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## Conditions, perspectives and barriers of low carbon development in Kazakhstan

The article provides an overview of the state of low-carbon development in Kazakhstan as the next step after the events of sustainable development. The author describes the concept of low-carbon development adopted in Kazakhstan. As a guideline, in this area the author has chosen the British experience in dealing with decarbonization of industries. One of the solutions to reduce the burden on the environment in Kazakhstan due to unique natural conditions and capabilities of Kazakhstan is implementation of the use of renewable resources such as solar energy. The article describes the main obstacles to development of this development in the country. In conclusion, it was given the conclusions and recommendations.

*Key words:* sustainable development, low carbon development, climate change, decarbonisation, GHG (greenhouse gas) emissions, solar energy.

A number of researchers' papers has grown up around the theme of low carbon development after COP 21 climate change Summit in Paris last year in December. Before this even we all remember about tragedies in the world such as Nepal tragedy, the disaster at the nuclear plant in Japan and etc, it is becoming extremely hard to ignore the existence of future threats. The statement «The need for a transition to low level of emissions both for developed and developing countries is widely recognized as critically important by the international community if carbon emissions are to be reduced» was announced in *UNDO project* [1]. We also agree that, «Global temperatures must not increase by more than 2 degrees C if only catastrophic climate change is to be avoided». Although, achieving a low level of emissions is proving to be challenging and extremely problematic without cooperation between countries and interacting for creation new forms of existing. A number of literature sources a full of reports about this issue from different points of view. According to *UNEP RIS III Centre* «The development of a low carbon strategy requires a balanced focus on the process of government coordination, stakeholder involvement and the result in the form of a strategy document, but rather the formulation of a sustainable pathway to achieve the established development goals» [2]. There is another point, which is sound, as «low carbon development requires the market oriented methods and marketing differentiation service» (*Feng Yi, Zhang Kun*) [3]. The authors suggest that Hainan's low carbon electric power system greatly promoted low carbon development from hardware perspectives and it has many benefits for country budget. There are new decisions were exist as creation «hydrogen plants among the major sources of CO<sub>2</sub> emissions into the atmosphere». «The authors propose a scenario of fossil-based «hydrogen-carbon» infrastructure which will allow a smooth transition from the current hydrocarbon-based economy to a hydrogen-carbon economy as a half-way point to the ultimate hydrogen-from-renewables economy of the future». (*N.Z.Muradova, T.N.Veziroglu*) [4]. The main challenge faced by such experiments is the issue of low carbon development in areas of interest of authors but all of them are directed to solve the great issue of the Earth as Climate change and Global warming.

So, low carbon development nowadays is perhaps the only true way to reduce GHG and mitigate pollutions without losing the level of economic well-being of countries.

Moreover, the survey of literature showed that notions of SD and LCD are associated with one duration is weak and inconclusive.

We consider that, a systematic understanding of low carbon development contributes to sustainable development is still lacking. For instance, *Yacob Mulugetta and Frauke Urban (2010)* who explained low carbon development by next determination «... is a much used word in development circles today» expressed in DFID's White Paper (2009) appears to be a common feature in what is implied by LCD» [5]. The statement «Low carbon development (LCD) is a development model that is based on climate-friendly low carbon energy and follows principles of sustainable development, makes a contribution to avoiding dangerous climate change and adopts patterns of low carbon consumption and producing» and its own *Urban, 2010; Urban et al. (2011)* [6]. It is still not clear whether low carbon development strategies will be able to reach the main requirements of sustainable development's concept. Particularly, far too little attention has been paid to issue of management of low carbon development in Kazakhstan.

The present article fills a gap in the literature and provides an exciting opportunity to advance our knowledge about sequential searching of decisions and successful results of using them in order to set back a global warming on the Earth for secure life of future generations. The findings of this article should make a significant contribution to the field of electricity generation management in Kazakhstan in terms of sustainability and low carbon intensity of economy. This paper is based only on the materials of Kazakhstan and Britain experiences. The main aim of this article is to remind that low carbon development concept will tackle the same goals of sustainable development. The main reason for choosing this issue is lack of research in this field of science in Kazakhstan as long as in the world about Kazakhstan's sustainable development perspectives.

During more than twenty years world's attention attracted to term of «sustainable development». The main conclusions of the report «Our general future» prepared by the Commission of the UN on environment and development were a theoretical-methodological and conceptual basis of the decisions made by Conference of the UN on environment and development. Discussion of the reasons of global changes in environment revealed their direct link with way of modern development of a civilization.

As it known, Kazakhstan on an equal basis with 20 countries of the world accepted national programs for environment and development taking into account the recommendations and the principles stated in documents of Conference of the UN on environment and development (Rio de Janeiro, 1992), and decisions of the Commission of the UN on a sustainable development.

The model of a sustainable development represents uniform system of the integrated components, their relations and communications reflecting the main content of processes of the balanced social, economic and ecological development. According to short definition of a sustainable development of society, this satisfaction of needs of modern generation without causing damage to future generations of people.

The developed ecological situation in Kazakhstan is a result of last crisis phenomena in national economy, the saved-up structural deformations of economy (to prevalence of resource- and power-intensive technologies), and result of excessive concentration of production in certain industrial regions of the country.

The analysis of a state of environment in Kazakhstan the ecology leads to a conclusion about insufficiency in economic processes components. Thus, environmental policy of the state is traditionally directed on greening of economic activity, all economy, and greening of the legislation.

There was the following sequence and priority in greening of economy for many years: alternative versions of the solution of environmental problems; development of low-waste and resource-saving technologies; direct nature protection actions.

Realization of this sequence allowed to provide in the long term positive dynamics of change of the major indicators reflecting invariable functioning, the balanced combination of social, economic and ecological spheres. Such approach provided the need of transition to model of a sustainable development taking into account interests, conditions and features of country.

On November 14, 2006 the Decree No. 216 the President of Kazakhstan approved the Concept of transition of Kazakhstan to a sustainable development. This Concept defines vision, the purposes and priorities of a state policy of country in the field of providing a sustainable development and allows approving a role of nation on the world scene as one of leaders of a sustainable development of a human civilization. Furthermore, this Concept provide the balanced development of political, economic, ecological and social aspects, providing thereby, high quality and the advanced social standards of life of all segments of the population of the country [7].

Resources of a subsoil of Kazakhstan, a variety of an environment, huge on scale, allowed the country to become an example of «the state of the future». Transition to a sustainable development became for Kazakhstan an objective necessity.

Besides, Kazakhstan accepted «strategy of entering into number of 50 most competitive countries of the world» [1]. This strategy sets new tasks in the field of a sustainable development as indicating the need of sustained economic growth, steady power policy, transition to environmental standards of a sustainable development of society and creation of steady business structures, etc.

Kazakhstan — the constant participant of the international forums on environment and development, the main international organizations, such as the Commission of a sustainable development of the UN, UNECE, etc., and the active initiator of the agreement on bilateral and multilateral bases. At the same time, Kazakhstan participates in conventional process: the Convention on a biodiversity (1994), the Framework convention of the UN on climate change (1995), cross-border Conventions of UNECE (2000). The government ratified about 20 ecological conventions and agreements.

In this study it was found differences in countries' achievements for sustainable development in such countries as Azerbaijan, Turkmenistan (neighbor countries) from the period after 1995. According to this observation, Kazakhstan and Turkmenistan have established a number of internal documents for accelerating approaches of mitigation pollutions. According to data of general emissions of GHG (one thousand tone of CO<sub>2</sub>e.) such documents are still not enough to impede environmentally sustainability. Additionally it was known from the New Policies Scenario that perspective levels of carbon intensity indicator in this region would changeable for four countries. (Fig. 1) Kazakhstan leads to be at the level of 0.8 tons of CO<sub>2</sub> per thousand dollars of GDP.

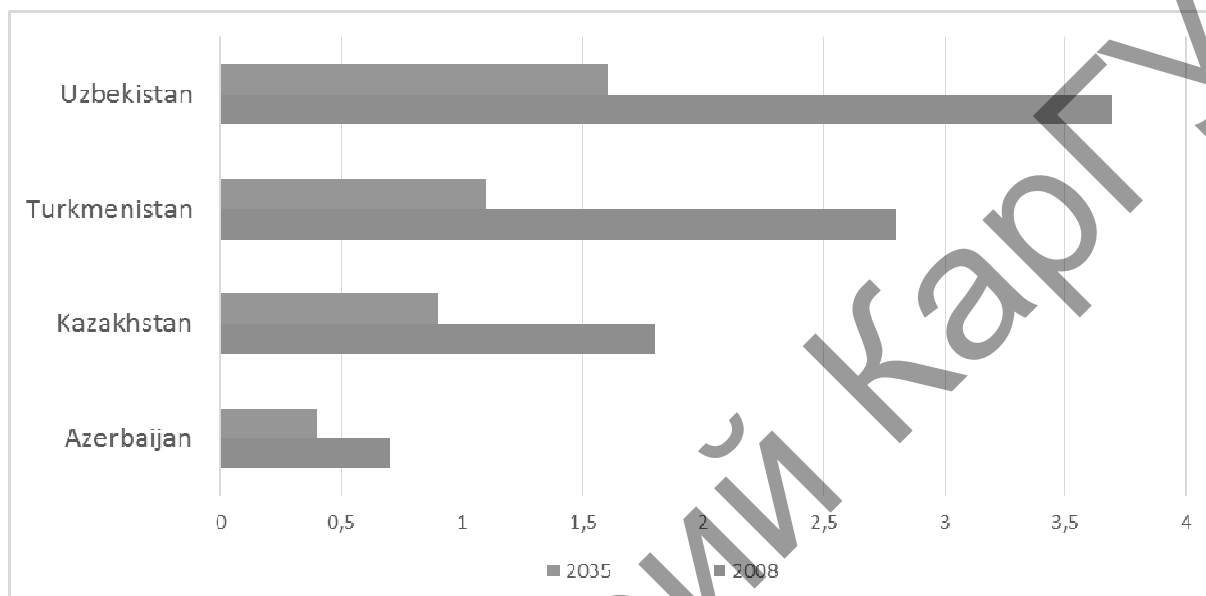


Figure 1. Carbon intensity in Caspian countries in the New Policies Scenario, tons of CO<sub>2</sub> per thousand dollars of GDP (\$2009, MER) (CO<sub>2</sub> emissions from Fuel Combustion (2014 Edition), IEA, Paris)

Thus, activity of Kazakhstan in the field of a sustainable development proceeds from the principle that only those requirements, abilities to development, a tendency, forecasts and alternative scenarios of events which will provide success in achievement of reference points of the Declaration Rio-92 are important for the state.

Process of stability of development in Kazakhstan has a number of specific features. First, closing of the Semey nuclear test proving ground and refusal of the nuclear weapon was one of big political strides of the new state. Secondly, system and dialectic approach is inherent in foreign and domestic policy of Kazakhstan. In conceptual and strategic documents of Kazakhstan, in works and speeches of the President of Kazakhstan N.Nazarbayev concepts, the principles and methodical approaches of a sustainable development are widely used. Thirdly, a sustainable development for Kazakhstan it is stage-by-stage process.

Kazakhstan has distinctive features of process of a sustainable development. The country number of internal and external prerequisites to formation and realization of policy of a sustainable development:

- existence of a large number of the ecological and social crisis phenomena,
- political stability as the second important prerequisite for formation of a sustainable development,
- the balanced foreign policy, a steady place in world political space,
- the high level of public safety,
- high rate of market reforms,
- existence of incentives of transition to a sustainable development,
- a strategic orientation of the country on development of the international relations and an advantageous geographical position,
- the growing public intelligence, mentality,
- a tendency of strengthening of environmental policy,
- Progress of potential of ecological activity and another.

The Concept of transition to a sustainable development of the Kazakhstan accepted indicators, characterizing an economic situation, an ecological state, social development, regional development, organizational indexes and integrated indicators [7; 5].

Kazakhstan already takes part in the international efforts on fight against climate change. Developing the concept of low-carbon development for inclusion in national strategy of development and defining the purposes, Kazakhstan considers the level of the economic and technological development, justice and social influence of measures. The country seeks to pass to «safe» development to promote mitigation of climate change, to reach high-quality economic development and improvement of a standard of living of the population. Kazakhstan as a developed country that has not fully overcome poverty faces a problem of a choice in the direction of future development. The existing opportunity to develop low-carbon economy turns into the necessity caused by climate change.

First, it is a tendency of development of low-carbon power, restructuring of economy, economy of energy and a sustainable development. Achievement of low-carbon development faces a challenge of the requirement of high growth of the economy, which today is characterized by power structure with the prevailing coal share with some lag of technological development and labor, and with existence the adequate of administrative structures and an institutional framework. Despite it for 2000–2008 GDP of Kazakhstan doubled and despite increase in emissions of GHG by 60,1 %, the carbon intensity of GDP decreased by 20,7 %. Transition to low-carbon development has to create strategic possibility of achievement of growth of economy without further heavy industrialization of the country, using all economic and technological advantages arising in the country and in the world.

The concept defines main objectives and problems of low-carbon development, economy sectors on which influence and strategic measures which should be undertaken at the national level has to be directed. Kazakhstan, together with request for inclusion of the country in the list of the countries of the Appendix B, declared the voluntary purpose of reduction of emissions for 15 % until 2020 and for 25 % by 2050 [7; 8].

Now Kazakhstan is developing the concept of low-carbon development for inclusion in the national development strategy. Kazakhstan is among the countries with an average to high carbon intensive economy and with a low GDP per capita. In 2005 among 186 countries, Kazakhstan was placed 71 according to GDP per capita at \$9,529. However, on the volume of emissions per capita Kazakhstan is in 14th place at 19.1 t. carbon dioxide and the 24th place on carbon intensity of GDP with 1,559.2 tso2e/1000 a dale. USA. Kazakhstan already takes part in the international efforts on fight against climate change. Developing the concept of low-carbon development for inclusion in national strategy of development and defining the purposes, Kazakhstan considers the level of the economic and technological development, justice and social influence of measures. The country seeks to pass to «safe» development to promote mitigation of climate change, to reach high-quality economic development and improvement of a standard of living of the population. Kazakhstan as a developed country, which has not fully overcome poverty, faces a problem of a choice in the direction of future development. The existing opportunity to develop low-carbon economy turns into the necessity caused by climate change. First, it is a tendency of development of low-carbon power, restructuring of economy, economy of energy and a sustainable development. Achievement of low-carbon development faces a call of the requirement of high growth of the economy, which today is characterized by power structure with the prevailing coal share with some lag of technological development and labor, and with existence the adequate of administrative structures and an institutional framework. Despite it for 2000–2008 GDP of Kazakhstan doubled and despite increase in emissions of GHG by 60,1 %, the carbon intensity of GDP decreased by 20,7 %. Transition to low-carbon development has to create strategic possibility of achievement of growth of economy without further heavy industrialization of the country, using all economic and technological advantages arising in the country and in the world. The concept defines main objectives and problems of low-carbon development, economy sectors on which influence and strategic measures which should be undertaken at the national level has to be directed. Kazakhstan, together with request for inclusion of the country in the list of the countries of the Appendix B, declared the voluntary purpose of reduction of emissions for 15 % till 2020 and for 25 % by 2050.

It is interesting that the region of Eastern Europe and the Commonwealth of Independent States (EU-CIS) includes 6 of 20 carbon intensities economies in the world Table.

**The most carbon intensities countries with economies in transition**

Country	Carbon intensity of GDP, CO <sub>2</sub> t equivalent / mln \$, parity of purchasing power	World rank
Uzbekistan	3,081	2
Serbia	2,265	5
Kazakhstan	1,872	8
Ukraine	1,380	11
Turkmenistan	1,376	12
Russia	1,302	15

*Note.* Used climate Analysis Indicators Tool 2008, <http://cait.wri.org>

At the same time this region remains to one of the most power-intensive regions of the world as concerning consumption, and energy production. This region is responsible for 12 percent of global emissions of GPG, for 10 percent of world demand for energy, and makes only 5 percent of global GDP. About a third of internal consumption of energy is the share of losses of energy. Electricity consumption grows in the region on average for 3.7 percent a year, thus it is expected that carbon fuel will still prevail in the near future [1].

Due to the high rates of emissions of GHG for each dollar of the made GDP, the real region possesses high potential of economically effective decrease in emissions for each dollar of the corresponding investments.

The government of Great Britain intends to spend about 200 million GBP in the next decade for development of new power sources for implementation of obligations for decrease in harmful emissions in the atmosphere as it was declared by British Minister of Energy and climatic changes Ad Miliband.

It presented in Parliament «Plan of transition to low-carbon economy» (The Low Carbon Transition Plan). The document provides, in particular, expansion of use alternative and renewables, thermal insulation of houses and installation of electric meters of new generation.

To 120 million pounds, it is planned to spend for development of coastal wind power stations, about 60 million — for technologies of receiving the electric power by means of sea waves and inflow, 10 million more — for development of a network of stations for recharge of electric cars.

By 2020, Great Britain plans to reduce emissions of greenhouse gases by 34 % in comparison with the level of 1990, which is accepted as a reference point in world practice and is recorded in the Kyoto Protocol.

The main UK GHGs according to (Fig.3) consist of F-gases (GHG), transport and other non-CO<sub>2</sub>.

According to the government, now the level of harmful emissions in Great Britain is already reduced by 25 % in comparison with 1990.

The British authorities also confirmed the commitment to reach the level of decrease in harmful emissions for 80 % by 2050. This level was approved at the recent Group of Eight summit in Italy, and earlier Great Britain became the first-ever country, which approved this figure as legally binding.

According to «The plan of transition to low-carbon economy», by 2020 Britain has to receive 40 % of all electric power from low-carbon sources.

«Our plan will increase our energy security, it seeks to be fair for the most vulnerable segments of the population, it gives new opportunities of the industry and answers moral calls of fight against climate changes», — Miliband (British former Labor Party politician ) emphasized.

Meanwhile, the government recognizes that the forced transition to eco-friendly power sources will make it more expensive to the population — by 2020, accounts for electricity will grow because of it approximately by 6 %.

Thus, individuals and the companies which will independently make the electric power from renewable sources (the sun, a wind and others), now can to sell its surplus to national distributive networks.

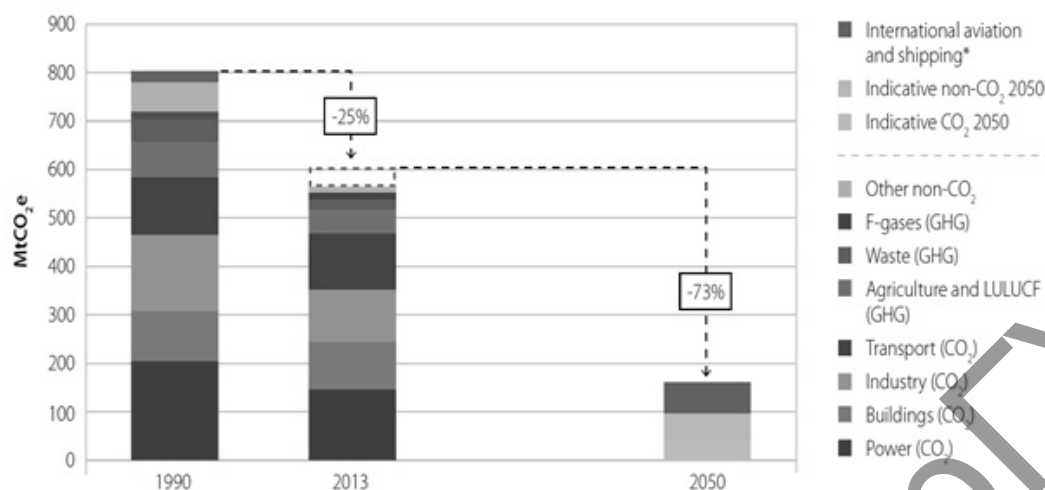


Figure 2. UK Greenhouse gas emissions by sector (1990–2050) (NAEI (2014) Final emissions estimates; CCC analysis)

Therefore, hopefully by 2015 in the branches directly or indirectly connected with «green» power about 400 thousand additional workplaces will be created. They say that it promises great opportunities — the economy after recession will look so, and exactly there will be new workplaces there. The world passes to low-carbon economy, and Great Britain has to be on a first line of this process.

Within process of transition to renewables, Great Britain intends to reduce dependence on traditional energy sources.

The government announced that during the period from 2010 to 2020 the United Kingdom does not intend to expand import of natural gas from abroad.

In this regard, the level of import of gas in 2020 is planned for 20–30 % below calculated earlier.

Great Britain, which at the beginning of this decade turned from the exporter into the importer of gas, receives this fuel from three main sources — on the Interconnector pipeline from continental Europe, on the Langeled gas pipeline from Norway and the liquefied natural gas in tankers from Qatar.

In Kazakhstan conditions, one of the available due to unique nature capabilities is using a solar energy. A large of squares in the country can be used for this needs as well as wind power, biofuels and well using hydro energy.

Meanwhile despite of «considerable renewable energy potential there are significant barriers to stimulate the use of renewable energy in the electricity sector; persistent governmental body reforms; inadequate levels and quality of scientific support; awareness and information barriers; and a high-risk business environment». (Marat Karatayev, Michèle L. Clarke (2015) [8]. According to prices for electricity in Kazakhstan as it was mentioned by»Government Decree (No. 392) in March of 2009 — increases will not be sufficient to support the development of new renewable energy technology facilities in Kazakhstan». In addition, the electricity transmission and distribution networks across the country are inefficient with losses during transmission and distribution estimated at approximately 15 %. The aforementioned programs and strategies mainly set out Kazakhstan's long-term vision; they do not however provide a specific regulatory framework. Most government indicators for Kazakhstan including accountability, effectiveness, regulatory quality, rule of law, and control of corruption have been notably negative. Such factors make the prospect of investing in renewable energy projects in Kazakhstan prohibitively risky [8; 502].

In view of the expected future economic growth, it is necessary to begin as soon as possible transition to development at the low level of emissions and to part economic growth with increase in emissions of GHG (decoupling) to prevent the sharp growth of emissions of GHG expected in the region at the scenario of development without realization of additional measures (the scenario of development as usual). It seems that there are successful future for carbon capture and carbon storage experience of UK for Kazakhstan. In addition, renewable energy development, which is very popular in UK and EU, now in Kazakhstan has as positive impact on the process of achieving of sustainable development. But at the same time Kazakhstan has own features and policies which are build different barriers to construct ideal form of production structure, infrastructure of branches and mechanisms of inserting in Kazakhstani economy new decisions which has European countries' experience.

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### Қазақстанның төменкөміртекті дамуының жағдайы мен болашағы

Мақалада Қазақстанда тұрақты даму жұмыстарын өткізген соң келесі кезеңі ретінде төмен көміртекті даму жағдайдың шолуы жасалынған. Авторлар Қазақстанда қабылданған төмен көміртекті дамуының тұжырымдамасын сипаттады. Бұл бағытта авторлар бағдар ретінде салалардың декарбонизация мәселелерін шешуші қожбасшы ел ретінде Ұлыбритания елінің тәжірибесін тандаған. Қазақстанда қоршаған ортаның жүктемесін азайту шешімдерінің бірі болып табиғи бірегей мүмкіндіктерінің арқасында күн энергиясы сияқты жанартылатын ресурстарын пайдалануы жүзеге асырылатын болды. Еліміздегі осы бағыттың дамуының басты кедергілері анықталған. Сондай-ақ осы мәселе бойынша сонында қорытындылар мен ұсыныстар берілген.

А.Е.Агумбаева, А.А.Мухамадиева

### Состояние и перспективы низкоуглеродного развития Казахстана

В статье приведен обзор состояния низкоуглеродного развития в Казахстане как следующий этап после проведения мероприятий устойчивого развития. Авторами описана концепция низкоуглеродного развития, принятая в Казахстане. В качестве ориентира в данном направлении авторами выбран опыт Великобритании как страны-лидера в решении проблем декарбонизации отраслей. Отмечено, что одним из решений Казахстана в вопросе снижения нагрузки на окружающую среду стало внедрение использования возобновляемых ресурсов (солнечная энергия), которое стало возможным благодаря имеющимся уникальным природным условиям. В статье определены основные барьеры развития данного направления в стране. В заключение приведены выводы и рекомендации авторов.

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Репозиторий Қарғу