them appointed by the President. The legislative branch consists of a bicameral Supreme Assembly[12], whose members are either directly or indirectly elected by the people of Tajikistan. The President has the power to appoint some members of the Assembly, but the majority of them are elected through elections. However, a multiparty parliamentary system exists to the extent that it comprises six registered political parties. The judicial branch consists of the Supreme Court, the Constitutional Court and the High Economic Court, whose judges are nominated by the president of the republic. The judiciary branch is of nominal independence but with no actual power to enforce the rule of law (CIA, 2015).

The government's relations with society in Tajikistan are based on clan politics more than in any other state in the post soviet Central Asia. The actual causes of the devastating 1991-1997 Tajik civil war can be traced to the effort of several clans which formed political factions to seize power and acquire control over resources and assets in the political structure of the newly established state (Collins, 2002). The initial social unrest evolved into an open warfare in May 1992 as the Khujandi and Kulobi faction representatives rejected the legitimacy of the opposition in the new state formation (Buisson, 2007). This led to the 1992 to 1997 Tajik civil war which de facto fragmented the Tajik territory.

After the civil war, clan politics continued to influence the political and social reality of the state. The year 2000 signaled President's Enomali Rakhmon engagement into more authoritarian practices, although his government succeeded in co-opting certain leaders of the Islamic Renaissance Party (IRP) and the United Tajik Opposition (UTO) into a power-sharing arrangement that gave them a share of what they were promised in the 1997 peace agreement (Collins 2002). The overwhelming victory of Rahmon's People Democratic Party of Tajikistan in 2000 elections opened an era of marginalization of the opposition political parties and initiated the hegemonic domination of the Kulobi political faction, Rahmon's own political faction. Formal state institutions and state resources are used to enhance and reinforce the Kulobi regime that is mainly based on informal structures and practices for its governance (Buisson, 2007). People in this war-torn land however, seem to let Rahmon's faction fixate elections and steal the few state assets managed to survive the civil war and the devastation of the 1990s.

Regarding social cohesion in Tajikistan the republic's population was approximately 8.000.000, in 2014 CIA estimations, with the majority being of Tajik ethnicity. 14% of the population is of Uzbek ethnicity and the remaining 2% consists of people with Kyrgyz,

[12] Majlisi Oli

Russians and other ethnicities. Tajik is the official language of the state, but Russian is widely used in government and business. Ethnic groups speak also their own language; therefore Uzbek, Kyrgyz, and Pashto are listed among the country's spoken languages. Islam is practiced by roughly 90% of the population, while the remainder 10% is mainly Russian Orthodox, with some other small Christian and Jewish groups. Among the Muslim population, 85% of them are Sunni Muslims, while 5 % are Shia Muslims (CIA, 2015).

The Tajik governmental durability is doubtful as the civil war divisions still exist at some extent. Tensions still rise in many regions and Rahmon's government tries to handle the situation by cautiously using forces against the local warlords still in power positions in their regions. Some unsuccessful operations in 2010 in Rasht region though, a stronghold of the UTO, rose concern about Rahmon's hold on power (ICG, 2011). Furthermore the situation in neighboring Afghanistan can be a trouble for Tajikistan's political stability. The country remains ostensibly united after the end of the 6-year civil war, but there are territories that the central government has de facto no influence.

As it can be derived, Tajikistan is deeply vulnerable to any form of social, economic or political stress, even more vulnerable than its neighboring Kyrgyzstan. It is poorer than its neighbor; its infrastructure is more degraded; its economy is the most underdevloped and its political establishment among the most corrupt in the region (ICG, 2011). Finally its proximity to Afghanistan raises the threat to its security and its military forces showed their weaknesses in the Rasht valley. All these vulnerabilities can at any time destabilize again the political and economical structure of the country. If that happens, all the efforts of the government to proceed to grow economically sustainably will be in vain. It is remarkable though that despite the civil war, the renewable energy transition was stable and the production of electricity was steady, although a dramatic drop in the electricity consumption was observed. This might be attributed to the numerous hydro powered plants in Tajikistan, which allowed electricity generation even though the country was on a civil conflict, a pattern which was inherited by the country's soviet past.

Chapter conclusions

To sum up this variable, we investigated the political stability of Kazakhstan, Kyrgyzstan and Tajikistan in order to conclude to what level its components affect the renewable energy transition process. The analysis showed that the most robust country regarding governmental structure and its relations with society is Kazakhstan, while Kyrgyzstan and Tajikistan are less robust. Kazakhstan and Tajikistan have been authoritarian since their independence and Kyrgyzstan started as democratic to become authoritarian, but since 2011 it seems to return to more democratic functions again. However, in all three countries clans and political factions dominate the political and social life, while economic assets are shared among the prevailing elites and their factions. Renewable energy resources are also used as assets into this "pie sharing" of power. Social cohesion is therefore not granted, as societal functions are based on clan networks, despite the fact that there are no big ethnic minorities causing unrest. As far as political stability is concerned, Tajikistan was and still is the most unstable, as it witnessed a 6-year civil war and still faces turmoil in its territory caused by local warlords on power in their regions. Kyrgyzstan can also be characterized as unstable as there have been 2

revolutions that overthrew the country's governments in the last 10 years. Kazakhstan has no record of social unrest or political turmoil yet.

Renewable energy transition seems to have slightly grown in the authoritarian but stable Kazakhstan since independence, but if political stability remains in the country, the governmental plans of increasing its renewable share will be implemented. Kazakhstan has been exploiting its vast fossil fuels reserves and only lately has set plans on the diversification of its energy sources. Kyrgyzstan's transition was progressing until 2005 when the Tulip revolution occurred. Since then and until 2011 the transition was halted and only after 2011 it started progressing again. Last but not least, Tajikistan started in the chaos of a civil war and it ended up socio-politically fragile and under an authoritarian rule. Its renewable energy production was stagnant but at high levels during the civil war years and after the central government was restored it slightly increased, despite the authoritarian nature of the government and the fragile stability among the ruling elites that still exist in the country. This paradox is explained from Tajikistan's soviet past. During the soviet era, Tajikistan was selected for its huge hydro reserves to produce the majority of its electricity by exploiting these resources. The new state in 1991 inherited all the soviet hydro infrastructure and it kept using them, despite being in civil war. After the end of the war that infrastructure was still in use, although the consumption patterns of the country were low as a result of the civil war.

5.2.3. Foreign Direct Investments

This chapter examines an external factor that can influence the renewable energy transition course in Central Asia. This factor is the level of Foreign Direct Investments in the renewable energy sector of the countries in study. We have already investigated some endogenous factors influencing the course of the transition, but on the energy sector in general and especially in countries with economies in transition, investments from abroad can play a role into the further expansion of the sector. Investors after all have historically been interested in investing on the energy sector of resource rich countries.

Due to lack of sufficient data on FDI on the renewable energy sector though, this chapter focuses on general FDI and, where possible, on FDI in the energy sector of Kazakhstan, Kyrgyzstan and Tajikistan in order to reach some conclusions.

5.2.3.1. Kazakhstan

Kazakhstan has attracted significant foreign investment since independence. As of 2013, foreign direct investment in Kazakhstan totaled $9.739 million, primarily in the oil and gas sector. Although Kazakhstan prefers national investors instead of foreign ones, FDI continued to flow in and even increased in 2014, despite an overall decrease on FDI in the region. The main investors are the Netherlands, USA, France, Great Britain and China (Santander, 2015). Oil and gas sector attracted the majority of foreign investments, with the United States being the top source of investment capital. From 2005 to 2013 the US invested in Kazakhstan around $31 billion. According to the U.S. Department of State (2015) and the IMF (2015) 43% of the inward direct investments in Kazakhstan in 2013 came from the Netherlands, while 11 % from the U.S. and 7% from France. China and the British Virgin Islands with 4%

each completed the 5 biggest investors in Kazakhstan for 2013. According to the same sources investments from the Netherlands have been concentrated in financial services, the United States and France invested in oil and gas, while Chinese and Russian investors have been investing in oil and gas as well. Oil and mining sectors are apparently the most attractive sectors in the Kazakhstani economy since they concentrate more than half of the total FDI. During the last decade Kazakhstan, also as known the "*locomotive*" of post-Soviet Central Asia, has tripled its oil production and become the world's second largest exporter of oil after Russia (Santander 2015). Most of the current oil and gas output comes from foreign companies and only 20% comes from the state-owned company Kazmunaigaz (US EIA, 2015), a fact that shows that foreign companies are already active in the country's energy sector.

Astana continues to make progress towards the country's goal of diversifying its economy and drive away from an overdependence on extractive industries by improving the investment climate. Therefore Kazakhstan has adopted a national FDI promotion strategy with Kaznex Invest, the national investment promotion agency playing a key role in trying to attract foreign investment into priority sectors.
Alternate energy sector is one of the priority sectors of Kazakhstan for investments, especially the power generation where great investment opportunities exist. Most of the power generation infrastructure in Kazakhstan was installed during the Soviet era, therefore many power plants have reached or are about to reach the end of their techno-economic life. Due to underinvestment in rehabilitation of power generation plants and transmission lines and the construction of new power plants, Kazakhstan faces difficulties in meeting power demands and power winter shortages especially in the south are often. The opportunities for investors in both power generation and transmission are abundant, in particular for the rehabilitation of existing power plants and the construction of new power plants (UNCTAD, 2014).

It is apparent that the majority of FDI in Kazakhstan the last years has been concentrated in the oil and gas sector, but there is a declared goal of the government to attract FDI on the alternate fuels sector as well. On that purpose Astana is trying to improve its overall attractiveness for investments with a special emphasis on the renewable sector industry. That seems to work good so far, as the majority of the renewable energy projects in the country are either from foreign companies or from joint projects with Kazakh companies. Most of these projects are concentrated in solar and wind infrastructure and it seems that they are going to be finished soon enough to assist the renewable energy transition of the country.

5.2.3.2. Kyrgyzstan

Despite the efforts of the Kyrgyzstani government to improve its investment climate, FDI in the country has been limited for many years, with the national economy remaining unattractive to foreign investors. The main reason why the volume of FDI remains low is the low economic development and the low competitiveness of the country's industrial sector. Moreover, attracting investments requires having a transparent and well-functioning legislation that reduces interference from the state, eliminates corruption and provides a stable finance system and treats both foreign and domestic investors in the same way. The Kyrgyz

republic has listed some priority sectors for attraction of FDI and the fuel and energy sector is on the top of that list.

According to UNCTAD (2015) $758 million flowed in 2013 into Kyrgyzstan from abroad. There have been investments from Canadian companies in mining and petroleum industry, from Chinese in mining industry, from German in agro-industry and from Russian in finance, telecommunications and tourism. The following countries are listed as the largest sources of FDI in first nine months of 2011: Canada (48%), China (14%), United Kingdom (7%), and Germany (6%). In 2010 largest sources of FDI were Canada (37%), United Kingdom (16%), China (12%) and Russia (10%). (World Bank, 2015)

FDI inflows declined in 2011, mainly because of the economic situation in the euro-zone and the political instability in the country the previous years. In 2013, China announced an aid of several billion dollars to finance various projects on energy and infrastructure (Santander, 2015).

FDI in Kyrgyzstan is limited and is concentrated on extracting industries and oil and gas exploration. Bishkek is trying to attract investors in other sectors, including renewable energy sector, so that it can develop its fair resources in renewables apart from hydro. It is unknown if they are going to succeed in attracting FDI on renewables therefore the future funding of renewable energy transition is uncertain.

5.2.3.3. Tajikistan

With improvements in the investment climate of Tajikistan, opportunities exist in energy, telecommunications, natural resource extraction and tourism. President Rahmon has made many statements for foreign investments, particularly in energy and transport infrastructure and his government has identified some priority areas on investments. Priority industries listed in the investment promotion program of the Tajik State Committee on Investments and State Property include: hydropower engineering, extraction and processing of precious metals and stones, telecommunication and infrastructure development (UNCTAD, 2014).

The government has also taken some steps into creating an enabling environment for attracting investments. For example, the Government already adopted a series of laws[13] that provide protection to foreign investors' rights and legal guarantees for foreign investors' activities. These laws also stimulate foreign participation in privatization. Furthermore the Tajik government has established some Free Economic Zones, trying to boost the country's economic activity. Sughd Free Economic Zone is the most developed zone in the country and it has attracted foreign investment in mining, aluminum processing and solar panel manufacturing (UNCTAD, 2014).

Despite the government's efforts though, FDI inflows in Tajikistan remain low. According to UNCTAD (2014) in 2013 $108 million were invested in Tajikistan from foreign investors, while in 2012 there were $233 million invested in the country. Tajikistan's official statistics

[13] "On Foreign Investments", "On Foreign Economic Activities", "On Joint-Stock Companies", "On Concessions and the Tax and Customs Codes"

report that China, Russia, Qatar, Great Britain, Turkey and Iran were the leading foreign investor in Tajikistan for 2013, with most of the FDI flowing into the construction materials production sector, followed closely by communications.

Tajikistan could speed up the adoption of innovative green technologies by facilitating foreign direct investment in key economic sectors. But the Government of Tajikistan mostly courts state-led investment and external loans from the country's perceived geopolitical friends rather than making conditions favorable for private investors from abroad (US Department of State, 2014). Accordingly, the principal investors in recent years have been governments with geopolitical interests in the region, especially China, Russia, and Iran.

Tajikistan is the poorest and the most unstable country in the region and that is reflected on the amount of FDI flows in the country. Bishkek tries to attract investments on several sectors including energy, but the low productivity and production in the country as well as a weak infrastructure pose difficulties on that cause. The government together with International Foreign Investors started an active development of national infrastructure with several large road and bridge reconstruction and rehabilitation projects aiming to upgrade them according to the internationally acceptable standards. Electricity distribution facilities also undergo a serious reconstruction.[14] Renewable energy transition though is also uncertain regarding its funding from FDI.

Chapter Conclusions

To conclude this part, Foreign Direct Investments have the potential to boost the renewable energy transition course of Central Asian states and they certainly played an important role in that process in Kazakhstan. The most prominent sector attracting FDI in those countries is the still exploitation of hydrocarbons, but it seems that there are also significant investments on electricity generation from renewables in Kazakhstan and Kyrgyzstan. According to UNCTAD (2014), power sector needs investment of about $36 billion during the period 2011 to 2022 in order to meet the increasing power demands in South Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan and the majority of that money should be provided by international investors. On that way the renewable energy transition will continue. Investors and companies willing to develop and run big renewable energy projects are however usually interested in doing business with stable governments and they tend to invest on countries that are not prone to social unrests and turmoil, something that would jeopardize their investments (Feng, 2001).

[14] Republic of Tajikistan. Tajik embassy in Pakistan. Retreivedn on June 5th 2015 from http://www.tajikembassy.pk/investment.php.

6. Concluding remarks

The main goal of this research was to identify and explain the variation in the energy transition process in Central Asia. It focused on Central Asia because this region is rich in hydrocarbons which are successfully exploited, but simultaneously the renewable energy transition has been initiated by most states in the region. Moreover the region is on the centre of international community's attention for its geostrategic place between East Asian markets and European markets and because of its peculiar sociopolitical systems that tires to combine western type democratic functions with Asian style politics. Transition was examined on the basis of the percentage of electricity generated from renewable energy sources in three case study countries, Kazakhstan, Kyrgyzstan and Tajikistan. Transition was explained on the basis of three factors categorized as endogenous and exogenous to the countries. As endogenous factors this paper identified the countries' geomorphology and their political stability. More specifically this paper looked into the geographic characteristics and the potential these might provide to the countries for renewable energy sources exploitation. Regarding the political stability, this thesis investigated the formation of those countries' governments and their relations with their society, as well as the social cohesion within these countries. These indicators also indicate political stability within the country which was also examined in terms of the occurrence of social unrest and turmoil within the countries the last 25 years. Moreover, on the basis of its analysis the thesis discussed implications about the future course of the renewable energy transition in Kazakhstan, Kyrgyzstan and Tajikistan.

The results show that Tajikistan is the leader in electricity generation from renewable sources while Kazakhstan is the laggard. Kyrgyzstan comes second, but its electricity generation from renewables is high, close to the levels of Tajikistan.

Geomorphology explains to a large extend why Tajikistan and Kyrgyzstan are leaders in the renewable energy transition in the region. Having examined the landscape and the renewable potential given by the landscape, this thesis showed that these countries are mountainous, upstream countries and this is the reason why they have vast hydro resources. In fact their resources are so vast that they still have a big potential, even though they have been using them for decades. Kazakhstan on the other hand is a downstream country in the steppes with a significant but not vast hydro potential. As a result Kazakhstan has been mainly using its vast hydrocarbon resources for electricity generation. Kazakhstan has good small hydro potential and very good wind and solar potential. Kyrgyzstan and Tajikistan have also good solar potential while their wind potential is not as good as wind, apart from being technically challenging.
It seems then that geomorphology played a role into the current use of electricity from renewable sources in the three countries as it indicated the source with the most potential in order to be exploited. Geomorphology however does not explain whether these states are going to further exploit their renewable sources. It only indicates the sources with the greater potential. States assess this factor when they are planning their renewable energy policies, but whether they will eventually proceed with the exploitation of these sources and their renewable transition is based on other factors.

The next factor that this paper examined was the political stability in Kazakhstan, Kyrgyzstan and Tajikistan. The governmental structure and its relations with society and the social coherence in these countries were investigated and hence the occurrence of turmoil and unrest. Political stability seems to affect the whole governmental structure of any state and thus it affects the renewable energy transition, as part of the economic system of a country. According to our research, Kazakhstan has the most robust government, has the most cohesive population and has been the most politically stable country in the region as there have been no social unrests in the country since independence. It is characterized though as

authoritarian. Kyrgyzstani and Tajikistani governments are slowly enhancing again after the political instability the revolutions in 2005 and 2010 in first state and the 1991-1997civil war in the later brought. Tajikistan's government is also characterized authoritarian, while Kyrgyzstan's later government seems to be more democratic than the previous ones. Those countries' population is less cohesive than Kazakhstan's, however in all three countries it seems that clan based politics and networks dominate the political and social life in the region. In the authoritarian regimes the use of national assets, including natural resources, functions as a way to keep the balances between different factions. This fact is strongly related to the influence of local elites in central government and its decision making process.

The research also showed that in the years of instability in Kyrgyzstan and Tajikistan the renewable electricity generation was hindered, meaning a halting in the transition process too, while in the years of relatively stability the percentage of renewable electricity increased. Thus it seems that political stability indeed affects the transition progress. If Kazakhstan and Kyrgyzstan are to remain stable they are likely to continue their transition process and implement their diversifications and expansion projects. Tajikistan is doubtful if it is going to proceed with its transition path as it remains kind of unstable, although during instability the past its transition was not hindered that much.

The last factor that this paper examined was the level of Foreign Direct Investments in each country's renewable energy sector, a factor identified as exogenous. Lack of data availability though led to the assessment of this factor's contribution in the transition process by looking at general FDI in these countries. Kazakhstan is the most international oriented state and the most politically and economically stable among the three. Therefore it attracts amounts of FDI, the biggest part of them going in its oil and gas sectors. Kyrgyzstan and Tajikistan are receiving far less FDI and the majority of that goes to the extracting industries and road and telecommunications infrastructure.

FDI is of particular importance for the most countries as it brings technology and management practices and it opens up new markets and opportunities (OECD, 2008). Renewable energy sector on these countries cannot grow further without FDI, especially in the Kyrgyz and Tajik republics which suffer from low economic development. Kazakhstan may have the economic power, but lacks the renewable technology expertise, that is why it also needs FDI to proceed with its transition. FDI has been and can be the mean to boost the renewable energy transition in those countries. The only problem is that most investors take into consideration the sociopolitical regime in the countries they intend to invest and they try to avoid unstable countries. There are some investors though, especially from China, who do not pay that much attention in the socio-politics of the countries they are investing. This fact might affect the FDI levels in the Central Asian region, considering the growing investments on various sectors from Chinese investors in the region.

To conclude with, the analysis shows that the most important factor that affects the renewable energy transition in Central Asia, among the three examined in this research, is the *political stability* in each state. Kazakhstan, Kyrgyzstan and Tajikistan may have a huge potential in renewable sources and may attract different level of investments, but their renewable energy share and its expansion are directly linked to their sociopolitical regime affecting governmental stability. Civil unrest and a weak central government will most probably hinder the transition. Such incidents happened in Kyrgyzstan and in a lower extend in Tajikistan, but the Tajik system's dependency on its soviet past shrank the effects of instability on its transition process. On the contrary, political stability can provide the frame for development and even expansion of the renewable sources, especially by attracting FDI on that purpose. That has happened in Kazakhstan, even if the state is not characterized as democratic.

Regarding the future implications of the renewable energy transition in Central Asian countries, it seems that these countries will proceed with their transition on the grounds that their governments will remain robust, even if not democratic, and that there will be no social unrest initiated from their minorities or their local elites wanting a new power and resources sharing in their countries. Renewable energy transition in that region seems to be first and foremost a political process closely linked with the political and economic interests of the elites in power and it seems that it can be promoted in most of those states, but in expense of democratic functions.

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