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Development of Green Economy via Commercialization of Green Technologies: Experience of Kazakhstan

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Abstract

Green technologies are essential tools to ensure sustainable development of the economy. In this regard, the article deals with analysis of the development tendency of green economy in Kazakhstan emphasizing commercialization of green technologies. In the first part of the study, authors investigated more than 50 official sources of information, including laws, concepts, programs, events and reviews of major international organizations. The study's methodological basis included Kazakhstan's legislative and regulatory Acts, state programs and Concept for transition to Green economy, and data about innovations in the field of green technologies. Six experts were interviewed in order to determine factors which interfere to commercialization of green technologies. Urgent problems and trends of development, challenges and obstacles to gain green economy have also been identified in the result of expert interviewing. The research shows that despite Kazakhstan's intentions to update and develop much of its infrastructure over the coming 20 years, inefficient use of resources is currently observed in every sector. It is necessary to encourage scientists and entrepreneurs to invent and commercialize new green technologies. That would be basis for successful implementation of transition from "brown" to green economy.

Keywords: Green economy, Kazakhstan, Green technologies, Commercialization of innovations, Sustainable development.

JEL Classification Codes: Q01, Q55, Q58, O31, O38.

1. Introduction

Today the task of ensuring the sustainable development of human civilization is being viewed as the guiding principle of the life of the economy and of the society in general. Sustainable development is considered to be a development which "... satisfies our current needs without jeopardizing the capability of generations to come to satisfy their own future needs (UNCTD, 1997). In a most general sense, the solution of this task is linked to the shaping of "a new model of green economy" (Toloraya, 2014). Researchers focus their interests on the commercialization of new green technologies that will substantially improve social welfare and ensure process of transition to green economy.

The OECD (2011) has defined green growth as follows: "Green growth is about fostering economic growth and development while ensuring that the natural assets continue to provide the resources and environmental services on which our well-being relies. To do this, it must catalyze investment and innovation which will underpin sustained growth and give rise to new economic opportunities".

Critically, the green economy concept is more than merely "greening" economic sectors; it is a means of achieving the sustainable development imperatives of:

- 1) Improving human well-being: securing better healthcare, education and job security;
- 2) Increasing social equity: ending persistent poverty and ensuring social, economic and financial inclusion;
- 3) Reducing environmental risks: addressing climate change, ocean acidification, the release of hazardous chemicals and pollutants, and excessive or mismanaged waste; and
- 4) Reducing ecological scarcities: securing access to freshwater, natural resources and improving soil fertility.

Deep "ecologization" of the economy on the basis of the key priority of modern development, which is to increase the value of nature and natural resources, as well as of human life and health is a challenging task in the agenda. Implementation of the sustainable development tasks based on market economy means to ensure market demands on natural resources, ecosystem services and related characteristics of the goods, consumer demands (including by population and State). This measure will enable to stimulate the developed countries to diminish the neg-

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ative environmental impact as well as to encourage the developing countries into defining ways of their development towards the green economy, preservation and augmentation of natural capital through their capitalization and receiving benefits from the global community.

In most countries, Kazakhstan is not an exception, in which the transition to a green economy requires changes to existing governance approaches, institutions, and markets. The transition will take different paths in different countries depending, inter alia, on domestic context, natural capital, and socio-economic priorities of a country.

The Rio Earth Summit (1992) provided the vision and important pieces of the multilateral machinery to achieve a sustainable future. Nevertheless, many authors around the world, such as environmentalists, scientists, politicians, economists have made a huge contribution in attempting to create a more sustainable future.

For example, Leopold and Schwartz (1949) published their well-known book in 1949, wherein the main message is that the land is not there to serve us, but that we need to live in community with the land. Ehrlich (1968) stated that population growth and environmental deterioration are inextricably linked, and proposed four action items to address the crisis. He also accentuated that gargantuan efforts are necessary to increase food production and feed all human-being. Buckminster (1969) argued that shortsightedness and silo of thinking are the main causes of impending ecological crisis. His book is a remarkable for its overall message as for its elaboration of concepts that were ahead of their time. Also, he suggested considering the planet as a closed system, using a metaphor "Spaceship Earth" to indicate it, so there is no "away". In 1972, Meadows et al. (1972) published a commissioned report to the Club of Rome, which is known as a book "The limits to growth". Their book was revolutionary, and reported 13 scenarios for the future based on a computer simulation model developed at MIT. Despite variations, all of them produce a sobering conclusion, namely that "the behavior mode of the system is clearly that of overshoot and collapse. Authors claimed that growth trends in world population, industrialization, pollution, food production and resource depletion suggest that biophysical limits will be reached sometime within the next 100 years.

One of the turning points in the sustainable development is the publication of The Brundtland report (1987), also known as 'Our common future'. This report introduces the three fundamental components of sustainability – environment, economy and society – and highlights what is needed in each area to achieve sustainable development. It makes clear that we cannot achieve success in one of these areas at the expense of areas. Being considered as one of the first comprehensive assessments of social, environmental and economic problems facing the world, one should admit that the UN Conference in Environment and Development held in Rio de Janeiro in 1992 was a direct outcome of the Brundtland report (1987). Doubtless, Kazakhstan has a distinct understanding of the state management assuming that promotion of the green economy is the main way and the only one in maintaining a sustainable

development. And our paper aims to consider the development and future perspectives of green technologies in Kazakhstan as a main tool of establishing sustainable economy.

2. Research Methodology

The relevance and necessity of development of green technologies have been investigated in the first phase of the study. Then, stages of development of green technologies in Kazakhstan were identified based on secondary sources of information. In addition to the analysis of statistical indicators, it was decided to conduct an expert interviewing with leading experts in various industries. The main and indirect questions were drawn up for interviews in order to reveal five aspects of development of green technologies, such as demand for the product or service, technology (scientific aspect), human resources, mentality and perspective. It is important to distinguish main research questions and subsidiary questions according to methodology of qualitative research (Andrews, 2003). Six experts were interviewed on condition of anonymity. Interviews were conducted by the method of story-telling, where the researcher asked basic questions to guide conversation in the right direction, subsequently the story of an expert based on his personal experience and deep knowledge. A great experience and professionalism of the experts revealed several hidden factors and the specific problems of green technologies. Direct, but anonymous quotes from the interviewees are used to support our analysis, because examining theoretical scheme and active work of both interviewer and interviewee can make the research lively and original (Silverman, 2005).

The main guiding questions during an interview with an expert:

- 1) How do you assess the demand for green technologies in Kazakhstan?
- 2) Who is the main consumer of your products / services?
- 3) How do you assess the human resources in your area?
- 4) What are the factors hindering the commercialization of green technologies in Kazakhstan?
- 5) What can you say about the scientific research, development and technology transfer in the "green" area?
- 6) What can you say about the mentality of the people of Kazakhstan in terms of the transition to a green economy?
- 7) How do you see the future of green technology in the country?

Main characteristics of the selected expert are specified in the following Table 1. One should note that even if the E2 does not have a branch in Kazakhstan, his company intends to open it in the West of our country. Thus, he did market research and other complex investigation before making such decision, so, undoubtedly can be considered as an expert in green technologies regarding conditions of Kazakhstan.

<Table 1> Characteristics and Interviewees' Roles in Six Organizations

Experts	Fields of activity	Interviewee role	Location	Experience: total / in Kazakhstan (year)
Expert 1 (E1)	solid waste management, municipal infrastructure, renewable energy sectors	Board Advisor	Astana (Headquarter in Poland)	30 / 10
Expert 2 (E2)	cleaning soil from pollution	Member of the Board	No branch in Kazakhstan (Headquarter in Latvia)	18 / 0
Expert 3 (E3)	sewage treatment, pump equipment, environmental protection	Sales Manager	Astana (Headquarter in Finland)	45 / 9
Expert 4 (E4)	sustainable development, waste management, energy efficiency	Executive Director	Almaty	12 / 12
Expert 5 (E5)	reuse and recycling of waste	Manager	Almaty	2 / 2
Expert 6 (E6)	alternative energy sources, biophysics	Scientist	Almaty	21 / 10

Note: compiled by the authors on the basis of research.

3. Main Part

3.1. Current Situations in Kazakhstan Regarding Development of Green Economy

Green Economy is instrumental to nation's sustainable development. Transition to Green Economy will enable Kazakhstan achieve the proclaimed goal of entering the top 30 developed countries of the world.

According to estimates, the transformations to be implemented as a part of a Green Economy will additionally increase the GDP by 3%, create more than 500,000 new jobs, develop new industries and services and generally provide higher living standards all over the country by 2050. Overall investments required for transition to a Green Economy will be about 1% of GDP per annum, which is equivalent to USD 3 to 4 billion (CTRKGE, 2013).

There are certain reasons for transitioning to a Green Economy:

1) Inefficient use of resources. According to experts, this translates into USD 4 to 8 billion lost by the economy each year and may amount to USD 14 billion by 2030. Furthermore, the energy saving potential amounts to USD 3 to 4 billion per

year, which is likely to reach USD 6 to 10 billion per year by 2030 (MESRK, 2013).

2) Inadequate system of tariffs and pricing for energy resources disincentives industrial technology improvements.

3) Currently, Kazakhstan is facing a situation where its natural resources and environment are seriously deteriorating across all crucial environmental standards. Almost one third of the agricultural lands are either degraded or under serious threat of being so, with more than 10 million ha of potentially arable land abandoned so far. Currently, the economy is forecast to run short of 13 to 14 BCM of sustainable water resources by 2030. No integrated waste management system exists. 97% of municipal solid waste (MSW) ends up in uncontrolled landfills and waste disposal sites that do not meet the sanitary requirements. Historically, toxic and radioactive industrial waste is also a serious problem.

4) Kazakhstan has inherited great territorial heterogeneity in terms of economic parameters, living standards and environmental conditions. Development of new industries and green clusters will make it possible to reduce inequality in the development of various regions and harness their potential in the renewable energy sector, agriculture, water management, waste disposal and other sectors.

5) The global community expects Kazakhstan to successfully implement several land mark projects: the EXPO 2017 exhibition entitled Energy of the Future and the Green Bridge Partnership Program aimed at contributing to sustainable development in Central Asia and other regions of the world. Countries in the region such as Mongolia, China and South Korea have already started implementing their ambitious Green Economy plans as promised internationally by their presidents. For example, South Korea has committed 2% of its GDP to green growth and China's investments account for 1.5% of its GDP, and this figure is expected to grow by up to 2% by 2015 (UNEP, 2013).

The Green Economy Concept is to be implemented in accordance with the provisions of the Constitution of the Republic of Kazakhstan, Strategy "Kazakhstan-2050" and "Kazakhstan-2030: Prosperity, Security and Growing Welfare of All the Kazakhstanis" and the Strategic Plan for the Development of the Republic of Kazakhstan until 2020. The matter of the Green Economy Concept implementation will be regulated by legislative acts of the Republic of Kazakhstan related to the transition towards Green Economy (Nazarbayev, 2014).

The tools for implementing specific tasks of the Concept by sector are the existing program documents as amended and supplemented with respect to the implementation of the main areas of the Green Economy Concept, such as the Program of Agro-Industrial Complex Development for 2013-2020 (Agribusiness2020), the State Program for Expedited Industrial and Innovational Development of Kazakhstan in 2010-2014, National Education Development Program of Kazakhstan in 2011- 2020, local development programs, strategic plans of governmental bodies, Zhasyldamu Industry Program for 2010-2014 and other industry programs that will be updated to include new areas of focus such as on air quality, waste management, prevention of desertification and land deterioration, improving soil

fertility, development of fisheries, aqua cultures and fish breeding. The plan is also to develop the State Program for Water Resource Management for 2014-2040.

The top-priority measure to assess the situation and determine action priorities is to introduce a system of indicators of sustainable development. These are primarily indicators of the resource intensity and energy intensity in economic growth and specific indicators of pollution. Moreover, accumulated environmental damage, resource depletion, landscape degradation and the impact of pollution on human health should be taken into account. It is principally important, especially to determine prospects for development and to assess the use of 3 renewable energy sources, to evaluate ecosystem services (including various ecosystems, biological resources, biodiversity and area of protected natural reserves). Therefore, we compare key indicators of green economy for Kazakhstan and other developed countries in Table 2 (Tamanini, 2014; Essekina, 2014).

business community and among all citizens of Kazakhstan.

The social aspect of transitioning to Green Economy is expressed through the creation of new jobs in the five industrial clusters which will make it possible to diversify the economy of Kazakhstan.

Green construction. Current dynamic of the construction sector shows that the number of new houses to be built by 2030 will be equal to total current housing stock. Moreover, Kazakhstan imports a lot of main construction materials, such as windows, heat insulation, and copper pipes. If it were arranged that even 50% of such products were produced domestically, this would make it possible to create up to 150,000 new jobs by 2030.

Agriculture. Implementation of the Concept will make it possible to create around 400,000 new jobs in the agricultural sector. Up to 150,000 jobs are expected to be created from the ex-

<Table 2> Key Indicators of Green Economy for Kazakhstan

Countries	Energy efficiency (GDP per unit of energy)	The share of fossil fuels (% of total)	The share of renewable energy (% of total)	Carbon dioxide emissions per capita (tonnes)	Urban pollution (mg/m ³)	Exhaustion of natural resources (% of GNI)	Satisfaction with the actions for the protection of the environment (% satisfied)
Norway	8,1	58,6	45,3	10,5	16	10,6	51,5
Netherlands	7,7	92,5	4,4	10,5	31	0,8	66,1
Germany	8,3	80,1	8,9	9,6	16	0,1	61,8
Sweden	6,6	31,1	32,4	5,3	11	0,2	62,9
Denmark	9,5	80,4	18,9	8,4	16	1,5	64,3
France	7,4	51,0	7,6	6,1	13	0,0	57,5
Czech Republic	5,5	81,5	5,4	11,3	18	0,3	56,6
United Kingdom	10,1	90,2	2,8	8,5	13	1,2	66,8
Poland	6,8	93,8	6,3	8,3	35	1,0	43,6
Belarus	4,1	92,1	5,5	6,5	7	0,9	50,6
Russia	3,0	90,9	3,0	12,1	16	14,5	18,3
Kazakhstan	2,5	98,8	1,1	15,3	15	22	37,4
China	3,7	86,9	12,3	5,2	66	3,1	73

3.2. Main Principles and General Approaches of Transition to a Green Economy

Transitioning to Green Economy will require adhering to the following principles:

- 1) Improvement of resource productivity.
- 2) Responsible use of resources.
- 3) Modernization of the economy using the most efficient technologies.
- 4) Investment attractiveness of measures for efficient use of resources.
- 5) Prioritization of profitable measures.
- 6) Education and culture supporting the environment in the

tension of pastures and agricultural lands. An additional 50,000 jobs will be created as a part of the extension of greenhouse facilities. More than 200,000 jobs will also be created by developing the whole value chain, including food production.

New technologies in the energy sector. Significant investments in the energy sector in the amount of around USD 50 billion by 2030 and around USD100 billion by 2050 will provide employment opportunities for people with scientific, engineering, technical or construction qualifications. A great share of such investments (up to 50%) will be allocated to renewable and alternative energy sources, and this will make it possible to create new jobs in the high tech renewable energy sector.

Waste management and closed-loop material handling. Global practice shows that the waste management and recycling sec-

tors are very labor-intensive, engaging mainly specialists with engineering and general qualification. Collecting and recycling waste across Kazakhstan may open up to 8,000 new jobs by 2030.

Public water supply and water management. 3,000 to 8,000 new jobs will be created in waste water treatment and irrigation sectors; temporary jobs may also be created for the period of construction of new infrastructure facilities (CGeGD, 2015).

3.3. Science and Innovation for Sustainable Development and «Green» Economy

Belying the idea that commercialization of innovation is a simple construct are the multiple definitions, conceptualizations, and operationalizations that have emerged across studies. Commercialization of innovation refers to the activities required for introducing an innovation to market. Experts measured commercialization of innovation as the early indication of commercialization, operationalized as the first sale of the target product or service (Nerkar & Shane, 2007). However, when an innovation is introduced in the market, only technology enthusiasts typically procure in the early stage, and such enthusiasts comprise less than three percent of the market. Reaching the main stream-market in this manner is often difficult, and the threshold for "successful" commercialization of an innovation will likely lie somewhere between these two extremes - single sale on the one hand and saturating the mainstream market on the other. We therefore define the ability to commercialize an innovation as a firm's capacity to bring a product into a market and reach the mainstream of the market beyond the initial adopters.

There are provisions for the development of new technologies and facilities for sustainable use of natural resources; standards for sustainable forest management have been developed; methodological approaches to environmental protection, flora and fauna preservation have been defined. The results of the most promising scientific developments have been introduced into the real economy with the support of the state, primarily through the mechanism of the State Program of Industrial-Innovative Development, which was first drawn up in 2003. Currently a new program for the period 2015– 2019 is being implemented (CIIDRK, 2013). The state's efforts are aimed at applying an integrated approach to promote high-tech R&D, within which the innovation infrastructure facilities (research and production centers, industrial parks, etc.) implements the whole range of activities - from the scientific idea of development to its implementation, including for the area of «green» economy. Currently, there are a number of innovation infrastructure facilities: research and technology parks, research and production centers, business incubators, etc.

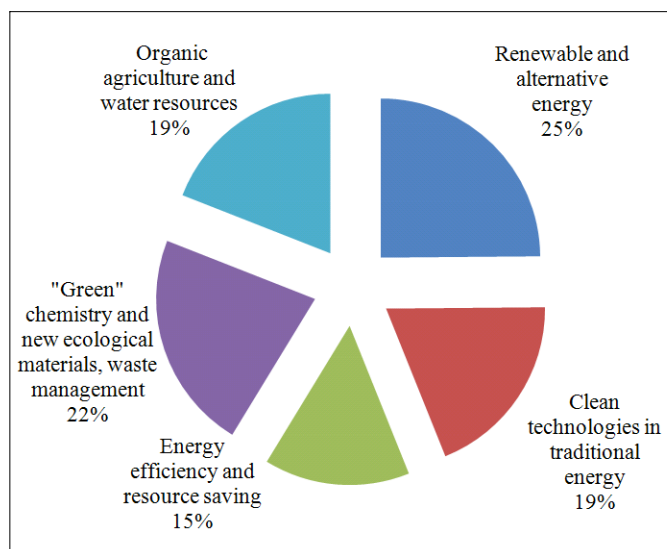
On November 22, 2012 Astana was chosen by the International Exhibitions Bureau (BIE), as the venue to host EXPO2017, which will focus on the theme "Future Energy". The theme is aimed to concentrate on both the future of energy, but also on innovative, practical energy solutions, and their global impact.

The Ministry of Education and Science of Kazakhstan, the Ministry of Investment and Development of Kazakhstan, development institutions – JSC «NMH KazAgro», JSC «NMH Baiterek», JSC «Entrepreneurship Development Fund Damu», JSC «National Science and Technology Holding Parasat», JSC «KazAgroInnovation», JSC «National Agency for Technological Development», JSC «Kazakhstan Industry Development Institute», LLP «Technology Commercialization Center» Innovation Park Eurasian National University named after LN Gumilev and a number of public organizations of Kazakhstan support the competition of technological innovations for green economy.

Mission of the online competition "EXPO 2017" is to bring together the entire scientific and innovative potential of the country to find the best «green projects» in the country, to accompany their implementation, thereby providing content filling EXPO 2017.

Innovative projects were received by following sections (Figure 1):

- 1) Renewable and alternative energy sources – 47
- 2) Clean technologies in the traditional energy sector (storage and transportation of energy, coal, hydrocarbons, coal mine methane, passing gas oil and others.) – 36
- 3) energy efficiency and resource conservation – 28
- 4) «green» chemistry and new composite ecological materials, recycling of waste (solid, liquid, air) and CO₂ – 42
- 5) organic agriculture, adapting to climate change, promoting the absorption of CO₂ and methane emission reduction, and sustainable water supply – 36 (EXPO, 2015).



<Figure 1> Innovative Projects in Green Technologies for EXPO-2017

4. Findings and Results

Kazakhstan aims to diversify the economy with alternative, cleaner sources of energy and will reform its agricultural and industrial sectors to spur scientific innovation and the use of advanced technologies. Such strong government endorsement should stimulate economic drivers of green development. Of course, 'greening' the economy of an oil-producing resource-based country requires sustained political commitment, significant long-term investments and a range of other enabling conditions.

During the study, we analyzed more than 50 sources of information including laws, conventions, concepts, programs, reviews, and reports of international organizations, as well as the sites of government agencies and nongovernmental organizations. According to the results of such a comprehensive analysis, we found that the scientific works about stages of development and establishment of a green economy are virtually absent. This has led us to draw up our own vision of the evolution of green technologies in Kazakhstan. As a result, we have identified the key moments in the history of independent Kazakhstan regarding the green technologies based on the following aspects: the adoption of laws, ratification of conventions, the establishment of competent authorities and companies, major events and other factors (Figure 2).



<Figure 2> Stages of Green Technologies' Development in Kazakhstan

Descriptions and key features of each stage are briefly given below:

1992-2002 years – the period of formation of the basic principles, concepts and the emergence of the foundations.

2003-2012 years –the period of serious steps by the government in terms of support and major events remarkably influenced the course of development of green technologies.

2013-2019 years – the period of active development of green technologies and increased public awareness in our country.

2020-2030 years – development based on sustainable use of natural resources, use of renewable energy on the basis of high technologies. This will be the period based on the established green infrastructure, transformation of the national economy, oriented at rational water use, motivation and stimulation of development and broad implementation of renewable energy technologies, as well as construction of facilities based on high energy efficiency standards.

2030 and further – the transition of the national economy to the principles of the "third industrial revolution". Facing the prospect of a second collapse of the global economy, humanity is desperate for a sustainable economic game plan to take us into

the future. Here, Rifkin (2011) explore show Internet technology and renewable energy are merging to create a powerful "Third Industrial Revolution." He asks us to imagine hundreds of millions of people producing their own green energy in their homes, offices, and factories, and sharing it with each other in an "energy internet", just like we now create and share information online. The vision of Rifkin (2011) is already gaining traction in the international community. The European Union Parliament has issued a formal declaration calling for its implementation, and other nations in Asia, Africa, and the Americas, are quickly preparing their own initiatives for transitioning into the new economic paradigm.

Our paper is an effort to ask difficult questions and start discussing potential pathways and available options. We classified answers of experts by the factors which interfere to the successful commercialization of innovations both in green technologies and other fields (See Table 3).

<Table 3> Terms and Factors Hampering Innovation Activities in Kazakhstan

Terms of innovation	Factors hampering innovation activities
The demand for innovation	Underdevelopment of the national high-tech market; State erroneous position to warrant the incompatibility of fundamental research to the innovation process
Capacity development (achievements, personnel, infrastructure)	The lack of institution innovation managers, professional experience and knowledge in the field of commercialization of innovative structure
Incentives and motivation to engage in innovation activities	The lack of policies of state protectionism of national science, including the innovative grants, grants for youth and women; favorable conditions for venture capital funds
The legal, economic and organizational conditions	Inharmonious legislation on IP; the absence of a developed institute of public contracts; bureaucratic restrictions innovation as the costs of transition from a planned to a market economy; lack of regulation of product markets and related standards, competition rules

Apart from our classification of factors which interfere to the successful commercialization of green technologies, we analyzed the answers of experienced experts, and then tried to focus on main issues mentioned below:

1) The demand for green technologies will consistently grow in Kazakhstan. This is not only due to the requirements of the market, but also due to an urgent need to achieve sustainable development. The sooner we realize this truth, the better. In the meantime, the demand for such technologies is provided by government agencies and private entities in very small

quantities. Foreign companies see a huge untapped market in our country and try to take these niches first, while domestic companies are dependent on foreign technology.

2) The transition to green technology obsolescence of most difficult material and technical assets in the country. While on the other hand, it should be a turning point in the modernization and renovation of the planned facilities. Unfortunately, the denials of the introduction of resource-saving technologies for the sake of personal interests were also revealed. And the development of scientific research in this area requires sophisticated laboratories and cooperation with industry.

3) The opportunity to train personnel of high profile has appeared in the major universities of the country. However, we must take into account that foreign companies coming to the market of Kazakhstan hire their own people to work directly with the technology, and the local staff for other jobs. This complicates the transfer of experience and knowledge. Also, we need to arouse young people's interest in engineering sciences from the school in order to grow up creative and imaginative people.

4) The mentality in Kazakhstan does not allow to sort garbage, or to save energy. However, in all developed countries, this process took some years, sometimes even up to 20 years. In addition, due to the different programs and initiatives that promote green economy, public awareness of the need for the introduction of green innovation in everyday life is steadily growing.

5) The positive trend is expected in the development of Kazakhstan regarding the green technologies. But we must take into account the fact that all the existing problems in this sphere must be addressed in an integrated manner, in other words systematically. It should actively deal with problems such as the commercialization of scientific and technical ideas, preparation of highly qualified personnel, the establishment of associations uniting members of one sphere, the elimination of corruption, literacy on the green economy of the population and businessmen.

Table 4 indicates some of interviewed experts' important comments on selected aspects to support our conclusions.

<Table 4> Interviewees'views about the Development and Commercialization of Green Technologies in Kazakhstan

Nº	Directions	Excerpts from an interview in key areas
1	Demand	"While there is oil extraction and production, there will always be demand for cleaning soil from harmful wastes and pollutants" – E2 "At the moment, the demand comes mainly from the state structures, but according to research, demand from private companies will only rise in the future, we are confident in it" – E1 "Some clients do not always understand the specifics of the work and put forward the absurd requirements of the contract. As a result, we have to give up that kind of job" – E5
2	Technologies	"The opinion that green technology began to develop thanks to the EXPO-2017 is fundamentally wrong" – E4

		"Foreign investors interested in my unique adapted technology on alternative energy, while I could not persuade Kazakh authorities in its effectiveness" – E6 "If this is a global problem, we usually buy proven foreign technology. And if the problem can occur in the long term, we do not mind to cooperate with research institutes [in Kazakhstan]" – E1
3	Human resources	"Our young people are very clever. Their potential is very high" – E6 "Young professionals come to us, but they require a higher salary and are interested in obtaining an apartment, which is impossible in our private company" – E3 "We happened to meet two Kazakh scientists with a great idea and started to cooperate" – E1 "We need environmentalist-economists and ecologists with a legal background" – E4
4	Mentality	"The mentality will not change immediately. For example, it took twenty years to go to the sorting of waste in Europe" – E5 "We put the containers for separate recycling throughout the city [Almaty]. Unfortunately, this initiative failed completely" – E5 "It is undeniable that there have been cases where managers of factories refuse to adopt new technologies, because the innovations contradict the personal interests of some people" – E6
5	Perspective	"The prospect of green technologies in Kazakhstan is enormous. "We either will develop it [green technology] or fall behind the world for decades. There is no other way" – E4 "Definitely, the progress is expected. But we need to solve problems systematically. Otherwise, it might not work" – E5 "I think that recycling of household waste can be a great source of local development [for Kazakhstan]" – E1
Note: compiled by the authors on the basis of research.		

By analyzing current situation in Kazakhstan regarding green economy, we propose next steps and measures to develop this process of moving toward sustainable development:

1) Focus the green economy policy concept on specific sectors such as renewable energy, energy efficiency, water governance or waste management

2) Assess the viability of the proposed investment mechanisms and ensure a wide variety of economic actors, not just the largest technology and infrastructure players, can access them

3) Establish coherent measures to mainstream the green economy — such as a multi-stakeholder green economy forum, screening of public expenditure, green accounting

4) Set up an inter-agency green economy coordinating body with a regulatory mandate, for example, a State Commission or a Council under the President.

5) Increase Kazakh institutional capacities and governance, to improve accountability and enable effective public oversight of

the green economy programme

6) Carry out fiscal reform to shift incentives from 'brown' to green economic activities, and towards inclusive approaches

7) Review subsidies and other incentives, notably in the oil and gas, mining and agricultural sectors. Subsidies should address the social as well as the environmental impacts

8) Clearly define the options for transferring of ownership of publicly funded research results from the state (government) to the (public or private) agent performing the research, down to the level of the individual inventor;

9) Establish clear incentives for innovation by protecting the rights of researchers and scientists, while creating favourable conditions for the creation of firms based on the results of their research which will enhance effectiveness of usage of green technologies;

10) Provide precise guidelines that allow knowledge organizations to understand the opportunities and limitations of IPRs and offer guidance on how to deal with the different options. Based on this, organizations would be able to develop their own intellectual property guidelines, providing clear and strong incentives to the inventor.

11) Ensure public finance accountability and oversight over new environmental programmes.

12) Adopt a step-by-step approach in order to create dialogue and engagement with Kazakh industries and businesses — and a strong business case for the green economy concept.

13) Develop a strong communication strategy to support policy breakthroughs in the short-to-mid-term, in order to promote investment in renewable energy, energy efficiency, water and waste management technologies.

5. Conclusion

Kazakhstan's new capital city Astana will host the international trade fair EXPO in 2017. It has chosen the theme Future Energy, which aims to "promote and discover sustainable, energy solutions". The next few years will be crucial for laying the groundwork if Kazakhstan is to make a meaningful transition to a green inclusive economy by then. Progress in the dissemination of the ideas of sustainable development and active participation in this process means their adjustment to the specifics of each country. The concepts of sustainable development and the ways of its implementation are different in various countries and will undoubtedly keep changing further on. It is necessary to assess achievements and challenges on the way to sustainable development at the national level. The success of the implementation of the ideas of sustainable development depends on the pro-active position and awareness by the broader population.

Domestic support is essential, while international engagement can help to ensure that the process is more inclusive and brings benefits across Kazakhstan's population. New international financial and institutional instruments are also needed to support Kazakhstan's national endeavors to embrace a greener future. In

our time, it is important to build an effective relationship between science, production and business. This applies to all fields of science. But we separately analyzed the transition to a green economy, and concluded that the commercialization of new green technologies significantly contribute to sustainable development. Necessary measures have been taken for this purpose, but there are problems and challenges that need to be solved.

The green economy is more than just environmental in scope; it is also about development and the economy. From a development perspective there are a number of ways in which a green economy might benefit both developed and developing countries. Kazakhstan cannot remain aside from the sustainable development through green technologies; in fact it can be a new impetus for the future development of the country.

References

- Andrews, R. (2003). *Research questions*. Cornwall: MPG Books.
- Buckminster, F.R. (1969). *Operating manual for Spaceship Earth*. Carbondale: Southern Illinois University Press.
- CGeGD. (2015). Coalition for green economy and the development of G-Global. Retrieved September 30, 2015 from <http://greenkaz.org/index.php/ru/>
- CIIDRK. (2013). About the approval of the Concept of Industrial-Innovative Development of Kazakhstan for 2015 - 2019 years. *Concept of Industrial and Innovation Development of the Republic of Kazakhstan*. Retrieved September 30 from http://fic.kz/uploads/files/Concept_Eng.pdf
- CTRKGE. (2013). Concept for Transition of the Republic of Kazakhstan to Green Economy. *Ministry of Environmental Protection of Republic of Kazakhstan*. Retrieved September 30, 2015 from <http://www.osce.org/eea/104851?download=true>.
- Ehrlich, P.R. (1968). *The population bomb*. New York: Ballantine books.
- Essekina, B.K. (2014). "Green" economy: international experience and Kazakhstan. Research and Education Center "Green Academy, Borovoe. Retrieved September 30, 2015 from <http://pps.kaznu.kz/2/Main/FileShow2/26163/100/3/0/2015//>
- EXPO. (2015). Register for selection of green innovations for EXPO2017. Retrieved September 30, 2015 from <https://expo2017astana.com/en/>.
- Leopold, A., & Schwartz, C.W. (1949). *A Sand County almanac, and Sketches here and there*. New York: Oxford University Press.
- Meadows, D.H., Meadows, D.L., Randers, J., & Behrens, W. W. (1972). *The limits to Growth*. New York: Universe Books.
- MESRK. (2013). Scenario development of direction of "safe, clean and efficient energy". Ministry of Education and Science of Republic of Kazakhstan, Astana: JSC "National Center for State Scientific and Technical Expertise." Retrieved September 30, 2015 from <http://pps.kaznu.kz/2/Main/FileShow2/26163/100/3/0/2015//>

- Nazarbayev, N. (2014, January 17). Address of the President of the Republic of Kazakhstan N. Nazarbayev to the nation. Retrieved September 30, 2015 from http://www.akorda.kz/en/addresses/addresses_of_president/page_215752_.
- Nerkar, A., & Shane, S. (2007). Determinants of invention commercialization: an empirical examination of academically sourced inventions, *Strategic Management Journal*, 28(11), 1155-1166.
- OECD. (2011, May). Towards green growth: A summary for policy makers. Organisation for Economic Co-operation and Development. Retrieved September 30, 2015 from <http://www.oecd.org/greengrowth/48012345.pdf>.
- Rifkin, J. (2011). *The Third Industrial Revolution: How Lateral Power Is Transforming Energy, the Economy, and the World*. St. Martin's Press.
- Silverman, D. (2005). *Doing qualitative research. A practical handbook* (2nded.). SAGE Publications.
- Tamanini, J. (2014). *The Global Green Economy Index GGEI 2014. Measuring National Performance in the Green Economy* (4thed). Dual Citizen LLC. Retrieved September 30, 2015 from <http://dualcitizeninc.com/GGEI-Report2014.pdf>.
- The Brundtland Report (1987). Our common future. World Commission on Environment and Development, United Nations. Retrieved September 30, 2015 from [http://www.exteriores.gob.es/Portal/es/PoliticaExteriorCooperacion/Desarrollosostenible/Documents/Informe%20Brundtland%20\(En%20ingl%C3%A9s\).pdf](http://www.exteriores.gob.es/Portal/es/PoliticaExteriorCooperacion/Desarrollosostenible/Documents/Informe%20Brundtland%20(En%20ingl%C3%A9s).pdf).
- The Rio Earth Summit. (1992, June 3-14). United Nations Conference on Environment and Development (UNCED), Rio de Janeiro. Retrieved September 30, 2015 from <http://publications.gc.ca/Collection-R/LoPBdP/BP/bp317-e.htm>
- Toloraya, G. D. (2014). Sustainable development and BRIC. Problems develop a strategy for Russia. Retrieved September 30, 2015 from <http://pps.kaznu.kz/2/Main/FileShow/2/26163/100/3/0/2015//>
- UNCTD. (1997). Trade and Development Report. United Nations Conference on Trade and Development. Retrieved September 30, 2015 from http://unctad.org/en/Docs/tdr1997_en.pdf
- UNEP. (2013). *Global Trends in Renewable Energy Investment 2013*. Frankfurt School-UNEP Centre/BNEF. Retrieved September 30, 2015 from <http://www.unep.org/pdf/GTR-UNEP-FS-BNEF2.pdf>.