



ECONOMIC AND ENVIRONMENTAL ASPECTS OF STUDY STRUCTURAL SHIFTS IN INDUSTRY OF THE REPUBLIC OF KARAKALPAKSTAN

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Abstract

This paper is devoted to analysis of structural changes in industry of the Republic of Karakalpakstan under the impact of the environmental consequences of Aral sea's evaporation. The research methodology consists of two approaches which are identification cause-effect in the structure of industry and indexation of structural shifts on sectoral level. Taking into account current year measures in industry economic and environmental development opportunities of the region in existing domestic and external conditions are assessed.

Keywords: structural changes, ecological impact, industry, development programs.

Economic and environmental approach to study reached structural changes and determining new in future allows forming an information platform which incorporates economic activity of mankind in environment. In a line with this the approach plays a role of premise by reason of planning and economy in industry based on quantitative and qualitative figures of ecological factors like labor, energy, land resources and environmental conditions. Interconnection and interdependence of industrial production with energy and resource conditions determine the structure and specialization of economy, bear the need of periodical assessment and forecasting of adjusted changes in scheme "environment-human-economy". In case of Karakalpakstan the scheme changes its structure in follow order "economy-human-environment". In other words by economic activity local population try to be drawn into the rate of changes in environmental conditions and its components. And this is not the only occasion in the world when society is spoiled by environment and attempts to find scientific solution to increasing ecological problems. Due to fact that rational nature use and protect determine principles which provide balanced economy and it's sustainable development, the issue of ecological and economic study of structural changes in economy remains topical at the present time.

Review

The theoretical background of study on economic and environmental processes is conditional on the fact that they have a significant impact on the material, labor, investment flows, along with significant costs of labor and materials in an enterprise as well as on macroeconomic level.

The Republic of Karakalpakstan is located on the West-North of Uzbekistan near the Aral Sea. The consequences of evaporation of the sea and reduction of Amu Darya and Syr-

Darya's tributaries have reflected in its environmental, social and economic states.

The Aral Sea played an important role in development of economy, particularly manufacture, employment and in forming sustainable social infrastructure. More than 80 percents of local population were employed in production, proceeding and transportation of fish and fish products. Rich lands of Amu Darya and Syr-Darya's delta used to provide more than 100 thousand employed in livestock, poultry breeding and agriculture.¹

The sea was a climate regulator reservoir making easy sharp fluctuations of the weather. Nowadays Aral has early frosts in the middle of September causing negatively on harvest ripening. These complicated problems have made critical socio-ecological situation in the region nearby.²

A harmful effect or more, according to assessment of Ashirbekov – the director of Nukus branch of Executive Committee of International Fund of the Aral Sea (IFAS), took place in economic and social life of Karakalpakstan in disaster of 2000-2001 years. For the same time frame in irrigative agriculture of the region the square of sowing plot decreased for 55,5 percents, and the same of gathering plot was cut for 58,1 percents. Annual volume of raw cotton production went down by 58,6 percent. Before this fur farming, river and sea transport had stopped their functioning. Along with this raw cotton, rice, meat, milk, cotton seed proceeding and mixed feed, building materials and constructions production stopped utterly (Ashirbekov, 2002).

This drought was the hardest for the last century, says Zaletayev, which damaged nine northern districts and virgin land in southern district of Karakalpakstan, 90 percent of crops of other food cultivation (Zaletayev, 1991).

¹ Source: <http://mfa.uz>.

² The Aral Sea and the Aral Sea region problems – the imperative for international cooperation // Ecology of industry. Scientific and practical journal. 2006. Source: <http://www.ecoindustry.ru>



The Aral Sea Disaster Zone covers areas of Uzbekistan, Kazakhstan, Turkmenistan, Kyrgyzstan and Tajikistan. Just because of it in 1993 the Interstate Council on Aral Sea and its working body – Executive Committee was established. The governance leaders of Central Asia launched programs referring to situation in the Aral Sea basin: in January 1994 - ASBP-1, in October 2002 - ASBP-2 and in 2010 - ASBP-3. The last Program was directed to joint management of water resources, ecology, socio-economic state and improvement of institutional and legal mechanism (Davletov, 2014).

In this study we took 2004-2013 years, because most visible changes in social and economic activity, institutional and infrastructural transformations in Karakalpakstan had occurred in this time frame. One of them was significant labor flow from agriculture and close sector into other ones and abroad due to challenges in structure of region's economy. The social side of environmental effects for involved years looks as follows (please look at Figure 1):

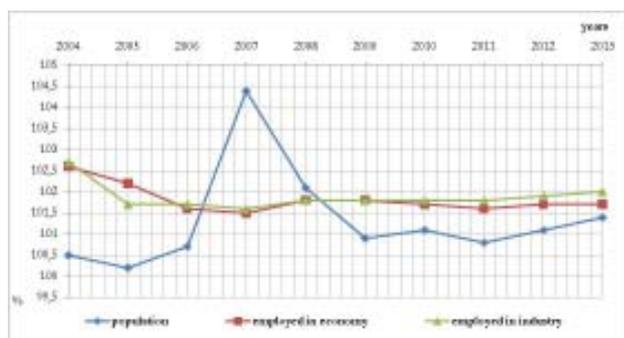


Figure 1 - Dynamics in rates of change in social indicators of the region in percentage.*

* Source: State Committee of the Republic of Karakalpakstan on Statistics.

It is difficult to make any decision from figure because of short period for social changes. However it is possible to see slight change in number of employed in economy and industrial sector in comparison with the change in total population which sharply fluctuates in 2007-2008. The effect of jump in 2007 includes the period of forming able-bodied population creating complementary consumption of economic wealth simultaneously. During study period an averaged share of able-bodied people counts for 55,7 percents and employed in industry – 34,5 percents of total population. In whole relatively close changes in rates of employed in economy and industry (1,82 and 1,88 percents respectively) are traced concluding the fact that the most of employed go into industry.

At the same, the overall structure of economy and industry in particular were changed under the influence of environmental factors (please see Figure 2).

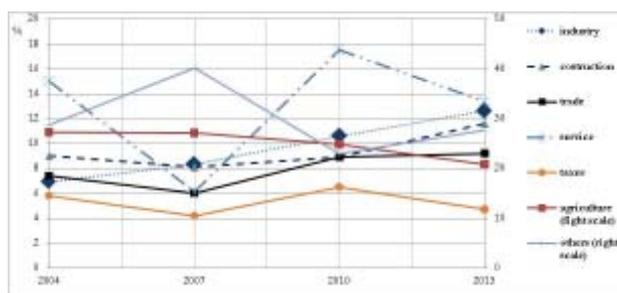


Figure 2 - Dynamics in structure of gross regional product.*

*Source: State Committee of the Republic of Karakalpakstan on Statistics.

The proportion of industrial production in gross regional product (GRP) for the period increased from 7,4 to 12,6 percents while in agriculture it was leveling off. There was a slight increase in both construction and industry for the last eight years caused by construction of chemical plant, expansion and modernization of cotton proceeding factories. The structure of GRP has changed by growth in proportions of industry, construction and trade and by decline in shares of agriculture, taxes and services (refer to Table 1).

Table 1 - structural changes in industry of karakalpakstan*

Sectors\Years	2004	2008	2011	2013	Changes for 2004-2013 years,%
Industry	100	100	100	100	
- fuel and energy, %	13,5	21,1	15,5	28,8	+15,3
- metallurgy, %	-	1,4	2,3	0,9	+0,9
- chemical and petrochemical, %	0,5	8,9	9,7	7,6	+7,1
- engineering and metal processing, %	2,3	1,2	1,1	0,6	-1,7
- wood processing and pulp, %	0,4	0,8	0,6	0,6	+0,2
- construction materials, %	6,1	4,1	7,9	10,8	+4,7
- light industry, %	40,4	36,1	32,2	24,4	-16,0
- food industry, %	18,8	12,9	16,2	17,7	-1,1
- flour-milling and groats industry, %	13,8	9,7	11,3	6,8	-7,0
- others, %	4,2	3,6	3,2	1,8	-2,4

*Source: author's calculations in comparable prices on materials of State Committee of the Republic of Karakalpakstan on Statistics.

Data in Table 1 illustrates the changes in proportions of certain branches in total industry of the region. Fuel and cotton industries have great proportions of industrial product and food industry has joined them in recent years. Cotton processing has major share in forming light industry which is characterized by seasonal dependence. During periods of drought cotton processing factories did not function at full capacity, resulting on physical depreciation of the plants' assets and price evaluation for cotton-fiber. And moderate growth of light industry was ensured in respect of vertically diversified enterprises of textile profile.

The export structure remains an important figure of structural changes which is defined by internal resources and specialization in equal with external market conditions.

According to table data, the share of light industry decreased almost twice. Despite the fact that proportion of this sector in export structure has declined from 84,8 to 74,9 percents, it creates one third of the region's export.

Possessing a minor share in material production (0,5 percents) in 2004 chemical industry had increased to 7,6 percents by the end of 2013 due to exploitation of production of soda ash. The share varies considerably between 0,05 and 5,6 percents. Positive changes are observed in fuel industry, metallurgy and construction materials industry.

In general, changes in favor of industries that consume relatively less water are obvious.

Research design

In order to deep study the reasons of these changes in industrial structure of the region, we will consider two methods: causal and index methods.

First approach involves the study of causes called structural changes in a link with changes at the institutional, sectoral and technological levels. In a line with this comparison of branches will let find out the changes in specialization of the region and their character.

The state programs on localization and investment, targeted development programs, specialized funds and movements' activities on support the exporters, small business subjects and entrepreneurs provided institutional changes. The disappearance of some industries and evolution of others, two or more industries involved into production of a specific product, transition of human resources and labor from one industry to another cause significant shifts in sectoral structure of industry. Environmental effects led to reduction and elimination of fishing and aquaculture, evaluation of new industries in the chemical and petrochemical industries, the outflow of labor from material production to non-material sphere. Along with this they had influence on micro level by reducing economic indicators of the resource sufficiency and the compensation ability to adapt to external influences. The results are high level of obsolescence and physical depreciation of fixed assets, inability of industrial enterprises to invest in modern technologies and machinery, discrepancy between imported technologies to existing quality of local natural and human resources. Together they form the technological level of structural changes.

Second approach is indexation structural shifts in branches of industry through evaluation indexes of structural shifts and comparison with similar figures across the country. This method lets assess how much and how (positive or negative) the state in branch has changed because of impact of factors

available after first method's examination of structural changes.

Analysis and interpretation

Industry of construction materials. The trend of building materials production in the Republic of Karakalpakstan is provided in table below (refer to Table 2).

Table 2 - The dynamics in rates of building materials production in karakalpakstan*

Figures \ years	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Rate of production growth, %	105,5	89,4	107,4	101,1	135,1	104,4	201,9	147,8	153,9	196,2

* Source: State Committee of the Republic of Karakalpakstan on Statistics.

Building materials contributing the majority of construction materials are given in next graph (please look at Figure 3):

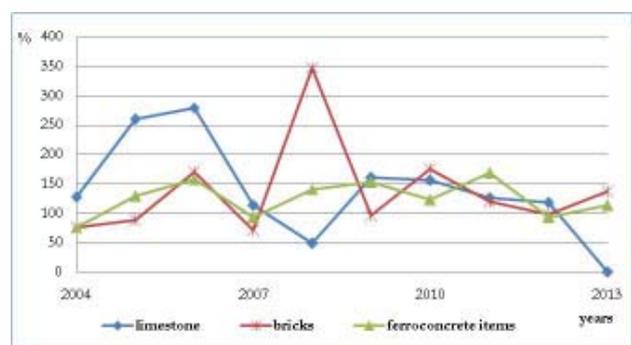


Figure 3. The rate of growth in construction materials production of the region.*

* Source: State Committee of the Republic of Karakalpakstan on Statistics.

The rate of mining and production fluctuates unequally. This situation is caused by putting into operation houses, clinics and hospitals in 2008-2013 years. Low rate in production of limestone, burnt bricks and concrete are demonstrated in 2004 and reasoned by demand reduction and, in some cases, by lack in volumes of construction works.

Moreover, institutional changes activated by state and local governments through initiation of targeted sectoral development programs, such as localization and investment programs, built these dynamics.

It should be noted that mainly bank loans were activated in launch of new projects except ferroconcrete items production, which was realized by own funds. In modernization and expansion of existing projects, a similar pattern is shown except projects on building breakstone and concrete productions.

In whole, the difference between mined and processed building materials prevails in favor of the first.

Light industry. In sectors of light industry production growth rate is relatively stable for the period (refer to Table 3).

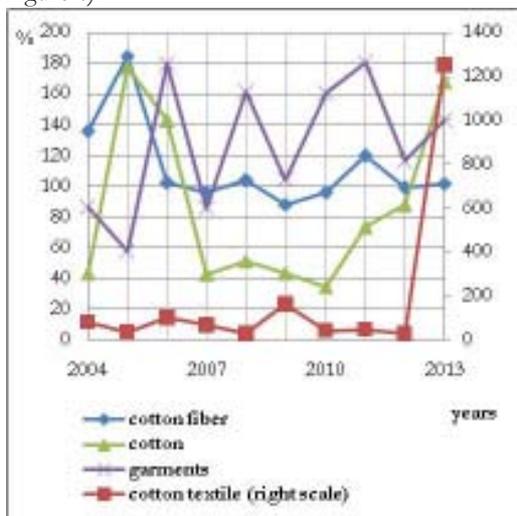


Table 3 - The rate of growth in light industry of karakalpakstan*

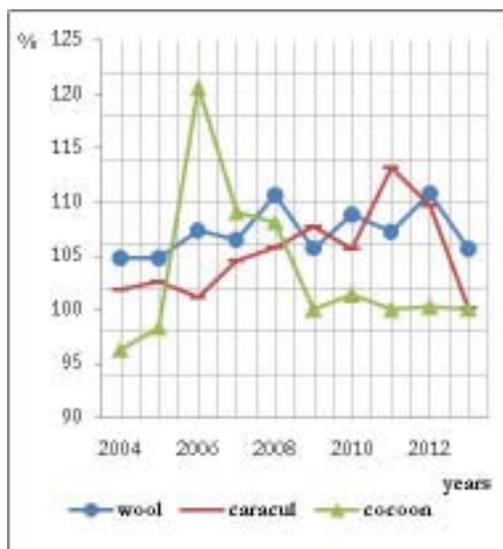
Product\years	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Light industry products, %	159,9	169,3	117,2	113,8	110,3	112,9	112,4	119,8	119,5	125

* Source: State Committee of the Republic of Karakalpakstan on Statistics.

Table 3 involves both current and perspective sorts of products. For example, the textile industry developed various stages of cotton processing: from the processing of raw cotton to garments with high added value. This is evidenced by textile combines Katex and Eltex, which started functioning in 1992 and 1993 years respectively. They were specialized in production of cotton yarn, fabrics, garments, hosiery and bandages, denim fabrics and garments. Along with this livestock products look perspective in spite of their low part in creation of added value. There are graphs describing rates of growth in production crop and stock-rising products for light industry below (please see Figure 4):



a) crop products



b) livestock products

Figure 4. Growth rate in production of light industry of the region.*

* Source: State Committee of the Republic of Karakalpakstan on Statistics.

There are fluctuations in rates of changes in production of light industry products in diagram 4.a, and overall there is growth in the production of cotton fabrics and decline in the fiber that says about technological shifts in the branch. The diagram 4.b demonstrates a similar situation, where rates of karakul and wool have a sharp decrease, and silk cocoons have relatively stable rate of change.

Broadly, state programs on investing and localization have mainly included projects in textile whereas production of goods with high added value from wool, karakul and cocoons is involved insufficiently.

Chemical industry. Chemical industry of the region is a young branch that is getting pace but already defining the prospects for long-term development (refer to Table 4).

Table 4 - The rate of growth in chemical industry of karakalpakstan*

Product\ years	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Chemical products	130	100,4	7 times	317,4	158,8	111,6	125,6	138,5	135,2	110,3
-soda ash	-	-	-	327,4	158,7	109,4	128,5	139,2	135,3	108,8

*Source: State Committee of the Republic of Karakalpakstan on Statistics.

The region was profiled particularly in processing oil prior to soda ash production, making about 3-4 percents of total output. Production of soda ash makes about 96-97 percents of this sector.

Pharmaceutical industry. Project on cultivation of licorice was implemented in a pharmaceutical sector. Data on growing and sale of this product is presented in picture below (please look at Figure 5).

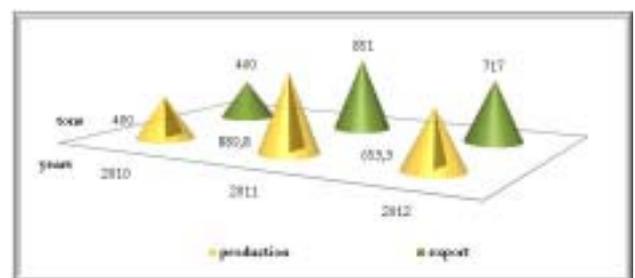


Figure 5. Production and export volumes of licorice.*

* Source: State Committee of the Republic of Karakalpakstan on Statistics.

Based on the chart almost all production goes to export except data of 2012 which indicates exceed volume of export to produced one. External market provides source of foreign exchange inflows at the same time this trend says about increasing exploitation of land resources.

Fuel industry. In the region fuel industry produces diesel fuel, kerosene, gasoline and liquefied gas. Accordingly they count for an important item of export of Karakalpakstan. In this regard, the majority of investments is focused on exploration activity, fields construction. Certain products from

oil and gas condensate in the region in rates of growth are illustrated in followed figure (please see Figure 6).

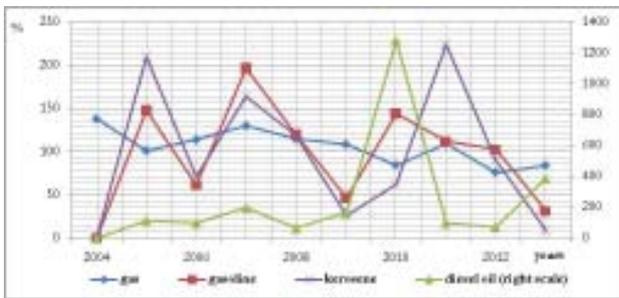


Figure 6. The rate of growth in fuel industry of the region.*

* Source: State Committee of the Republic of Karakalpakstan on Statistics.

The figure describes high potential of the region in extraction and processing of gas condensate in comparison with oil. Mainly being provided by investments this sector is basic in industrial sector as well as plays role of infrastructure for other sectors of economy. Consequently, being based on the available reserves of natural gas a chemical plant has been launched, raw materials are delivered to neighboring countries, new roads and social, roadside, transport and communications infrastructure facilities are under exploitation – all are providing sectoral changes in the region.

Comparative analysis of growth rates of industries, according to second approach, shows that structural changes appear in advanced development of some industries and relatively slow development of others.

The growth rate of building materials production is uneven and correlates with volume of construction works. Production of concrete products distinguishes with relatively stable growth rate. Lime stone's supply goes up at an average rate of 40 percents, wall materials – 30 percents, concrete – 7,6 percents per year, while the similar figure for the gross demand is 9,5 percents for the period. As a consequence, there is a considerable differentiation between mining limestone and manufacturing ferroconcrete products.

The average growth rate of gross production in light industry accounts for 16 percents. In details the rate of change in demand for cotton fiber exceeds the supply. The rates of change in production of cotton (an average decline is 13,3 percents) and the cotton fabric in 2013 (an average growth is 85,7 percents) had sharp fluctuations. High rate of intra-industry growth to 20,6 percents was fixed in production of cocoon in 2006, while wool and karakul production had slow increase.

An investment project on production of pharmaceutical substances from petersiana acid with capacity of 10 tons and cost of 4,5 million USD is planned in the IP for 2015 (¹ PD-4707 from 04.03.2015). Also licorice is included in list of localization projects within two stages: dried licorice roots and diversification into drugs and food foaming agent production (¹ PR-2298 from 11.02.2015) (100 grams of root cost 0,75 USD, 100 grams of syrup – 0,84 USD, 1kg of foaming agent – 24,4 USD)³. Processing of licorice root will contribute to improve waste-free production – pharmaceuticals, dye for textile industry, additions for food industry; and the stems of the licorice - for the manufacture of coarse yarn, rope products, pastilong materials for furniture, brush fiber; and the waste - for feed additives. This, in turn, requires a complex pattern of structural changes.

The chemical industry is designed with sharp fluctuations in production and sale rates according to new productions in the industry and their strategic orientation to foreign markets. In particular the production of soda ash has risen on average rate of 30 percents since it reached the designed capacity.

The production of petroleum products characterizes with sharp fluctuations in its growth rate in spite of comparably steady pace of natural gas production. The pace in production of natural gas, gasoline and kerosene are relatively close in value and constitutes. Production of diesel fuel has unsteady variation. Export of the industry demonstrates a 12,8 percents growth rate over the period which is well above the nationwide one (6,7 percents). This indicates the mobility of the region in reforming sectoral structures.

In steel industry Tebinbulak field development is under project, which expects costs at 600,0 million USD with three process stages and followed products: ore pellets, iron and exfoliated vermiculite, rolled ferrous metals and insulating materials (¹ PD-4707 from 04.03.2015). The fact of import of about 62-64 percents of consumed in the country rolled ferrous metals is revealed (Kasimov, 2015). The economic issue of iron production impact on the socio-economic condition involves savings foreign currency and an increase in gross industrial product in total as well as (382 million USD annually) in the structure of export, a growth in employment (main project – 1,5 thousand workers, additional projects – 1,9 thousand workers) and a technological structure increase in specialization.

According to the materials have been published by World Bank, the decline in oil price and recession in Russia has influence on the projected growth of the economy throughout the region of Central Asia.⁴ This situation has reflected in structure of exports of neighboring countries, especially in export of

³ Source: <http://kurs-dollar.net/konverter-valyut/currency-calculator.html>.

⁴ Source: <http://www.worldbank.org>



fuel products. Indeed the global economic and financial crisis in the 30s of the twentieth century proved on the example of Brazil that export could not ensure a growth in economy, but only stimulate.

A comparison of rates of change in production by individual industries in the region with the average rate for the Republic evidenced that the region had sharp fluctuations in sectors of metallurgy, wood processing, chemistry and engineering. Industries such as light, food and building materials are close to the rate of the same branches in the country.

From above-mentioned it follows that the region with environmental challenges needs ecological-economic approach in solution it's socio-economic and environmental development problems.

The need for production development with minimal negative impact on the environment is obvious and has alternative solution scenarios. Despite the fact that this need is in contrast with development of industries with high added value, environmental implications have affected the economy of the region, therefore, the decision depends on substantial means.

The economic approach is to provide with investment funds the measures on pollution reduction and the use of resource-saving technologies. Not loan but only investment helps to prolong the deadline of results after implemented measures and to make investors interested in its efficiency.

A gradual drop in world prices of main export items of the region, in particular for energy and cotton, should be perceived as an opportunity for diversification in industry with the integrated nature of the measures. In other words, the change of export raw materials with production of competitive in external market products is given as a solution. This strategy is able to provide industry with structural changes in specialization, consumption of natural resources and consumer goods, creating markets.

Conclusion

The experience of Karakalpakstan proves one more time the fact that ecology plays role of not only resource provider but also determiner of industrial structure. Cause-effect analysis shows that structural shifts in industry of the region are caused by institutional, sectoral and technological changes.

Following the liquidation of water resource based branches, like agriculture and fishing, allied branches consuming the products of previously mentioned branches like husbandry, agricultural machinery cut their functioning. Also institutional changes took place in structure of industry: reduction and

reorientation of number of specializations, rise of structural unemployment, incapability of social infrastructure, need of changes in legacy. In addition to this technological inappropriate of industry to modern requirements of economy, domestic and external markets, high degree of depreciation of production assets led to visible structural shifts in industry and economy of the region. Social problems are described through decline in degree of able-bodied people in total population, low ability to adapt to new qualifications with losing time lag for learning appropriate study area. Export assisted to expanse fuel and chemical productions and led to structural changes in industry of the region.

Traditional approaches to relationship between environment and production is limited by modern reality spreading in many countries with transition economy. To sum up, the condition of ecological factors in equal with economic ones significantly determines the structure of industrial production.

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