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The analysis and classification of problems of environmental protection of the urbanized territory of Kazakhstan

In article the analysis and classification of the main problems of environmental protection of the urbanized territory of Kazakhstan are presented. Unevenness of emissions of the substances polluting the atmosphere departing from stationary sources across the territory of Kazakhstan is shown. The cities with high extent of pollution of atmospheric air are revealed, the main sources of pollution are defined. Dynamics of an index of pollution of the atmosphere in settlements of the Republic of Kazakhstan is estimated. The cities in which cases of high pollution and extremely high pollution in atmospheric air are recorded are allocated. The current assessment of use of water resources on the basis of the analysis of dynamics of a fence and losses of water, and also the main water consumers in a section of areas and cities of Kazakhstan is given. The main problems of rational use of natural resources are defined. Target indicators of the State program of water resources management are presented. The current situation in the field of education and utilization of municipal solid waste is assessed. The main problems in this direction, in particular management of thriftless dumps of municipal solid waste, withdrawal at the population of dangerous municipal solid waste are allocated. The analysis of dynamics of formation of industrial wastes is carried out, key industries education sources are defined. On the basis of the carried-out analysis classification of the environmental problems having significant effect on an ecosystem of the cities is presented and the factors constraining the solution of environmental problems and processes of greening of city economy are generalized.

Keywords: environmental protection, the urbanized territory, pollution of atmospheric air, an index of pollution of the atmosphere, rational use of water resources, an index of impurity of water, municipal solid waste, thriftless dangerous wastes, industrial wastes, utilization of MSW.

The research of problems of improvement of quality of the environment of the urbanized territories on the basis of an ecologic-economic assessment hasnot gained adequate development so far. Averaging of results of the observations on all cities published in official state and departmental reports doesnot give an accurate account of quality of the environment in the place of residence of people. At the same time in the territory of the industrial cities there are sites with various ecological and impuritysituation, demanding prime measures, economic expenses and efforts of society in respect of improvement of quality of the environment. The shortcomings of system of observation and quality management of the habitat of urban population is also a lack of an integrated approach to assessment, considering influence of both negative (pollution) and positive (gardening) of physical factors. The environmental problems existing practically in all urbanized territories are connected also with lack of feedback at adoption of administrative decisions where the public opinion can be used.

In the conditions of the large cities the problem of improvement of quality of the surrounding environment, optimization of relationship in the «nature-society» system, ensuring physiological requirements in combination with production and social requirement, where adverse responses and diverse negative consequences exert considerable impact on health of the population and, eventually, on quality of human life.

In the conditions of the urban environment, especially large industrial centers, the level of pollution of atmospheric air is considerably increased that is caused by existence of a large number of the industrial enterprises and motor transport in rather small limited territory.

Kazakhstan on the level of emission of harmful organic substances in water advances such countries as the Russian Federation, the USA and Germany by 37 %, 66 % and 75 %, respectively. Level of pollution of the atmosphere in the cities exceeds similar Russian indicators twice, and by 3 times - indicators of the EU.

In the territory of the cities the large enterprises, thermal power plants and sector of private housing which along with motor transport are intensive sources of environmental pollution.

Lack of system approach to the solution of environmental problems of the city is present. Mostly, the protection activity is directed to elimination of consequences which becomes senseless without elimination of the reasons.

The condition of ecology has direct impact on the social sphere and quality of life of the population, thereby either attracting human and personnel resources to the territory, or, on the contrary, promoting their escape of the territory.

Unevenness of emissions of the substances polluting the atmosphere departing from stationary sources across the territory of Kazakhstan is shown in Table 1.

Table 1

Emissions of the substances polluting the atmosphere departing from stationary sources, thousands of tons

Name of the settlement	2012 y.	2013 y.	2014 y.	2015 y.	2016 y.
Republic of Kazakhstan	2 346,3	2 384,3	2 282,7	2 256,7	2 180,0
Akmola region	77,8	105,7	83,8	84,6	85,6
Aktobe region	119,8	123,9	125,4	121,8	134,3
Almaty region	73,4	64,3	68,4	51,6	55,0
Atyrau region	107,4	133,1	138,4	109,1	110,7
The West Kazakhstan region	55,9	62,0	60,4	44,7	42,4
Jambyl region	24,9	40,7	33,6	38,2	41,9
Karaganda region	691,3	641,4	572,6	603,6	596,4
Kostanay region	109,4	100,6	115,4	103,8	91,6
Kyzylorda region	31,9	31,1	31,2	30,8	30,1
Mangystau region	75,8	64,2	77,5	88,3	72,5
The South Kazakhstan region	47,1	48,6	56,3	59,9	69,0
Pavlodar region	632,2	675,9	650,4	610,2	552,9
The North Kazakhstan region	77,0	75,7	71,4	72,0	74,9
The East Kazakhstan region	147,2	140,1	125	129,6	127,1
Astana	63,5	64,9	60,6	65,1	56,3
Almaty	11,7	12,1	12,4	43,5	39,1

Note. Based on source [1].

The main volumes of pollutants have been created in territories of Pavlodar (27,3 % of total amount) and Karaganda (25,3 % of total amount).

As can be seen from the table, regions of Kazakhstan can conditionally be divided into 3 groups depending on the volumes of emissions of pollutants:

– regions with high extent of pollution of atmospheric air where the Pavlodar and Karaganda regions have entered, 52,7 % of all volume of emissions in the atmosphere came from these two regions in 2016;

– regions with average extent of pollution of atmospheric air where the Atyrau, Aktyubinsk, Akmola, East Kazakhstan, North Kazakhstan, Mangystau, Southern Kazakhstan and Kostanay regions have entered - these 8 regions in 2016 made 24 % of all volume of emissions in the atmosphere;

– regions with low extent of pollution of atmospheric air where have entered Almaty, West Kazakhstan, Jambyl and Kyzylorda, these regions in 2016 made nearly 13 % of all volume of emissions in the atmosphere.

The main pollutants of atmospheric air are the enterprises of production and distribution of the electric power, gas and water – 44,5 %; the enterprises of manufacturing industry, their specific weight in a total amount of emissions makes 38,5 %; the enterprises of the mining industry – 17 %.

In other regions the percent of capture remains at a low level.

Index of pollution of the atmosphere (IPA5) – the size of a complex index of pollution of the atmosphere which is calculated based on five substances with the greatest values by the following formula:

$$IPA5 = At\ (q\ cf.\ i/TLV_i)\ Ci, \quad (1)$$

where q cf. i – average concentration of i substance; TLV_i – average daily threshold limit value of i substance; Ci – the coefficient depending on a class of danger of i substance equal to 1,7; 1,3; 0,1 and 0,9 respectively for 1, 2, 3, and 4 classes of danger of the polluting impurity.

To the main harmful substances which are derivative of specialization of the industry of Kazakhstan and pollute the atmosphere, belong [2]:

– Carbon oxide;
– Nitrogen dioxide;
– Sulfur dioxide;
– Phenol;
– Formaldehyde;
– Hydrogen sulfide;
– Fluoric hydrogen;
– Chloride hydrogen;
– Ammonia;
– Chlorine.

From the total amount of the pollutants which are thrown out in atmospheric 75,4 % are the air gaseous and liquid substances, 24,6 % - solid. As a part of gaseous and liquid emissions 59,2 % accounts for Sulfur dioxide, 20,2 % - on monoxide carbon, 9,4 % - on oxides of nitrogen, 5,2 % - on hydrocarbons (without volatile organic compounds), 6 % - other gaseous substances.

IPA considers not only emissions from stationary sources, but also from the motor transport operating in the territory where there are posts of observation defining the pollutants in the atmosphere. Changes of an index of pollution of the atmosphere during the period from 2012 to 2016 it is presented in the Figure 1.

IPA of the atmosphere changes in the cities annually. The greatest indicators of an index of pollution of the atmosphere in different years are recorded in the cities of Shymkent, Almaty, Ust-Kamenogorsk, Kyzylorda, Temirtau. Low level of pollution at change of IPA from 0 to 4 is observed in the cities: Aktau, Kostanay, Kokshetau, Taldykorgan. However in 2016 increase in IPA in these cities, and also in Karaganda, Riddere, Semey, Balkhash, Ekibastuz is observed.

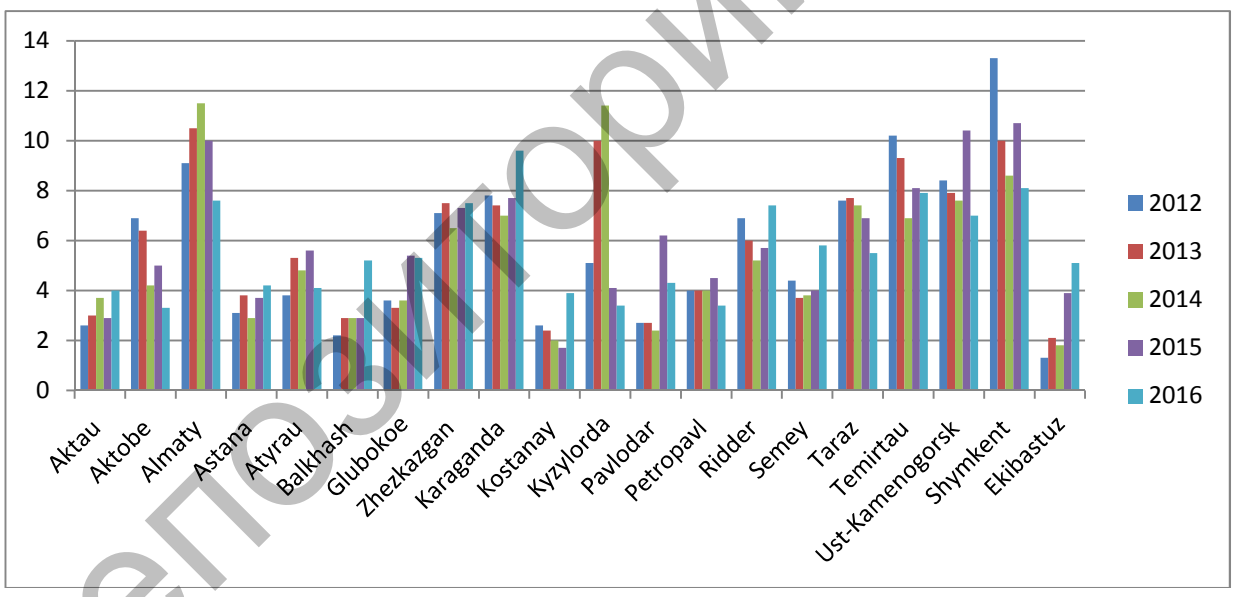

Figure 1. An index of pollution of the atmosphere in settlements of the Republic of Kazakhstan from 2012 to 2016 years (prepared by authors)

In 2016 the high level of pollution was observed in: Stepnogorsk, Ust-Kamenogorsk, Almaty, Ridder, Zhezkazgan, Shymkent, Temirtau, Karaganda. 6 settlements belong to the increased level of pollution: Taraz, Semey, Aksay, Ekibastuz, Balkhash, settlements Akay, Beyneu, Glubokoe.

In regions excess of level TLVs.s is observed on various pollutants getting to the environment. In atmospheric air most often meet theexcess of maximum allowable concentration on hydrogen sulfide, nitrogen dioxide, carbon oxide, sulphurous gas, ozone, the weighed particles, phenol and formaldehyde. Pollution level is generally presented in newsletters based on results of fixed networks of observation.

The World Health Organization in the documents devoted to problems of pollution of atmospheric air has considered ozone to the most toxic air pollutants which negatively influence health of the population of

Europe and other continents of the planet. Excess of concentration of ozone in air influences a human body in general, but mostly causes damage to respiratory and cardiovascular systems. Ozone, getting into a human body at inhalation, promotes development of the chain reactions leading to formation of free radicals and products of oxidation of the lipids causing damage to an organism. Growth of the contents of ozone in the ground atmosphere is connected with increase in pollution of the atmosphere nitrogen oxides, flying hydrocarbons and carbon monoxide. The listed above pollutants are predecessors of ozone of whom it is formed under the influence of sunlight, and intensity of formation increases with growth of temperature and intensity of solar radiation. Excess of concentration of ozone in atmospheric air cause harm to health of the population, negatively influences plants, trees and animals.

In 2016 the highest rates of pollution of atmospheric air are recorded by ozone in the cities of Lisakovsk (10,5 TLV s.s.), Stepnogorsk (4,1 TLVs.s.), Karaganda (3,7 TLVs.s) and settlements Glubokoe (5,9 TLVs.s), Akay (4,0 TLVs.s). However the content of ozone in atmospheric air is controlled not in all regions of Kazakhstan. In Almaty region, and also in the cities: Almaty, Astana, Kostanay, Ore, Kyzylorda, Temirtau, etc. the measurement of excess of ozone in atmospheric air isnot carried out,though excess of emissions of the pollutants promoting formation of ozone in the atmosphere is recorded.

In the territory of the Republic of Kazakhstan 407 cases of the high pollution (HP) and 21 cases of the extremely high pollution (EHP), from them have been recorded: 17 HP and 1 EHP – in Astana, 2 HP and 2 EHP – to Balkhash, 15 EHP and 62 HP – in Aktobe, 105 HP in Almaty, 8 HP – to Arkalyk, 1 EHP and 6 HP – in of Zhitikar, 1 EHP and 3 HP in Kyzylorda, 95 HP – to Lisakovsk, 1 EHP and 4 HP – to Taldykorgan, 1 HP – in Temirtau, 1 HP – to Ust-Kamenogorsk, 13 HP – to Ekibastuz, 90 HP – in the item of Aktau (Table 2).

Table 2

Cases of high pollution and extremely high pollution in atmospheric air of the cities of Kazakhstan

Name of the settlement	Number of cases		Polluting substance
	2016 y.		
	High pollution	Extremely high pollution	
Almaty	105		The weighed substances, nitrogen dioxide
Aktobe	62	15	Hydrogensulfide, chrome
Balkhash	2	2	The weighed substances, sulfur dioxide
Taldykorgan	4	1	Hydrogensulfide
Temirtau	1		Hydrogensulfide, carbonoxide
Aktau	90		Carbonoxide
Aksu			Sulfurdioxide
Astana	17	1	Nitrogendioxide
Arkalyk	8		Hydrogensulfide
Zhitikara	6	1	Hydrogensulfide
Kyzylorda	3	1	Nitrogendioxide
Lisakovsk	95		Hydrogensulfide
Ust-Kamenogorsk	1		Sulfurdioxide
Ekibastuz	13		Sulfurdioxide
In total	407	21	

Note. Prepared by authors on the basis of a source [2].

In general, it is possible to make a conclusion that the atmosphere of the large and average cities of Kazakhstan remains polluted.

High level of pollution in these cities lasts many years that testifies the need of implementation of nature protection measures for improvement of a situation for atmospheric air. The biggest part of the population of the republic lives in these regions.

Problems of rational use of water resources of Kazakhstan it is characterized by the following negative factors: pollution of water sources, unsatisfactory technical condition of systems of water supply, increase in an intake of water of the cross-border Irtysh River from China. Due to specifics of a geographical location of one of serious problems is deficiency of water resources, especially in the central and southern part of the republic, most part of which belongs to barred basins of the Caspian and Aral seas, Lake Balkhash, Tengiz, Alakol, etc., not having an exit to the World Ocean. Specific water security about 6 thousand CBM of water on one person a year.

The main water consumers in Kazakhstan are agriculture, the industry and municipal services. The main part of water consumption – 68 % of total amount is the agriculture, the industry is 27 %, are the share of municipal services – 5 %. In agriculture more than 92 % of water accounts for the irrigation. At the same time losses when transporting, make, on average, about 60 % for agricultural consumers, 50 % for municipal services, and about 40 % for industrial consumers (percentage of a water intake). The annual volume of losses of fresh water in general on the republic only when transporting can reach on average 5 cub. km/year, at the same time irrevocable water consumption, makes more than 15 cubic km a year. In agriculture - the main irrevocable losses of water happen in internal network, and directly on fields of irrigation. Over for the last 5 years the total volume of losses of fresh water by all consumers, on average, has made 19,33 % of the total amount of a water intake, or 4,27 km^3/year. From this volume nearly 3 km^3/year losses of water or 82 % of the total amount of lossesare observed in agriculture including 51 % in irrigation sector. Thereby deficiency of fresh water is observed. The main reasons for deficiency of water are the natural factors, but also the existence of a number of problems in a control system of water management branch, leading to irrational use of waters (wasteful water use and pollution of waters).

Information characterizing volumes of intake and losses of water on regions of Kazakhstan is provided in Table 3.

Table 3

Intake and losses of water in regions of Kazakhstan in 2016 year

Name of the settlement	Taken away waters for use, million cubic meters	Share in an intake of water, %	Loss during the transporting, million cubic meters	Share on losses of water, %	Loss of water to the volume ofintake, %
Republic of Kazakhstan	23 266	100,00	2 854	100	12,27
Akmola region	60	0,26	5	0,18	8,33
Aktobe region	291	1,25	7	0,25	2,41
Almaty region	3 374	14,50	713	24,98	21,13
Atyrau region	279	1,20	41	1,44	14,70
The West Kazakhstan region	641	2,76	40	1,40	6,24
Jambyl region	1 596	6,86	520	18,22	32,58
Karaganda region	1 640	7,05	23	0,81	1,40
Kostanay region	135	0,58	9	0,32	6,67
Kyzylorda region	5 215	22,41	1 068	37,42	20,48
Mangystau region	1 244	5,35	3	0,11	0,24
The South Kazakhstan region	4 284	18,41	291	10,20	6,79
Pavlodar region	3 500	15,04	13	0,46	0,37
The North Kazakhstan region	63	0,27	4	0,14	6,35
The East Kazakhstan region	609	2,62	77	2,70	12,64
Astana	93	0,40	16	0,56	17,20
Almaty	242	1,04	24	0,84	9,92

Note. Prepared by authors on the basis of a source [2].

Water intake volume in Kazakhstan following the results of 2016 amounts to 23 266 million cubic meters. More than 70 % of an intake of water are the share of 4 regions: Kyzylorda, Southern Kazakhstan, Almaty and Pavlodar regions.

Apparently from the table, one of a major issue of rational use of water are losses of water when transporting. Losses of about a quarter of the volume of an intake of water are noted in 3 regions: Kyzylorlinsky,

Almaty and Jambyl regions. In general, the level of losses has made 2301 million cubic meters of water, it is more than a total intake of water in 9 regions of Kazakhstan.

Table 4 shows a quantitative assessment of the directions of use of water.

Table 4

Use of water for needs in 2016, one thousand CBM

Name of the settlement	Economic and drinking	Production	Agriculture watersupply	Regular irrigation	Flood of pastures
Akmola region	731	23	18	9 704	
Aktobe region	15	17	12	10	
Almaty region	36	52	2 565	12	3
Atyrau region	38	79	82	2 513	2
The West Kazakhstan	21	10	15	78	
Jambyl region	16	34	690	15	
Karaganda region	24	1 500	78	688	
Kostanay region	94	37	16	75	
Kyzylorda region	38	12	3 004	14	
Mangystau region	24	1 223	-	3 004	
The South Kazakhstan region	18	39	2 951	2 817	54
Pavlodar region	66	2 306	291	269	10
The North Kazakhstan	43	18	17	1	
The East Kazakhstan	17	168	244	207	15
Astana city agglomeration	64	22	1	-	
Almaty city agglomeration	55	52	1	1	

Note. Prepared by authors on the basis of a source [3].

The most part of water, about 92 % is used for regular irrigation, in particular in the Akmola, Atyrau, Mangystau and Southern Kazakhstan regions. In these regions for regular irrigation 92 % of the total amount of consumption of water are used.

Weak introduction of the moisture preserving technologies is characteristic of all agricultural industry of the republic. Technologies and terms of cultivation and processing of the land arenot observed, in particular the share of fallows in structure of an arable land remains at extremely low level and on average doesn't exceed 5-6 %. Also there is an essential need for the adapted grades of the main crops.

Consumers of the industry are the second of the importance. 27 % of consumption of all water accounts for the industry.

Besides, the industrial enterprises are one of the main pollutants of water resources of the country.

Level of pollution of a surface water of land is estimated in size of the complex index of impurity of water (IIW) which is used for comparison and identification of dynamics of change of quality of waters [4].

In total, from total of the surveyed water objects 13 rivers, 5 reservoirs, 4 lakes and 1 canal are considerd «pure». The class «the moderate water objects polluted» – 23 rivers, 4 reservoirs, 2 lakes and 2 channels is most representative. The class of the «polluted» water objects possesses 12 rivers and 3 reservoirs and 1 lake.

The rivers Tichaya, Ulbi, Krasnoyarka (VKO) belong to the class «very dirty». At the list of the main pollutants exceeding maximum allowable concentrations values there are 14 ingredients from which are the most widespread copper, sulfates, chrome (6+), nitrogen nitrating, BPK5, oil products, iron and phenols.

The following are the main reasons for such situation:

The operating industrial productions of ore mining industry and power system. Annually in superficial reservoirs about 1250 million cubic sewage are disposaled.

Historical pollution. Pollution of surface and underground water non-recultivateddisposals of the overburden breeds, tailings dams, mines and adits located in the water protection zones of reservoirs.

Thus, problems of rational use of water resources are:

1) The system of a reservoir during the spring period is undeveloped though in Kazakhstan there are water deficiency problems. 80-90 % of a drain of the steppe rivers flow comes on the spring period and as a result loss of water are at the level of 60 km ³ / year taking into account transit of borders of the republic.

2) The problem of irrational use of waters which is expressed in wasteful water use and universal pollution of waters. Only when transporting the loss of water make about 3 billion cubic meters of water.

Weak use of the moisture preserving technologies in agriculture, extensive use of water at irrigation is led to 40 % of losses of water intake volume.

The worn-out condition of water supply and water disposal in settlements is led to losses of water in housing-and-municipal sector up to 35 % of volume of the taken-away water – 250 million cubic drinking water.

The industrial sector – about 40 % of the water purified to drinking requirements is used in the production purposes.

3) The problem of pollution of lake and river ecological systems by manufacturing enterprises and housing and communal services is particularly sensetive while they are the only suppliers of water resources.

Pollution of surface and underground water happens due to disposing of sewage by the industrial enterprises, and also historical pollution by washout the non-recultivateddisposals of the overburden breeds, tailings dams, mines and adits located in the water protection zones of reservoirs.

In the country practically all industrial, agricultural, household drains and waste are disposed without normal or in general without any cleaning.

4) Supply of drinking water in many settlements doesn't correspond to standard quality. As the operating water supply systems and conduits owing to the high operation time have come to full worthlessness, don't meet the sanitary and hygienic requirements. It threatens the outbreaks of many infectious diseases.

5) Owing to deficiency of the budgetary financing technical condition of hydraulic engineering constructions practically on all water management objects of the republic is extremely bad. It is expressed first of all, in loss of operational reliability of constructions, in increase in probability of risk of underground damages of water supply systems, emergency situations on reservoirs, flooding of the inhabited, industrial lands, farmlands and so forth, interruptions to water supply to consumers. Unfortunately, it is necessary to establish the fact of unavailability of water services with spring floods.

The State program of water resources management of Kazakhstan approved by the Decree of the President of the Republic of Kazakhstan No. 786 of April 4, 2014 became one of such programs, the most important for the organization of the territory.

The program purpose - ensuring water safety of the Republic of Kazakhstan by increase in effective management of water resources.

Program tasks:

– the guaranteed providing the population, the environment and branches of economy with water resources by implementation of measures for water conservation and increase in volumes of the located water resources;

– increase in effective management of water resources;

– ensuring safety of water ecological systems.

Target indicators of the program:

– by 2020 decrease in water consumption on GDP unit in real terms for 33 % to the level of 2012;

– increase in additional superficial water resources on 0,6 km3 by 2020;

– a share of the water users having continuous access to system of the central drinking water supply: in the cities no lower than 100 %, also in rural settlements not lower than 80 % till 2020;

– a share of the water users having access to systems of water disposal: in the cities no lower than 100 % till 2020; in rural settlements no lower than 20 % till 2020;

– satisfaction of annual needs of natural objects for water and preservation of navigation at the level of 39 km^3.

Achievements of tasks will be measured by the following indicators within implementation of the Program:

– loss in trunk and distributive channels no higher than 20 % by 2020;

– loss in irrigational infrastructure no higher than 30 % by 2020 (excepting trunk and distributive channels);

– the moisture preserving methods of processing of the soil and the water preserving restructuring of crops for 50 % of the possible regions by 2020;

– the water preserving technologies of irrigation for 30 % of the possible regions by 2020;

– the water preserving technologies in the industry for 20 % of the enterprises by 2020, and also technologies of reverse water-supply for 30 % of the enterprises by 2020;

– water metering devices in municipal services at 95 % of end users by 2020;

– the water wastage rate on city networks no higher than 15 % by 2020;

– increase in additional surface water resources on 0,6 km3 till 2020 by means of measures for maintenance and upgrade of operating infrastructure;

– till 2020 in operation system of the regular sampling of water and sewage – at least 12 tests a year, for the cities with the population more than 100 thousand people – at least 24 tests a year;

– the acting automated information system of the state water inventory on the basis of enhancement of its organization structure and an order of guiding by 2020;

– equipment by measuring instruments and control automation at all stages of a intake and water supply of 80 % of agricultural producers by 2020;

– spanning by hydrological observations of all large and average, and also the small rivers, significant for an economic complex of the republic, and finishing number of the state hydro-points till 2020 to 500;

– support of needs of natural objects for water for saving and improving of their ecological status, including Lake Balkhash at least 12 km3 in a year, Lakes Aral Sea – 3,6 km3 in a year, the delta of the Syr Darya River – 2,7 km3 in a year, the delta of the river Or – 2,0 km3 in a year and other natural objects switched on in the List of wetlands of the international value;

– reduction of level of pollution of water for 20 reservoirs till 2020.

Actually, the listed indicators define those measures which are provided by the Program for the solution of objectives, and also define the directions of development of ecological infrastructure at the regional and local levels.

Extremely unsatisfactory is a situation with production waste and MSW. The taken measures don't bring closer us to standards of the developed countries yet.

The total amount of the saved-up MSW in Kazakhstan makes about 100 million tons, at the same time about 5-6 million tons of MSW are annually formed. According to reporting data for 2016 the volume of MSW on the republic has made 8 941,249 thousand tons, from them only 3 % (Fig. 2) are utilized.

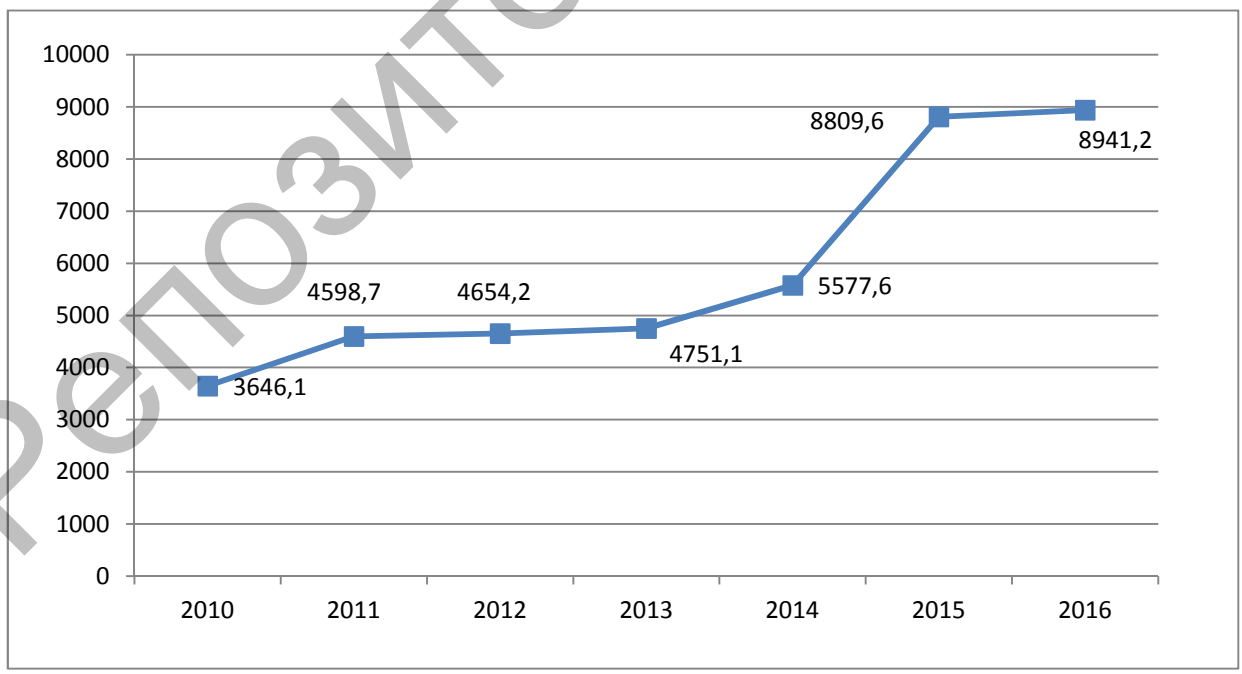

Figure 2. Volumes of the formed municipal solid waste by years, one million t (prepared by authors)

The volume of the utilization of MSW reached in the republic is provided with the small enterprises specializing in utilization and processing of separate types of waste: waste paper, plastic, a cullet, medical waste, non-ferrous metals, the fulfilled tire covers, accumulators, mercury-containing products and devices.

For attraction, and also supports of the enterprises of small and medium private business specializing in the sphere of processing and recycling are necessary measures of economic incentives (decrease in tax obligations, preferences, preferential crediting, etc.). As practice shows, construction of the large plants doesn't solve a problem properly.

Today in the republic at the system level separate collecting and sorting of MSW isn't adjusted, there are no capacities for their sorting and complex processing. Practically all volume of the formed MSW is placed on grounds.

Insufficient rates of work with ownerless disposals of garbage. For example, in 2013 from 4 459 functioning solid waste landfills, are officially legalized only 781 grounds (18 %), in 2014 from 3 796 724 grounds (19 %) are legalized, in 2015 from 4 354 956 grounds (22 %) are legalized [5].

As of 2016 in the territory of the republic there are 4 284 grounds and disposals of MSW. From them the legalized grounds and disposals which are conforming to ecological requirements and sanitary standards, having necessary documentation – 459. And the majority of grounds have exhausted the validity period, their recultivation, and also construction of the new grounds meeting existing rules and requirements is required. Local executive bodies hold events for recultivation of the disposals and grounds which have exhausted the validity period, execution of necessary allowing documents. So, for comparison, as of 2010 in the territory of the republic there were 4 499 subjects to placement of waste. Annually their quantity is reduced in connection with recultivation of the disposals and grounds which aren't conforming to requirements and exhausted the validity period. But nevertheless, the most part of subjects to placement of waste remain not legalized. The work which is carried out in this direction doesn't yield due result, often due to the lack of financing.

For the solution of questions of management of MSW in Kazakhstan the Program of modernization of a control system of municipal solid waste for 2014-2050 is adopted. Orders of the Minister of Energy of RK «About Formation of Selection Criteria of Projects on Modernization of Sector of MSW», «Plan of Information Work on the Treatment of MSW» are approved.

12 judgments on ownerless dangerous wastes have come into force. According to 3 judgments 4,7 million tons of dangerous wastes are transferred to the republican possession.

In 2016 over 99 million tenges are allocated for management of ownerless dangerous wastes from the republican budget, works are conducted in the Aktyubinsk, Karaganda and Kostanay regions. Works on elimination of the pollution formed as a result of destruction of warehouses of agricultural chemistry in the settlement Toguzak (The Kostanay Region), ownerless sludge collectors of the former Alginsky chemical plant (The Aktyubinsk Region), mercury-containing waste of JSC TEMK (The Karaganda Region) are carried out.

Justifications of investments on 9 cities (Aktobe, Atyrau, Karaganda, Kokshetau, Kostanay, Pavlodar, Taldykorgan, Taraz, Ust-Kamenogorsk) are developed.

Justification of investments provides the environmentally friendly and checked by practice technologies of mechanic-biological processing (sorting, receiving salvage, processing including with receiving compost and biogas), introduction of separate collecting, purchase of the specialized machinery and equipment, construction of new grounds and recultivation of the fulfilled disposals, and also the total cost and terms of construction. Also on the basis of the analysis of the current scheme of management of municipal solid waste the profitable model of management of this sector is offered.

Justifications of investments are transferred to local executive bodies – akimats of the Aktyubinsk, Almaty, Atyrau, Jambyl, Karaganda regions for further work on modernization of a control system of municipal solid waste of the region. Justification of investments on the cities of Kokshetau, Kostanay, Pavlodar, Ust-Kamenogorsk prepare for transfer in accordance with the established procedure to the relevant akimats.

28 015,420 million tonn of industrial wastes are saved up for territories of the country. For 2016 at the enterprises 9742981,30 thousand tons of waste are formed, from them 166,903 million tonn (Fig. 3) are processed, reused and utilized.

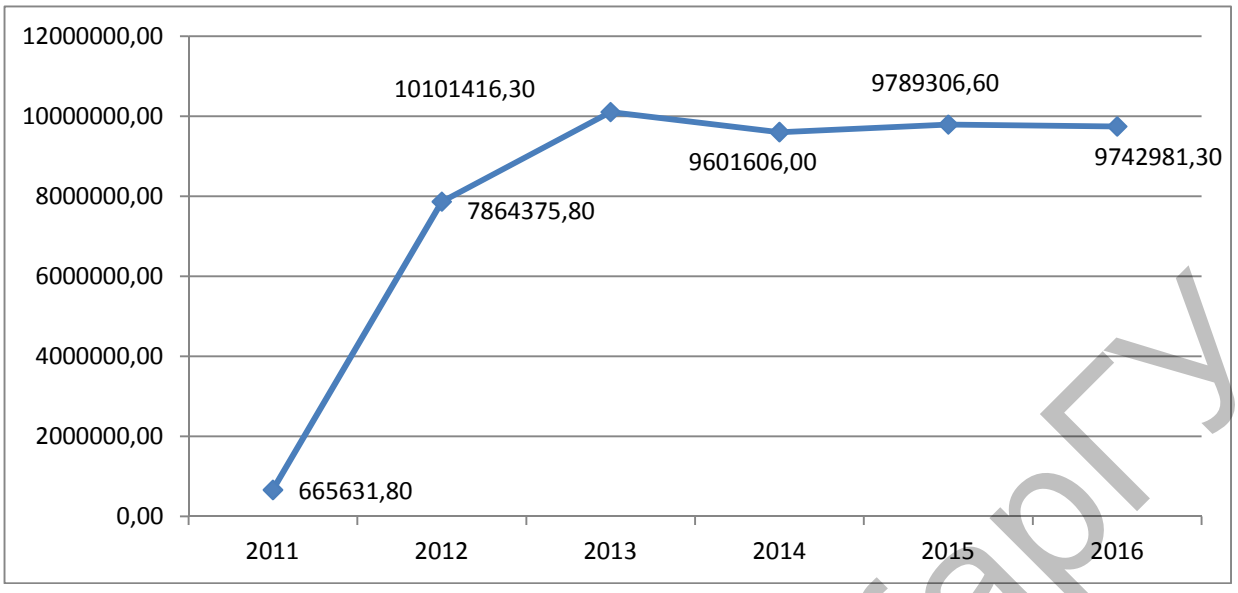

Figure 3. Volumes of the formed industrial wastes by years, thousand tons (prepared by authors)

The main sources of formation of industrial wastes are mining, metallurgical, oil and gas extraction, heat power branches. Volumes of the formed industrial wastes annually grow.

Now in the Republic of Kazakhstan any account of volumes of formation and collecting at the population of dangerous household wastes isnot kept. The exception makes the accounting of the medical waste collected in medical institutions. It is possible to define the following key problems in the sphere of the dangerous household wastes [6,7] at the moment:

– lack of system of the accounting of formation of dangerous household wastes;

– almost total absence of the adjusted system of separate collecting;

– absence of the enterprises and objects for processing or destruction of dangerous household wastes, except for mercury-containing household waste;

– lack of special subjects to burial of dangerous household wastes;

– backwardness of standard and legal base in the sphere of the account, collecting, processing, destruction and burial;

– lack of expanded responsibility of producers and suppliers for utilization of the fulfilled dangerous household wastes.

In Kazakhstan there was a developed system of the centralized heat supply so far, but its ecological efficiency is insufficient as operational energy consumption of residential and public buildings in the cities in Kazakhstan by 3 times exceed a similar indicator of technically developed countries with similar climatic characteristics. At the same time up to 30 % of the thermal energy made by combined heat and power plant and boiler rooms is lost at transportation in networks of external heating pipes with the insufficient or broken thermal isolation that negatively reflected in a condition of natural components (atmospheric air, a soil and vegetable cover, water resources).

Very important industry program for transition to Green economy is the Energy saving-2020 Program approved by the Resolution of the government of the Republic of Kazakhstan of August 29, 2013 No. 904. Target indicators of this program:

1) annual 10 percent decrease in power consumption of GDP during 2013 - 2016;

2) decrease in power consumption of GDP by 40 % by 2020 of the level of 2008.

The most striking example of the project of energy saving in housing and communal services is the thermomodernized house in Astana on Kuisha Dina St. Owners of apartments in comparison with last year after repair began to pay for heat for 50-60 %, and for hot water supply 18-20 % less, than for last heating season.

The projects realized on the Smart Astana project tightly intertwine with a subject of the EXPO-2017 exhibition. So today in the pilot mode technologies power - and resource-saving are implemented. It is «Smart-water supply system» and Smart LED. Last assumes changeover of lamps of street lighting on LED

and installation of the warning system. Results of a pilot project at once gave saving of electricity consumption of 20 %.

The Smart-water supply system project is directed to fast and high-quality determination of places of leaks on a water supply system of the city of Astana. Full-scale implementation of the project will allow reduction of the water wastage rate from 21 % to 8 %.

Thus, the ecological status of the urbanized territories is characterized by many components and depends on the general social and economic situation in the country, a possibility of implementation of actions of the state urban and housing policy in new conditions.

Now anthropogenicstress makes the strongest impact on natural ecosystems of the cities and the state of health of the population.

The main environmental problemsare connected to main types of technology-related influence and also natural geological threats:

1) the chemical pollution of all environments (air, soils, surface and underground water) caused by a high level of technology-relatedstress, especially in city and industrial agglomerations with complexes of oil-processing, metallurgical, mechanical, chemical industry. Proximity and activity of the industrial enterprises accompanied by danger of deterioration in an ecological situation in the cities (all monotowns, a some of the cities of the industrial regions of Kazakhstan);

2) accumulation of a huge number of the industrial and home wastes which are constant sources of many types of pollution of environments (practically all cities of Kazakhstan);

3) the radioactive pollution caused by natural and technogenic sources of radioactive radiation (Ust-Kamenogorsk, Ridder, Semey, Kurchatov, Aktau);

4) violations of environments and landscapes intensive economic activity of the mining industry (cities of oil and gas and carbon regions of Kazakhstan);

5) insufficient development of systems of municipal services is the reason of pollution of natural water currents and reservoirs (Astana, Balkhash, Priozersk, Shchuchinsk);

6) change of hydrogeological conditions: conversion of the natural hydrochemical and hydrodynamic mode, exhaustion of inventories and pollution of fresh underground waters (city of the southern regions of Kazakhstan, Priaralye);

7) development of exogenous geological processes - a karst, a suffosion, an erosion, landslides, flooding, bogging, a complex of the processes connected with processing of coast of reservoirs, geocryologic and various gravitational processes in the mountain region (Astana, Almaty);

8) development of emergency situations of natural and technogenic character with ecological consequences;

9) environmental problems of the urbanized territories become aggravated because of the increasing automobilization of the cities (Almaty, Shymkent, Astana and all large cities);

10) climate change state of environment in the urbanized cities also makes impact. Deficiency of water, reduction of agricultural production (because of thermal loading and deficiency of water) and an extreme heat in urban and industrial regions (the South of Kazakhstan) concerns to them.

Thus, the provided analysis clearly demonstrates existence of the large centers of environmental problems of the cities caused by production specialization of economy of the republic. All productions of the city it is inseparably linked with technogenic circulation of natural raw materials. It is possible to generalize a number of the factors constraining solutions of environmental problems and processes of greening of economy in general:

– Lack of system approach to the solution of environmental problems of the urbanized territory, in the majority nature protection activity is directed to elimination of consequences which becomes senseless without elimination of the reasons. Absence of effective legal, standard and methodical, organizational and economic managements of mechanisms of environmental protection and environmental management;

– The analysis of realization of a number of republic, and regional programs of environmental protection has shown the need and relevance, the ecological effect isnot observed, tasks of programs arenot concrete, in certain cases arenot coordinated that affects quality of the taking measures. The principle of growth of city economy even due to intensive use of natural resources and negative impact on the environment of the city and the living population is higher, than the principle of ensuring quality of the environment of the city and quality of life of the population;

– Lack of financial means and low efficiency of use of the available resources directed to environmental protection and rational environmental management. Despite toughening of the legislation and rates of pay-

ments for environmental pollution, insufficient control of an expenditure of budgetary funds at the local level have led to such situation when about 80-90 % of ecological payments are used not in direct appointment and only 10-20 % go directly to nature protection measures;

– Lack of effective incentives for the enterprises and businessmen to use of resource-and energy saving technologies, environmentally friendly productions, the equipment, transport.

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Қазақстанның урбанизацияланған аумақтарындағы қоршаған ортаны қорғаудың негізгі мәселелерін талдау мен оны жіктеу

Мақалада Қазақстанның урбанизацияланған аумақтарындағы қоршаған ортаны қорғаудың негізгі мәселелерін талдау мен оны жіктеу қарастырылған. Әсіресе күрделі қалалардың атмосфералық ауасының ластану динамикасы мен негізгі бағыттарына ерекше көңіл бөлінген, амосфералық ауасы ластанған жоғарғы деңгейлі қала және ластанудың негізгі көздері анықталды. Қазақстан Республикасының халық тұратын пунктеріндегі атмосфераның ластану индексінің динамикасы бағаланды. Суды толтыру және жоғалту динамикасын талдау негізінде су ресурстарын пайдалануға, сондай-ақ Қазақстан облыстары мен қалалары бойынша негізгі су тұтынушыларға ағымдық баға берілген. Табиғи рестурстарды тиімді пайдаланудың негізгі мәселелері анықталды. Су ресурстарын басқарудың мемлекеттік бағдарламасының мақсаттық индикаторлары ұсынылды. Қатты тұрмыстық қалдықтарды қалыптастыру және жою облысындағы ағымдық жағдай бағаланды. Берілген бағыттағы негізгі мәселелер көрсетілді: қатты тұрмыстық қалдықтарды шаруасыздық қоқыстарды басқару және халықтан қауіпті қатты тұрмыстық қалдықтарды алу. Қалыптасқан өнеркәсіптік қалдықтар динамикасына талдау жүргізілді. Талдау барысында қаланың экожүйесіне маңызды әсер ететін экологиялық мәселелер жіктеліп, қала экономикасын экологизациялау үрдісі мен экологиялық мәселелерді шешуді тежейтін факторлар жалпыланды.

Кілт сөздер: қоршаған ортаны қорғау, урбандалған аумақ, атмосфералық ауаның ластануы, атмосфераның ластану индексі, су ресурстарын тиімді пайдалану, судың ластану индексі, қатты тұрмыстық қалдықтар, қараусыз қауіпті қалдықтар, өнеркәсіптік қалдықтар, қатты тұрмыстық қалдықтарды жою.

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Анализ и классификация проблем охраны окружающей среды урбанизированной территории Казахстана

В статье представлен анализ и дана классификация основных проблем охраны окружающей среды урбанизированной территории Казахстана. Показана неравномерность выбросов загрязняющих атмосферу веществ, отходящих от стационарных источников по территории Казахстана. Выявлены города с высокой степенью загрязнения атмосферного воздуха, определены основные источники загрязнения. Оценена динамика индекса загрязнения атмосферы в населенных пунктах Республики Казахстан. Вы-

делены города, в которых зафиксированы случаи высокого загрязнения и экстремально высокого загрязнения в атмосферном воздухе. Дана текущая оценка использования водных ресурсов на основе анализа динамики забора и потерь воды, а также основных водопотребителей в разрезе областей и городов Казахстана. Определены основные проблемы рационального использования природных ресурсов. Представлены целевые индикаторы Государственной программы управления водными ресурсами. Оценена текущая ситуация в области образования и утилизации твердых бытовых отходов. Выделены основные проблемы в данном направлении, в частности, управление бесхозяйственными свалками твердых бытовых отходов, изъятие у населения опасных твердых бытовых отходов. Проведен анализ динамики образования промышленных отходов, определены основные источники образования. На основе проведенного анализа представлена классификация экологических проблем, оказывающих существенное влияние на экосистему городов, и обобщены факторы, сдерживающие решение экологических проблем и процессы экологизации экономики города.

Ключевые слова: охрана окружающей среды, урбанизированная территория, загрязнения атмосферного воздуха, индекс загрязнения атмосферы, рациональное использование водных ресурсов, индекс загрязненности воды, твердые бытовые отходы, бесхозяйственные опасные отходы, промышленные отходы, утилизация ТБО.

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