

ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫНЫҢ

Х А Б А Р Ш Ы С Ы

ВЕСТНИК

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

THE BULLETIN

THE NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN

PUBLISHED SINCE 1944

3

MAY – JUNE 2021

ALMATY, NAS RK

NAS RK is pleased to announce that Bulletin of NAS RK scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of Bulletin of NAS RK in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential multidiscipline content to our community.

Қазақстан Республикасы Ұлттық ғылым академиясы «ҚР ҰҒА Хабаршысы» ғылыми журналының Web of Science-тің жаңаланған нұсқасы Emerging Sources Citation Index-те индекстелуге қабылданғанын хабарлайды. Бұл индекстелу барысында Clarivate Analytics компаниясы журналды одан әрі the Science Citation Index Expanded, the Social Sciences Citation Index және the Arts & Humanities Citation Index-ке қабылдау мәселесін қарастыруда. Web of Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабаршысының Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді мультидисциплинарлы контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Вестник НАН РК» был принят для индексирования в Emerging Sources Citation Index, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Вестника НАН РК в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному мультидисциплинарному контенту для нашего сообщества.

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«Қазақстан Республикасы Ұлттық ғылым академиясының Хабаршысы».

ISSN 2518-1467 (Online),

ISSN 1991-3494 (Print).

Меншіктенуші: «Қазақстан Республикасының Ұлттық ғылым академиясы» РҚБ (Алматы қ.).

Қазақстан Республикасының Ақпарат және коммуникациялар министрлігінің Ақпарат комитетінде 12.02.2018 ж. берілген № 16895-Ж мерзімдік басылым тіркеуіне қойылу туралы куәлік.

Тақырыптық бағыты: *іргелі ғылымдар саласындағы жаңа жетістіктер нәтижелерін жария ету.*

Мерзімділігі: жылына 6 рет.

Тиражы: 300 дана.

Редакцияның мекен-жайы: 050010, Алматы қ., Шевченко көш., 28, 219 бөл., тел.: 272-13-19, 272-13-18

<http://www.bulletin-science.kz/index.php/en/>

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Типографияның мекен-жайы: «Аруна» ЖК, Алматы қ., Муратбаева көш., 75.

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«Вестник Национальной академии наук Республики Казахстан».

ISSN 2518-1467 (Online),

ISSN 1991-3494 (Print).

Собственник: РОО «Национальная академия наук Республики Казахстан» (г. Алматы).

Свидетельство о постановке на учет периодического печатного издания в Комитете информации Министерства информации и коммуникаций и Республики Казахстан № 16895-Ж, выданное 12.02.2018 г.

Тематическая направленность: *публикация результатов новых достижений в области фундаментальных наук.*

Периодичность: 6 раз в год.

Тираж: 300 экземпляров.

Адрес редакции: 050010, г. Алматы, ул. Шевченко, 28, ком. 219, тел. 272-13-19, 272-13-18

<http://www.bulletin-science.kz/index.php/en/>

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Адрес типографии: ИП «Аруна», г. Алматы, ул. Муратбаева, 75.

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Bulletin of the National Academy of Sciences of the Republic of Kazakhstan.

ISSN 2518-1467 (Online),

ISSN 1991-3494 (Print).

Owner: RPA «National Academy of Sciences of the Republic of Kazakhstan» (Almaty).

The certificate of registration of a periodical printed publication in the Committee of information of the Ministry of Information and Communications of the Republic of Kazakhstan No. 16895-Ж, issued on 12.02.2018.

Thematic focus: *publication of the results of new achievements in the field of basic sciences.*

Periodicity: 6 times a year.

Circulation: 300 copies.

Editorial address: 28, Shevchenko str., of. 220, Almaty, 050010, tel. 272-13-19, 272-13-18

<http://www.bulletin-science.kz/index.php/en/>

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Address of printing house: ST «Aruna», 75, Muratbayev str, Almaty.

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ANALYSIS OF HOUSING AND UTILITIES SECTOR ACTIVITIES IN ENSURING ENVIRONMENTAL SAFETY IN ATYRAU

Abstract. The state of the environment is influenced by various spheres of economic activity, including housing and communal services (HCS). The issues of the housing and communal services functioning in Kazakhstan are one of the priority directions in ensuring the environmental safety of the country.

The article provides a SWOT analysis of the activities of housing and communal services enterprises in ensuring the environmental safety of Atyrau. The given article has generated information about the enterprises of the housing and communal services of the city of Atyrau, in particular, the activities of enterprises for electricity supply, gas, steam and air conditioning, water supply enterprises, sewage systems, control over the collection and distribution of waste, stationary sources of pollutant emissions and the volume of their emissions.

The official statistical information on industry and the environment, published on the website of the Committee on Statistics of the Republic of Kazakhstan, has been studied. In particular, the indicators for 2017-2019 have been analyzed in the context of the regions of Kazakhstan.

In the course of the study, a sociological survey was conducted among the population of Atyrau to determine the opinion on the impact of the activities of housing and communal services enterprises on the environment.

Based on the results of the study, measures have been proposed to improve the environmental situation in the city of Atyrau, as well directions of activities of housing and communal services enterprises in ensuring environmental safety have been determined.

The study was carried out within the framework of scientific project «Economic mechanism for the development of housing and communal services in ensuring environmental safety (on the example of Atyrau)» by intra-university funding.

Key words: housing and utilities, ecological security, modernization, urban economy, economic assessment.

Introduction. Housing and utilities sector is found to be one of the anthropogenic factors for environmental pollution.

The activities of housing and utilities facilities have a negative impact on the environment as a result of: withdrawal of a large amount of natural water for the household, drinking and industrial purposes; discharge of untreated domestic and industrial wastewater and surface runoff from urbanized territories; emissions from boiler systems of heat supply into the atmosphere; placement of household and industrial waste in landfills [1-4].

In recent years, emissions of pollutants from stationary sources are still growing; in 2018 their level increased by 3.8% compared to the previous year, and in 2019 - by 1.5%. A quarter of the emissions are accounted for by utilities. According to statistics for Kazakhstan only 5.2% of stationary sources of pollutants are equipped with treatment facilities.

The aim of the study is to determine the extent of damage done by housing and utilities activities

on the environment, as well as to offer solutions to problems.

The research objectives are to study the environmental hazards caused by housing and communal services; to consider the negative effects separately and to make proposals to reduce threats to the environment.

The activity of housing and utilities companies in Atyrau was chosen as the object of the research due to the fact that Atyrau is referred to highly polluted cities rank. In Atyrau, none of the enterprises as sources of emissions has treatment facilities, including municipal utilities. Water supply and sewerage companies in the investigated region are equipped with treatment facilities that can only treat 45% of wastewater [5]. The given and other problems that have a negative impact on the ecology of Atyrau have been discussed by the authors in this article.

Methods. The ecological state of many regions in Kazakhstan is causing concern to the public and scientists. Numerous publications [6-13] have

shown that in most regions of our country there is a persistent trend to multiple exceeding the sanitary and hygienic standards for the content of various harmful substances in the atmosphere, soil, and water. Housing and utilities companies also have a negative impact.

To assess the influence of housing and utilities companies on the environment of Atyrau, we have conducted a SWOT analysis (table 1).

Table 1. SWOT analysis of housing and utilities companies' activities in ensuring environmental safety in Atyrau

Internal environment	Strengths	Weaknesses
	<ul style="list-style-type: none"> - availability of a legal basis for ensuring environmental safety; - availability of forms of annual national statistical observation for environmental statistics. 	<ul style="list-style-type: none"> -lack of an integrated waste management system; - lack of treatment facilities for stationary sources of pollutants; - insufficient number of wastewater treatment plants; - violations of environmental legislation; - environmental disasters caused by housing and utilities companies.
External environment	Opportunities	Threats
	<ul style="list-style-type: none"> - construction of a new thermal power plant with modern equipment for cleaning emissions; - construction of a waste processing plant; - activation of waste sorting among the population, saving electricity and water; - reclamation of evaporation fields; - modernization of water supply and sanitation systems. 	<ul style="list-style-type: none"> - financial crisis; - natural disaster; - industrial failure
Note: complied by the authors		

Discussion. Here are the strengths to be considered in detail.

The legal basis for ensuring environmental safety in Kazakhstan is the Environmental Code (2007), the Concept for the transition of the Republic of Kazakhstan to a “green economy” (2013). In 2019, leading experts and the business community accomplished a great deal of work to develop a new Environmental code of the Republic of Kazakhstan based on the best international experience [14, 15].

The state conducts annual monitoring of environmental statistics by different forms have been developed for this purpose:

- Index 2-TP “Report on atmospheric air protection”;
- Index 1-VK “Report on the operation of water pipes, sewers and their separate networks”;
- Index 4-OS “Report on environmental protection costs”;
- Indexes 1-Waste “Report on collection and removal of municipal waste”;
- Index 2-Waste “Report on sorting, recycling and depositing of waste” [17].

Weaknesses include the lack of an integrated waste management system. Total 100% of solid municipal waste in Atyrau ends up in uncontrolled landfills that do not meet the requirements of sanitary standards. The volume of collected municipal waste is growing every year; if in 2017 it amounted to 36333 tons, in 2018 and 2019 it comprised 39493 and 45499 tons respectively [18].

Only in 2019, plastic and paper waste sorting methods were introduced to handle household waste, and it is carried out by private individual enterprises while the remaining waste is deposited.

Another weakness is that none of the 7,632 stationary sources of pollutants are equipped with treatment facilities in Atyrau alone out of all the regions of Kazakhstan. The volume of emissions of pollutants by sources by these enterprises amounted to 177.0 thousand m³ in 2017, while 172.3 and 164.5 thousand m³ in 2018 and 2019 correspondingly [17]. Taking into account that the Atyrau region is ranked the first among 17 regions of the country in terms of the number of enterprises that are sources of pollutants, this fact is appalling. It can be seen in table 2.

Table 2 Number of stationary emission sources in the Republic of Kazakhstan

Region	2017			2018			2019		
	total, unit	Of them equipped with treatment facilities, units.	Volume of emissions by sources, thousand tons.	Total, unit	Of them equipped with treatment facilities, units.	Volume of emissions by sources, thousand tons.	Total, unit	Of them equipped with treatment facilities, units.	Volume of emissions by sources, thousand tons.
Total for the Republic of Kazakhstan	268 358	13 289	2 357,8	255 231	13 247	2 446,7	243 913	12 788	2 483,1
Akmola	18 129	1 242	86, 9	18 368	1 254	84,5	16 507	1 279	76,7
Aktuybinsk	21 912	445	169, 5	21 359	445	158,1	20 683	441	136,6
Almaty	15 115	570	43,4	13 830	610	50,2	12 278	470	48,1
Atyrau	29 918	-	177,0	22 567	-	172,3	25 259	2	164,5
Atyrau city	9 157	-	86,8	6 365	-	63,2	7 632	-	66,1
Zhylyoiskyi district	7 402	-	82,5	8 013	-	84,0	9 081	2	77,5
West Kazakhstan	11 761	419	41,5	11 769	419	48,2	10 705	387	41,2
Zhambyl	14 254	787	51,9	14 037	821	52,1	13 061	631	55,8
Karaganda	15 692	1 292	598,7	15 981	1 310	587,5	16 315	1 373	641,3
Kostanay	20 278	1 688	114,8	21 203	1 672	124,0	16 927	1 773	130,5
Qyzylorda	12 723	15	27,5	11 846	15	26,0	12 585	16	24,4
Mangystau	23 255	174	62,6	25 124	173	65,5	24 231	177	64,5
South Kazakhstan	16 580	756	68,2	-	-	-	-	-	-
Pavlodar	13 233	1 352	609,8	13 038	1 398	709,2	13 415	1 309	721,5
North Kazakhstan	12 951	1 619	76,4	14 136	1 628	75,5	12 925	1 569	74,7
Turkestan	-	-	-	9 618	328	30,1	8 547	321	33,5
East Kazakhstan	21 204	1 809	129,3	19 529	1 770	130,7	19 795	1 774	128,7
Nur-Sultan	6 734	425	59,2	5 955	377	56,4	5 731	320	65,1
Almaty city	14 619	696	41,1	11 337	599	43,0	9 711	503	46,0
Shymkent city	-	-	-	5 534	428	33,4	5 238	443	29,1

Note: compiled by the authors on the base of references [19]

As can be seen from Table 2, the number of stationary sources of pollutant emissions in Atyrau is growing. Of these, there are 10 enterprises for power supply, gas, steam and air conditioning, 2 enterprises for the Sewerage system, control over the collection and distribution of waste.

Since 2018, by Kazakhstan's statistics the sources of emissions are divided according to the types of economic activities, but unfortunately, the divisions are not reflected in official sources by regions of the country (Table 3).

Table 3 – Analysis of emissions by utilities in total emissions of the Republic of Kazakhstan

Number of stationary emission sources that emit pollutants, in units	Volume of emissions of pollutants by sources, in thousand tons.	Power supply, gas, steam and air conditioning companies, in units	Volume of emissions of pollutants by sources, in thousand tons.	Share in total emissions %	Enterprises of water supply, Sewerage system, control over waste collection and distribution, in units	Volume of emissions of pollutants by sources, in th.t.	Share in total emissions %

2018	255 231	2 446,7	322	632,3	25,8	40	25,4	1,1
2019	243 913	2 483,1	304	633,7	25,5	41	17,4	0,7
deviations+/-	- 11 318	+36,4	-18	+1,4	-0,3	+1	-8,0	-0,4

Note: complied by the authors on the base of reference[19]

As can be seen from Table 3 in the Republic as a whole in 2019, out of 243,913 stationary sources of emissions that emit pollutants into the atmosphere, 304 are accounted for by enterprises that supply electricity, supply gas, steam and air conditioning, 41 by enterprises that supply water, sewer systems, control over waste collection and distribution. This is slightly more than 0.1% of all enterprises, but the volume of pollutants emitted from their activities accounts for a fourth of all emissions and constituted 26.2% in 2019, which is 0.7% less than in 2018.

These figures prove that emissions from utilities cause huge environmental damage to the environment [19].

The weak points can also be attributed to the insufficient number of wastewater treatment plants (Table 4).

Table 4 – Analysis of water disposal systems in Atyrau

	2017	2018	2019	Deviations +/- 2019/2018
Number of water disposal system facilities, unit.	1	1	2	+1
Number of wastewater treatment plants, unit.	1	1	2	+1
Share of treated wastewater in % of total wastewater flow, %	36,5	44,6	45,0	+0,4

Note: complied by the authors on the base of the reference [17]

According to the data presented in Table 4, up to 2019, there was only 1 wastewater disposal facility in Atyrau that was equipped with a treatment system, the share of treated wastewater in the total flow of wastewater was 36.5% in 2017 and 44.6% in 2018. With the construction of the second water disposal treatment facility in 2019, the situation did not improve much due to incomplete start-up, the share of treated wastewater was only 45%. The remaining 55% of untreated wastewater pollutes the soil and air of Atyrau.

It is obvious that all this leads to a violation of the environmental legislation of the Republic of Kazakhstan.

Environmental disasters occur due to the fault of housing and utilities companies in Atyrau.

One of these disasters was the death of fish on the Ural river in December 2018, but the full scale of the environmental disaster was seen in the spring, when the ice melted. It was proved that the death of fish in the river occurred due to poisoning of river water with chlorine, which entered the environment from the treatment facilities of the Municipal State enterprise Atyrau su Arnasy.

In total, 14.3 tons of partial fish were lost in the Ural river, the damage is estimated at 13.9 thousand tenge. Ural-Atyrau sturgeon fish hatchery LLP suffered damage in the amount of 429.8 thousand tenge. About 100 tons of sturgeon fish were lost in Lugovskaya stud farm LLP, and the damage was 626.4 thousand tenge [20].

Opportunities.

At many large foreign energy facilities, the efficiency of ash collection using electric filters is 99.7% [21]. To reduce ash emissions, it is necessary not only to equip new thermal power plants with ash-collecting installations with an efficiency of up to 99.8%, but also to modernize a large number of installations of all types at existing thermal power plants (TPP).

It is difficult to achieve the European standards of emissions to the environment at the Atyrau TPP, since it has been operating for more than 55 years. The station's equipment is outdated completely. The layout of existing technological equipment does not provide for the installation of additional cleaning systems (there are no free areas for additional dust and gas cleaning equipment). A significant reduction in emissions (to achieve higher European standards) is possible if significant investments are made in technological equipment during the construction of a new thermal power plant in Atyrau.

Construction of a waste processing plant and reclamation of evaporation fields are vital in the climatic conditions of Atyrau, where the air temperature in summer reaches 55°C, strong winds up to 15-20 m/s. The population of Atyrau and, accordingly, the volume of municipal waste and waste water is growing every year.

These issues concern the residents of Atyrau who took part in the sociological survey.

500 respondents were involved in the sociological survey, of which 450 (90%) describe the environmental situation in Atyrau as unfavorable, 328 respondents (65.6%) believe that the activities of housing and utilities enterprises negatively affect the ecology of the city. The level of negative impact of housing and utilities companies on a 5-point scale (where 1 is the minimum impact, 5 is the maximum impact) they rated as follows (Figure 1).

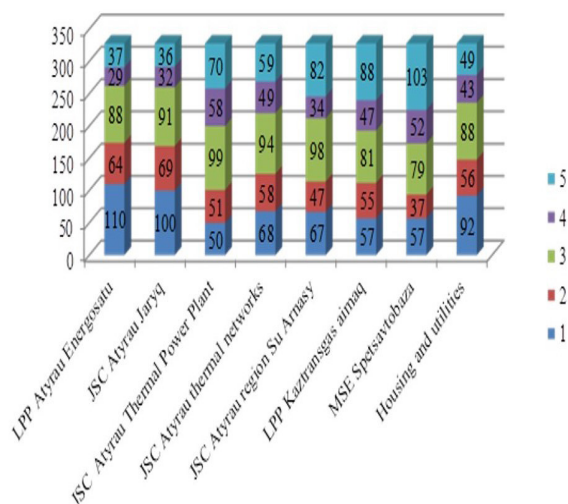


Figure 1 – Assessing the housing and utilities enterprises' activities on the environmental safety of Atyrau (based on the results of a sociological survey of the population of Atyrau)

Note: compiled by the authors on the base of the sociological survey results

According to 328 (65.6%) respondents, the main negative impact on the environment of Atyrau is exerted by MSE «Spetsavtobaza», LLP «KazTransGas Aymaq», JSC «Atyrau region Su Arnasy», JSC Atyrau TPP.

The emissions into the atmosphere as the most serious pollutants from the activity of housing and utilities enterprises are defined by 257 respondents, placement of household and industrial waste in landfills (organized and unorganized) was marked by 242, while discharge of untreated sewage, open evaporation fields and pollution from leaks and accidents were indicated by 227, 187 and 158 respondents relatively. 467 (93.4%) respondents are concerned about the

problem of garbage in Atyrau, 339 people of which note that there are no waste sorting containers in their area of residence. Only 194 (38.8%) sort garbage, but 266 (53.2%) do not separate it.

291 people (58.2%) do not transfer hazardous waste because they do not know where to take them, 110 (22%) or appropriate containers, 55 (11%) do not utilize waste as expected, 10 (6.8%) did not use separate collection facilities, because they are far away.

418 respondents (83.6%) save water and electricity both at work and at home; 47 (9.4%) save only at home, 26 (5.2%) do not save at all.

In General, 248 (49.6%) respondents are confident that they will be able to influence the solution of environmental problems in Atyrau, 117 (23.4%) are not sure, and the remaining 135 (27%) found it difficult to answer.

Conclusion. Thus, the analysis of the activities of housing and utilities enterprises in Atyrau showed their complete inaction in ensuring environmental safety.

We believe that to improve the environmental situation in the housing and utilities sector, it is necessary to build a waste processing plant, introduce waste sorting and subsequent processing, modernize sewage treatment plants, actively use the opportunities of renewable energy sources, start recultivating evaporation fields, modernize the equipment used at housing and utilities enterprises and digitalize their processes.

It is also necessary to ensure waste sorting, saving water and electricity, in particular, by placing advertising materials, posters, banners in public places, to conduct classes and master classes in educational institutions on competent utilizing of hazardous household waste, garbage separation, saving water and electricity and to provide environmental videos in shopping centers and cinemas for public view.

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ЭКОЛОГИЯЛЫҚ ҚАУІПСІЗДІКТІ ҚАМТАМАСЫЗ ЕТУДЕГІ АТЫРАУ ҚАЛАСЫ ТҮРҒЫН ҮЙ-КОММУНАЛДЫҚ ШАРУАШЫЛЫҚ КӘСІПОРЫНДАРЫНЫҢ ҚЫЗМЕТІН ТАЛДАУ

Аннотация. Қоршаған ортаның жай-күйіне экономикалық қызметтің әртүрлі салалары, оның ішінде тұрғын үй-коммуналдық шаруашылық (ТКШ) әсер етеді. Қазақстанның тұрғын үй-коммуналдық шаруашылығы инфрақұрылымының қызмет ету мәселелері елдің экологиялық қауіпсіздігін қамтамасыз етудегі басым бағыттардың бірі болып табылады.

Мақалада Атырау қаласының экологиялық қауіпсіздігін қамтамасыз етудегі тұрғын үй-коммуналдық шаруашылық кәсіпорындарының қызметіне SWOT-талдау жүргізілген. Жұмыста Атырау қаласының тұрғын үй-коммуналдық шаруашылық кәсіпорындары туралы ақпарат синтезделген, атап айтқанда, электрмен жабдықтау, газ, бу беру және ауа баптау кәсіпорындарының, сумен жабдықтау кәсіпорындарының, кәріз жүйесі, қалдықтардың жиналуын және таратылуын бақылау жөніндегі кәсіпорындардың қызметі, ластаушы заттар шығарындыларының стационарлық көздері және олардың шығарылу көлемі зерттелді.

SWOT-талдау ТКШ кәсіпорындары қызметінің зерттелетін мәселенің әлсіз және күшті жақтарын

анықтаған Атырау қаласының экологиясына әсерін бағалауға мүмкіндік берді. Алайда, Атырау қаласының ТКШ кәсіпорындары өз қызметін жақсарту бойынша жеткілікті мүмкіндіктерге ие – сумен жабдықтау және су бұру жүйелерін жаңғыртуды жүргізу, шығарындыларды тазалау бойынша қазіргі заманғы жабдықтары бар жаңа жылу электр станциясын салу, халық арасында қоқысты бөлек жинауды жандандыру, электр мен суды үнемдеу және т. б.

ҚР Статистика комитетінің сайтында жарияланған өнеркәсіп және қоршаған орта бойынша ресми статистикалық ақпарат зерделенді. Соның ішінде, Қазақстан өңірлері бойынша 2017-2019 жылдардағы көрсеткіштер талданды.

Зерттеу барысында Атырау қаласы тұрғындары арасында ТКШ кәсіпорындары қызметінің қоршаған ортаға әсері туралы пікірді анықтауға әлеуметтік сауалнама жүргізілді.

Зерттеу қорытындысы бойынша Атырау қаласының экологиялық жағдайын жақсарту жөніндегі іс-шаралар, ТКШ кәсіпорындары қызметінің экологиялық қауіпсіздікті қамтамасыз етудегі бағыттары ұсынылды.

Мақала «Экологиялық қауіпсіздікті қамтамасыз етудегі тұрғын үй-коммуналдық шаруашылықты дамытудың экономикалық тетігі (Атырау қаласы мысалында)» ғылыми жобасын жүзеге асыру үшін университетішілік қаржыландыру шеңберінде дайындалған.

Түйін сөздер: тұрғын үй-коммуналдық шаруашылығы, экологиялық қауіпсіздік, модернизация, қала шаруашылығы, экономикалық бағалау.

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АНАЛИЗ ДЕЯТЕЛЬНОСТИ ПРЕДПРИЯТИЙ ЖКХ Г. АТЫРАУ В ОБЕСПЕЧЕНИИ ЭКОЛОГИЧЕСКОЙ БЕЗОПАСНОСТИ

Аннотация. На состояние окружающей среды оказывают влияние различные сферы экономической деятельности, в том числе и жилищно-коммунальное хозяйство (далее ЖКХ). Проблемы функционирования инфраструктуры ЖКХ Республики Казахстан являются одним из приоритетных направлений в обеспечении экологической безопасности страны. В частности, проблемами деятельности сферы ЖКХ, являются действия по сбору (в том числе раздельному сбору), складированию, переработке коммунальных отходов, а также организация электро-, тепло-, газо- и водоснабжения населения, водоотведения, очистке сточных вод.

В статье проведен SWOT-анализ деятельности предприятий ЖКХ в обеспечении экологической безопасности г. Атырау. В работе синтезирована информация о предприятиях жилищно-коммунального хозяйства г. Атырау, в частности, изучена деятельность предприятий по электроснабжению, подаче газа, пара и воздушному кондиционированию, предприятий водоснабжения, канализационной системы, контроля над сбором и распределением отходов, стационарные источники выбросов загрязняющих веществ и объем их выбросов.

SWOT-анализ позволил оценить влияние деятельности предприятий ЖКХ на экологию г. Атырау, определив слабые и сильные стороны исследуемой проблемы. Вместе с тем, обозначены угрозы –финансовые кризисы, стихийные бедствия и производственные аварии, которые неизбежны в развитии отрасли. Однако, предприятия ЖКХ г. Атырау располагают достаточными возможностями по улучшению своей деятельности – проведению модернизации систем водоснабжения и водоотведения, строительство новой теплоэлектростанции с современным оборудованием по очистке выбросов, активизация среди населения раздельного сбора мусора, экономии электричества и воды и т.д.

В ходе исследования среди населения г. Атырау был проведен социологический опрос на определение мнения о влиянии деятельности предприятий ЖКХ на окружающую среду. Результаты опроса среди 500 горожан позволили отметить наиболее важные вопросы в решении проблем ЖКХ и их влиянии на экологическую обстановку региона – проблемы вывоза и разделения мусора, размещение бытовых и промышленных отходов, наличие открытых полей испарения и т.д.

По итогам исследования предложены мероприятия по улучшению экологической обстановки г. Атырау, направления деятельности предприятий ЖКХ в обеспечении экологической безопасности.

Статья подготовлена в рамках внутривузовского финансирования на реализацию научного проекта «Экономический механизм развития жилищно-коммунального хозяйства в обеспечении экологической безопасности (на примере г. Атырау)».

Ключевые слова: жилищно-коммунальное хозяйство, экологическая безопасность, модернизация, городское хозяйство, экономическая оценка.

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[www:nauka-nanrk.kz](http://www.nauka-nanrk.kz)

ISSN 2518-1467 (Online), ISSN 1991-3494 (Print)

<http://www.bulletin-science.kz/index.php/en/>

Редакторы *М.С. Ахметова, Д.С. Аленов, Р.Ж. Мрзабаева*
Верстка на компьютере *В.С. Зикирбаева*

Подписано в печать 12.06.2021.

Формат 60x881/8. Бумага офсетная. Печать – ризограф.

22, 25 п.л. Тираж 300. Заказ 3.