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Article

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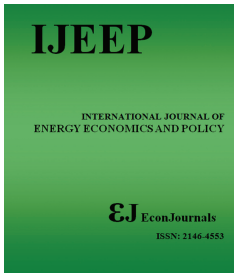

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The Economic Impact of the Energy and Agricultural Complex on Greenhouse Gas Emissions in Kazakhstan

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ABSTRACT

The work examines the impact of industrial activity on greenhouse gas (GHG) emissions in Kazakhstan. There are two trends in the activity of the energy: The decline in energy production against the background of the crisis (1991-1999) and growth at the level of the increase in world oil prices (2000-2015). The analysis of the electric power industry and the sphere of agriculture as the main sources of environmental pollution have been carried out. The calculations of the relative changes in the total GHG emissions in the CO_2 equivalent were calculated mathematically. High depreciation of fixed assets of power plants and agro-enterprises, high energy intensity of production, inefficient use of agricultural areas and a lack of investment inflow. The use of alternative types of energy, the introduction of "green" technologies, the withdrawal from hydrocarbon dependence, ensuring environmental safety of the companies of the fuel and energy complex and the agrarian sphere are justified.

Keywords: Greenhouse Gas Emissions, Kazakhstan, Electric Power, Agriculture
JEL Classifications: Q43, Q52, Q16

1. INTRODUCTION

On the territory of the Republic of Kazakhstan (RK) there are huge reserves of oil, gas, uranium. A significant land fund and natural-weather conditions provide an opportunity for crop production and livestock. True, because of the global crisis, oil production has decreased, and budget revenues have decreased. Therefore, in 2014-2016 annually, the budget deficit was about 2% of gross domestic product (GDP). This deficit, apparently, is quite high for more than 25-year period. In the republic in 2016 in the structure of GDP: For the production of services accounted for 57.9%, output of goods - 36% and 6.1% - other. The main increase in GDP is provided by the mining and oil and gas industries, and also partly due to agriculture.

Currently, most countries in the world provide state support for energy and agricultural production. This approach is related to the need for sustainable development of the national economy and ensuring food security. For example, in Kazakhstan, state programs for subsidizing energy and agricultural complex were introduced. These include the following programs: "Strategy of Kazakhstan-2050," "Development of the agro-industrial complex (AIC) for 2017-2021," "Industrial-innovative development for 2015-2019," concept of transition to "Green economy," "Development of agriculture territories," "Strategic Plan of the Ministry of Agriculture of the RK for 2014-2018" and others.

The RK has an Environmental Code of Kazakhstan (Ecological Code of the Republic of Kazakhstan, 2007). Its goal is environmental regulation of quality, the permissible impact on the environment, the protection of land from water and wind erosion. According to the Code, since 2018, the principles of trade will be introduced and emission quotas will be set according to regulated areas of activity. One of the main options for quoting will be the specific gas emission factors methodology based on international experience.

In addition, Kazakhstan voluntarily took obligations under the Kyoto agreements to reduce greenhouse gas (GHG) emissions. In

particular, by 2020 - by 15%, 2050 by 25% as of 1992. Analysis of the structure of industry by industry for 24 years showed that the share of electric power in 2015 reached the level of 1991 and amounted to only 5%. The greatest value of this indicator is in 1994 - 18.9%, the lowest in 2007 - 3.5%. For 2015, the largest increase in the GDP structure was demonstrated by the agricultural sector - about 4.4%. Here the export source of wheat is wheat. In 2015, almost 20 million tons of cereals were harvested, which is 3 million more than in 2014. At the same time, these achievements seem rather modest, given the high potential. In particular, if in 1993 the contribution of the AIC to GDP was >20%, then in 2016 - about 5%. So, for the last 17 years the total volume of agricultural production has grown more than 5 times, but the export value - only 3 times. Kazakhstan's entry into the World Trade Organization (WTO) in 2015 set the task of increasing the competitiveness of agricultural products. Accession to the WTO gave the state the right to subsidize agriculture about 8.5% of the gross output. Subsidizing the agrarian industry will attract investment resources for the introduction of innovative technologies, the use of mineral fertilizers, etc. As a result, this will have a positive impact on the level of crop yields. And in the short term will provide the prerequisites for the growth of competitiveness, productivity and exports.

According to estimates, the agrarian sphere demonstrates food dependence on the external market. Within the framework of a low level of competitiveness of agricultural products, many agricultural producers are leaving this sector. So, the share of imports, on the recommendation of the Food and Agriculture Organization should not be more than 16% of the local volume of consumption. While in the republic it is above 20%. However, even state support for the energy and agricultural complex does not yet yield significant results. Therefore, there remain certain difficulties in the sphere of energy and AIC development. These include: Low profitability, insufficient degree of introduction of new technologies, high wear and tear on equipment, low investment attractiveness, shortage of energy facilities and processing of agricultural products.

In addition, the economy of the RK is characterized by high energy consumption due to outdated technologies. In the energy system, the problem of aging equipment of power plants and electric grid facilities is acute. The products of these two spheres reduce competitiveness and contribute to significant pollution of the environment, incl. GHG emissions. According to their specific emissions per unit of GDP, Kazakhstan ranks 3rd place in the world. Therefore, at present, in Kazakhstan, a change is needed in the traditional "brown model" of development, which has exhausted itself. This model is characterized by a high content of carbon, waste and inefficient use of resources. The realities of the world economy, in general, and the economy of Kazakhstan, in particular, dictate the cumulative development of both the environment and the economic and social aspect, which are united by the notion: "Green economy."

2. LITERATURE REVIEW

Energy sector statistics are necessary to analyze GHG emissions (Liu et al., 2017). In addition, it is important to know the information on the use of alternative types of energy (ATE). They help governments to ensure national security and invest in protecting the environment (Ozturk and Al-Mulali, 2015).

Recent studies by Clarke-Sather (2011), Duro and Padilla (2006) conducted studies on the level of greenhouse emissions based on inequality in the level of economic development in various countries. It is proven that a different degree of economic development has a direct impact on carbon emissions. Scientist Sinha argued that during the period from 1980 to 2011, GHG emissions increased in OECD countries. At the same time, in these states there is an uneven level of use of energy intensity. Accordingly, there are differences in the intensity of carbon emissions. In this regard, an even strategy for reducing GHG emissions should be developed (Sinha, 2015).

Rafindadi and Ozturk (2017) scientifically proved that Germany is the leading European economy in the use of alternative energy sources. In their work they based on statistical data 1971-2013 conducted an econometric analysis of the influence of non-traditional energy sources on economic growth. Due to a sharp increase in oil and gas prices, interest in renewable energy has increased. One of its developed non-traditional directions is the production of biogas (Vavilin, 2008). It can be used to produce electricity, heat or motor fuel. Biogas is produced from specially cultivated crops, livestock waste, garbage, etc. If methane (CH_4) is not disposed of such waste, then its huge amount will increase GHG emissions.

If technology is introduced to improve the efficiency of vehicles and transition to low-CO_2 fuels, transport emissions can be reduced. The global transport infrastructure is built on fuel derived from oil. It accounts for almost a quarter of the carbon emissions associated with energy. Koponen and Hannula (2017) believe that a significant reduction in emissions requires both increased efficiency and a large-scale transition to low-GHG fuels. To reduce emissions, it is necessary to switch to biofuel production technologies. Concepts with hydrogen enrichment can become a new tool for mitigating the effects of climate change on the planet. A study was conducted to assess the impact of district heating on the basis of bioenergy. It is justified that the costs should be balanced and reduce GHG emissions, and a positive impact on the health of the population (Petrov et al., 2017).

According to Perrin et al. (2017), innovative methods of managing agricultural crops using biomass are a priority for reducing costs and minimizing adverse environmental impacts. Swedish researchers (Karlsson et al., 2017) believe that agricultural biogas plants are cost-effective. They represent alternative sources of fuel and electricity for vehicles. Also, the authors suggest using the business model innovation. These models help to effectively develop the production and marketing of farm biogas. At the same time, long-term government subsidies should play an important role. This will lead to the protection of the environment and the reduction of harmful emissions in nature. As Su and Moaniba (2017) notes, the role of innovation in mitigating the effects of climate change in order to reduce carbon emissions is enormous. It will require large investments in research into GHG emissions

according to Mazzanti and Rizzo (2017). In addition, it is necessary to introduce innovations to protect the environment.

3. DEVELOPMENT OF ELECTRIC POWER INDUSTRY IN KAZAKHSTAN

Electric power engineering is an important structural element of the fuel and energy complex of Kazakhstan. Over 70% of electricity is generated from coal, about 10% from hydro resources and gas, and 5% from oil. Atomic energy is not used yet, although there are uranium reserves. Therefore, the extraction of coal and lignite in the country is increasing. So, if in early 2016, their production amounted to 8617.7, then in the beginning of 2017 it increased to 10003.2 thousand tons (an increase of 16%). Oil production increased from 5688.7 (2016) to 5955.0 thousand tones (2017) - an increase of <5% (Socio-economic development of the Republic of Kazakhstan, 2017). Hence it is clear that the rate of coal mining is much higher than oil production.

In 2015, 91.6 billion kWh of electricity was produced, which is almost 8% more than in 1991. And the production of heat energy - fell by 36% in 2015 compared to 1991. In the structure of industrial electricity production, the main share is accounted for by thermal power plants (about 90%). In the production of electricity, there are 2 trends: The decline (1991-1999) and its increase with some recessions (2000-2015). Insufficient growth rates of the increase in electricity and heat supply occurred due to a decrease in the volume of production, distribution and transmission of electricity. And also - the supply of steam heat supply for heating water, heating, etc. (Table 1).

Today, the pace of investment inflows into the energy complex has fallen. This was due to the latest devaluations of the local currency and the global crisis. In the structure of electricity consumption, the major share falls on industry - 70%, population - 10%, services - 8%, agriculture - 1%, communications and transport - 6%, other spheres - 5%. In the republic, power grid facilities are unevenly distributed. High volume of electricity production in regional terms falls on Karaganda and Pavlodar regions - about 60% of its production in the country. The smallest volume is produced in the city of Almaty, Zhambyl and Akmola regions.

During the entire period under investigation, there is a shortage of electricity generation with the existing generating capacities. It is covered by the import of electricity from neighboring states. In 2015 Kazakhstan imported more than 8 billion kWh of electricity. At the same time, more than 4 billion kWh from Russia and more than 1.5 billion kWh - from Kyrgyzstan. Export includes more than 5.5 billion kWh to neighboring states. Real GDP growth in the republic is accompanied by an increase in specific indicators. This confirms the tendency of inefficient use of energy resources, since the energy-intensive industries are the basis of the economy. A large number of industrial and energy enterprises use obsolete technologies and operate equipment with a significant degree of wear.

On average, the wear of fixed assets of power plants in 2016 amounted to over 37%. In the total volume, the share of depreciated fixed assets is more than 8%. This leads to significant energy losses during transport. In particular, despite the reduction in its losses by almost 2 times in 2015 in relation to 1995 - in-kind losses - increased, amounting to more than 7 billion kWh. However, recently there is a positive level of the growth rate of renewal of fixed assets. First of all, it is associated with state support at the level of adoption of sectoral programs. But this is clearly not enough for the development of the energy complex.

Consequently, today the organization of the energy sector has reached a critical level of aging of fixed assets. This can be seen in the example of the energy crisis in the southern regions, the growth of tariffs for heat and energy services. It should be noted that all developed countries invest more in alternative and "green" energy technologies. This will generate half of all consumed energy by 2050. By this time, Kazakhstan intends to become one of the 30 developed countries of the world, while realizing the concept of "green economy" and sustainable development. Due to economic and environmental risks, the energy supply system is still not attractive for investment. At the same time, the payback is at least 10 years. On this basis, the use of ATE deserves attention.

At the same time, it is necessary to understand that the problem of exhaustibility of traditional energy sources is not only important in Kazakhstan, but also on a global scale. It is no accident that in the summer of 2017 in Kazakhstan, in the city of Astana, an international exhibition "EXPO-2017"was held. The theme of the exhibition is the "Future Energy." The priorities of the exhibition are:

- To rational and efficient use of electricity;
- To introduction of the principles of ATE;
- To expansion of the electrification of modes of transport;
- To application of clean energy.

To reduce the dependence of industry on the import of hydrocarbons, the world has long been using alternative energy. So, for more than 20 years developed countries: The USA, Japan, Great Britain, Germany, China, etc., actively use such types of energy (Bhattacharya et al., 2016).

ATE has a positive effect on reducing emissions into the atmosphere. They inhibit the dynamics of CO_2 emissions, despite economic

Table 1: Development of electric power industry in Kazakhstan, 1991-2015

Indicators	Years						
	1991	1995	1999	2003	2007	2011	2015
Electricity production (billion KWh*)	85.9	66.6	47.5	63.9	76.6	86.6	91.6
Heat production (million Gcal*)	126.2	82.9	63.3	85.7	93.2	98.0	80.7

Source: Committee on Statistics of the Ministry of National Economy of Kazakhstan, 2017

growth. In other words, industrial growth is ensured through the use of energy-efficient technologies. Accordingly, the level of production is accompanied by low specific GHG emissions per unit of finished products. However, in developing countries, including in Kazakhstan, the situation is completely different. Here, economic growth is directly related to the increase in CO_2 emissions. Therefore, the use of non-traditional energy sources is becoming a global task.

4. DATA AND METHODOLOGY

4.1. Analysis of Aggregate GHG Emissions in Kazakhstan

So, we will analyze the aggregate GHG emissions in the CO_2 equivalent in the territory of the RK (Figure 1). Here, the equivalent of CO_2 means that the amount of any GHG equals the amount of CO_2. That is, this equivalent shows the potential for global warming of various GHGs.

The greatest relative deviation was in 1995. It is less by 30.2% compared to 1990. But this was due to the economic crisis, when the energy demand is reduced. And as a result, the emission of energy pollution is reduced. Since 2001, there has been a trend towards increasing GHG emissions into the atmosphere. The largest peak occurred here in 2006, when GHG emissions increased by 12.3% compared to 2004. Also in 2010, the second peak (an increase of 10.2%) relative to the increase in emissions in comparison with the previous year was noted. This indicates an economic upturn in Kazakhstan, which increased the need for energy. From an economic point of view, the most objective indicator is CO_2 emissions per unit of GDP. Thus, during economic growth, the specific carbon intensity decreases and vice versa.

Figure 2 shows that Russia, Kazakhstan and Ukraine in terms of specific carbon intensity are clearly lagging behind developed countries. This is confirmed by the fact that in these countries high CO_2 emissions per one unit of GDP.

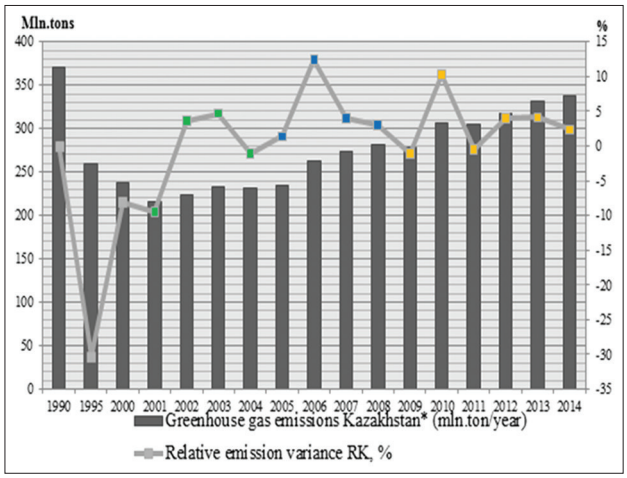
So, comparing the aggregate GHG emissions from 1990 to 2014, the overall trend of GHG emissions growth is generally observed. But, nevertheless, until 2001, because of the crisis, their emissions were declining. The above analysis proves the high energy intensity of Kazakhstan's economy. In general, the economic crisis contributes to natural energy saving and greenhouse emissions. But also, from the above analysis it follows that after the crises, the emissions of energy pollution quickly increase.

Therefore, in the long term, to achieve the goal of natural reduction of the emission of energy pollution into the atmosphere against a background of sustainable development, rather than an economic crisis, one can achieve by implementing the concept of a "green economy."

4.2. Estimation of Gas Emissions in Energy and Agriculture

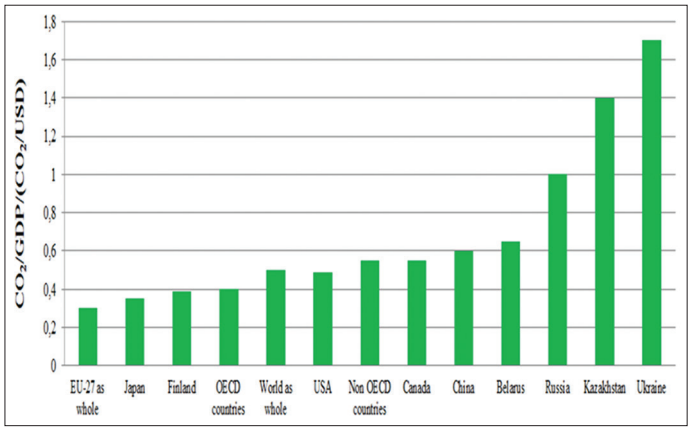
GHG emissions can arise as a result of human activities, they are called anthropogenic emissions of GHGs. Such emissions are associated with fossil fuel combustion, agricultural production and land use change. Anthropogenic emissions of GHGs are the main cause of the current warming of the climate. The authors analyzed data on sectors and determined the share of each sector in the total amount of GHG emissions in Kazakhstan from 1990 to 2014 (Figure 3).

Figure 1: Emissions of greenhouse gases in the Republic of Kazakhstan



Source: Committee on Statistics of the Ministry of National Economy of Kazakhstan, 2017

Figure 2: Specific carbon intensity of different countries in 2009: CO2 emissions per unit of gross domestic product/kg CO2/$ US



Source: International cooperation on climate change. Available from: http://textarchive.ru/c-1105290-pall.html

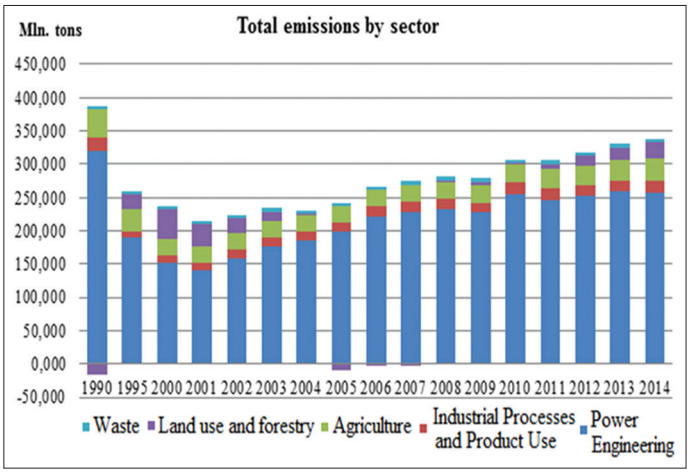
GHG sources are sectors: Energy, industrial processes, agriculture, land use and forestry, waste. Figure 3 shows that the largest amount of emissions falls on energy and agriculture. Based on the annual data on aggregate CO_2 equivalent emissions (Dougherty, 2011), relative changes were determined for each year:

$$RD = \frac{GHG_n - GHG_{n-1}}{GHG_{n-1}} \times 100\% \quad (1)$$

Where, RD - relative change,
GHG_n - Greenhouse gas emissions in the reporting year,
GHG_{n-1} - Greenhouse gas emissions in the previous year.

The first two periods are a break in 5 years: 1990-1995 and 1995-2000:

Figure 3: Total emissions by sector (in CO2 equivalent) in the Republic of Kazakhstan



Source: Committee on Statistics of the Ministry of National Economy of Kazakhstan, 2017

$$RD_{1995} = \frac{GHG_{1995} - GHG_{1990}}{GHG_{1990}} \times 100\% = \frac{258,906 - 317,014}{317,014} \times 100\% \approx -30,217\%$$

$$RD_{2000} = \frac{GHG_{2000} - GHG_{1995}}{GHG_{1995}} \times 100\% = \frac{237,923 - 258,906}{258,906} \times 100\% \approx -8,105\%$$

$$RD_{2001} = \frac{215,491 - 237,923}{237,923} \times 100\% \approx -9,428\%$$

In general, from 1990 to 2001 - the country switched to market relations. The relative changes in GHG emissions fell, because - these were periods of crisis. In these years, a decline in industrial and agricultural production was noted. The number of livestock has sharply decreased. The state sector of agriculture was privatized, the collective and state farms were dissolved.

The annual relative deviations of GHGs from 2002 to 2005 are then calculated:

$$RD_{2002} = \frac{223,302 - 215,491}{215,491} \times 100\% \approx 3,625\%$$

$$RD_{2003} = \frac{233,718 - 223,302}{223,302} \times 100\% \approx 4,665\%$$

$$RD_{2004} = \frac{231,053 - 233,718}{233,718} \times 100\% \approx -1,14\%$$

$$RD_{2005} = \frac{234,221 - 231,053}{231,053} \times 100\% \approx 1,371\%$$

$$RD_{2006} = \frac{263,087 - 234,221}{234,221} \times 100\% \approx 12,325\%$$

Since 2002, with the exception of 2004, the growth rate of GHG emissions has increased. This is a consequence of the economic recovery, and they reached 12.325% in 2006. In general, from 2000 to 2006, the annual rate of economic growth reached 10%. First of all, this was due to the intensive development of oil and gas fields. More than half of the emissions from fuel combustion are generated by the production of heat and electricity. At the same time, from 2003 to 2005 were declared years of agricultural development. As a result, the state of animal husbandry and plant growing improved. The number of livestock and grain crops increased. Therefore, the main article of export of agricultural food products began to act grain crops.

The calculation of annual GHG emissions from 2007 to 2009 gave the following results:

$$RD_{2007} = \frac{273,695 - 263,087}{263,087} \times 100\% \approx 4,032\%$$

$$RD_{2008} = \frac{281,778 - 273,695}{273,695} \times 100\% \approx 2,953\%$$

$$RD_{2009} = \frac{278,686 - 281,778}{281,778} \times 100\% \approx -1,097\%$$

The decline in GHG emissions for this period is dictated by a decline in the rate of economic growth. In addition, the global financial crisis began. The reduction in emissions from 2007 to 2009 was due to a decrease in the standard of living of the population, and unemployment grew. The stagnation in the AIC began to appear. According to the agro technical standards, in Kazakhstan, annually it is necessary to make up to 2 million tons (in physical weight) of herbicides and mineral fertilizers on all areas under cultivation. In practice, however, 5-6 times less phosphorus and nitrogen fertilizers are applied. In addition, with an annual requirement of 30 million liters, only about 10 million liters of herbicides are used. Accordingly, this increases GHG emissions. In villages, the privatization of the agro-industrial sector has largely ended. Various types of peasant and individual farms began to be formed.

The calculation of greenhouse emissions over the period from 2010 to 2014 showed a volatile trend:

$$RD_{2010} = \frac{307,058 - 278,686}{278,686} \times 100\% \approx 10,181\%$$

$$RD_{2011} = \frac{305,394 - 307,058}{307,058} \times 100\% \approx -0,542\%$$

$$RD_{2012} = \frac{317,718 - 305,394}{305,394} \times 100\% \approx 4,035\%$$

$$RD_{2013} = \frac{330,727 - 317,718}{317,718} \times 100\% \approx 4,095\%$$

$$RD_{2014} = \frac{338,452 - 330,727}{330,727} \times 100\% \approx 2,336\%$$

Variability of emissions in this period from 10.181% to −0.542% indicates a wavy development of the economy. This was due to the introduction in 2010 of the anti-crisis measures of the state and the revival of the demand for oil. The export of oil and metals increased. However, by 2014 world oil prices have fallen, the number of livestock has declined, and the growth of the economy has slowed.

In the AIC there is a place in the production of feed for animal husbandry - its quality is rather low. This position can be attributed to a low degree of local production of necessary ingredients: Amino acids, vitamins, various enzymes, etc. In addition, the consumption of low-calorie feeds by animals leads to an increase in harmful emissions into the atmosphere. A part of agricultural enterprises is forced to import imported mixed fodders. As a result, this leads to an increase in the cost of final agricultural production and a decrease in competitiveness with foreign products.

The AIC sector works in conditions of severe degradation of agricultural lands, the use of physically and morally obsolete equipment and backward technology. This leads to the fact that emissions and wastes reach 50%. Also, livestock production is one of the main sources of GHG emissions into the atmosphere in the agricultural sector. As a result, CH_4 and nitrous oxide are formed.

In Kazakhstan, the quality of food security is directly related to the state of the agricultural sector and the agrarian sector. Let's note rational use of agricultural raw materials assumes its complex processing. For example, from one type of raw material it is possible to produce several types of products. The remaining waste should be sent to the fattening of farm animals.

In the republic, mainly agro products up to 60-80% - are sold in the form of unprocessed raw materials. Production of final agricultural products occupies a small share - 20-40%. In addition, because of insufficient quality, it is not very competitive. At the same time, there is a shortage of storage facilities for raw materials: Warehouses, elevators, hangars, etc. Many of them are either obsolete or not equipped with powerful storage chambers, refrigerators. There are problems with the quantity and quality of existing processing enterprises. The biggest problem is that there are not enough such enterprises, they use outdated equipment, and not competitive agricultural products are produced.

In particular, the share of food processing in 2016 was 5-6% in fruits, meat - up to 30%, milk - 35-40%. All of the above in aggregate strengthens the process of emissions of GHGs into the atmosphere.

At present, the problem of resource saving in agriculture is growing. There is a growing interconnection between the fuel and energy and the AIC. The AIC is becoming increasingly energy intensive. Consumption of various types of energy resources in agriculture grows under the influence of the growth of mechanization of crop production and livestock. Therefore, it is necessary to introduce innovative technologies in energy and AIC that reduce both waste and GHG emissions.

So, based on the analysis, there is an increase and decline in GHG emissions in 3 periods: 2001-2005, 2006-2008 and 2009-2014. The tendency is practically traced: The rate of growth of emissions of pollutants into the atmosphere coincides with the economic cycle (Figure 4).

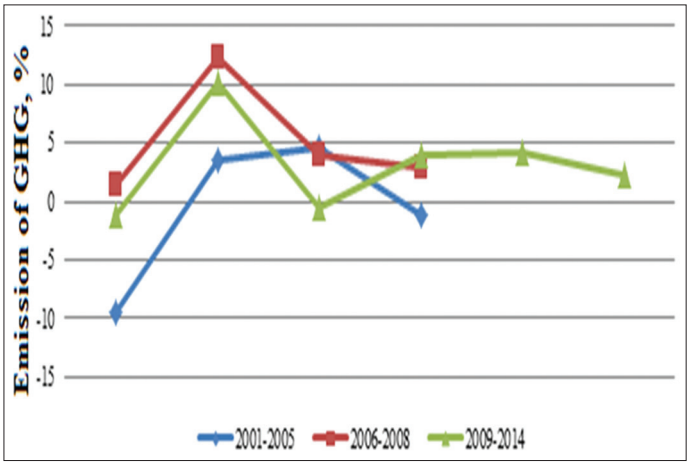
When comparing the cycles of growth rates of GHG emissions in Kazakhstan, it was revealed that the growth rate in the period from 2006 to 2008 was higher in comparison with the period 2001-2005 and 2009-2014. The rate of RD of GHG emissions in 2001-2005 is lower compared to the RD 2006-2008 rates due to the intensive development of oil and metal deposits. This affected the expansion of business activity in energy and agriculture.

If to pay attention, cycles of growth rates of GHG emissions occur against the background of absolute growth of the economy. This shows that the economic crisis contributes to economic growth. That is, crises contribute to a qualitative structural factorial renewal of the economy.

5. RESULTS AND DISCUSSION

The major contribution to global warming is made by carbon dioxide. CO_2 feeds plants, and it's good for the soil. But its excessive amount in the atmosphere adversely affects the state of the planet as a whole. Emissions of CO_2 in Kazakhstan fell sharply in the 90s of the last century. This was expressed by the existence

Figure 4: Cycles of growth rates of greenhouse gas emissions in Kazakhstan



Source: Estimated by authors

of an economic crisis, a decrease in the work of heavy industry and a decline in demand for goods. Such structural reorganization was accompanied by a decrease in agricultural crops and the volume of electricity consumption.

The economic growth in the period 2000-2007 and 2011-2014 led to a higher use of natural resources. In particular, the growth of oil, coal, increased use of agricultural fields. All these factors affect the increase in greenhouse emissions. In other words, in this period our country has become a high net sink. Energy facilities and agricultural producers do not have sufficient recourses to invest in the acquisition of technology and equipment.

A significant share of consumer income is spent on utilities for payment for electricity and food. This is significantly higher than in the states of the European Union, the USA and other advanced countries of the world. The main agricultural subject in agricultural production is the household sector. He produces agricultural products for his own needs, and only surpluses are sold on the market. At the same time, business involvement remains at a low level due to high costs and payback period, as well as problems of weather and climate dependence.

Some regions of the country, in particular, the southern regions, already feel a shortage of electricity. The lack of own power machine building complex makes the country dependent on external equipment supplies. High energy intensity of the economy and other problems lead to irrational use of fuel and energy resources.

The indicator of specific energy consumption per unit of GDP is at a level several times higher than that of developed countries. Recently, attracting investment in the agricultural system has been growing at a level of 10-15% per year. True, this is not enough to renew fixed assets and modernize the agricultural complex. The inflow of investment in agriculture is <1% of GDP (for example, in the EU countries 3-5% of GDP).

This means that power generation and food production based on "green" technologies can significantly reduce GHG emissions. Therefore, we propose the following solutions for reducing GHG emissions in the republic. The country faces two key tasks: Diversification of the economy and avoidance of hydrocarbon dependence. So, it is necessary to switch to energy saving and a low-carbon type of development: To reduce coal production, to increase the use of natural gas and renewable energy sources.

Structural changes in the economy and innovative technologies are needed to achieve high energy conservation rates. Increase of efficiency and modernization of the fuel and energy complex with higher rates of economic development. In general, the key and basic condition for ensuring environmental safety is equipping the enterprises of the fuel and energy complex and the AIC with innovative technologies and the introduction of alternative energy sources.

Great advantages for the country have the application of ATE - sun, water, wind. This is especially true in the context of the international exhibition EXPO-2017 in Astana. Equally important is the restoration of the electrification of sparsely populated areas remote from the power generation centers. It is proposed to intensify the introduction of the auction system to reduce payment for the sale of electricity to local consumers. In turn, this will allow expanding competition and lower tariffs for the use of renewable energy.

It is necessary to create a developed infrastructure for energy and agriculture, water pastures and improve the efficiency of mineral and water resources. For investors, successful land leasing legislation, fertile land, a geographical location in the market of the Eurasian Economic Cooperation, etc., are successful prerequisites. We must seriously approach the process of preparing electrical and agronomical personnel and engineers.

It is required to plant more forests and plants for the purpose of a large absorption of CO_2. It is expected that net absorption will tend to be closer to zero. It is necessary to introduce a step-by-step increase in payments for energy and agricultural companies for CO_2 emissions from one ton of production. Ensure measures to create an energy and food safety procedure. For example, the state should create conditions for the organization of laboratories to control phytosanitary and veterinary safety. Achieve universal compliance with the principles of technical regulation in the energy sector.

In order to rationally and effectively develop energy and AIC, as well as reduce its subsidies and budget expenditures, the process of public-private partnership should be used. To stimulate attraction of foreign investments with the purpose of introduction of innovations and the organization of hi-tech manufactures in electric power industry and agriculture.

5. CONCLUSION

Emissions to the atmosphere cause a global greenhouse effect, which affects the heat balance of the Earth. They provoke a global temperature increase. Without stopping this process, mankind will not be able to achieve sustainable development and eradicate poverty.

So, in order to reduce emissions into the atmosphere, one must fight against sources of their origin. Based on the study, we found that in Kazakhstan the main two sources of GHG emissions are energy and agriculture. These two sectors use a large amount of fuel (mainly coal) in their activities, outdated combustion technologies, intensive land use in agricultural production. It is obvious that industry, all types of transport (especially gas and oil pipelines and automobile) is also a certain source of greenhouse emissions. Here we are talking about serious losses of CH_4 during the extraction and transportation of gas.

In general, certain reforms have been prepared and implemented in the energy and agrarian spheres. Financial subsidization and state support are organized. This was expressed by an increase in the production of electricity and agricultural products. Despite a certain tendency of increasing the amount of investments, the

rates are still insufficient. There is high volatility and instability in the formation of working capital and the technical modernization of fixed assets.

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