ҚАЗАҚСТАН РЕСПУБЛИКАСЫ БІЛІМ ЖӘНЕ ҒЫЛЫМ МИНИСТРЛІГІ
МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РЕСПУБЛИКИ КАЗАХСТАН

ӘЛ-ФАРАБИ АТЫНДАҒЫ ҚАЗАҚ ҰЛТТЫҚ УНИВЕРСИТЕТІ
КАЗАХСКИЙ НАЦИОНАЛЬНЫЙ УНИВЕРСИТЕТ ИМ. АЛЬ-ФАРАБИ

«ҚАЗАҚСТАН РЕСПУБЛИКАСЫНДАҒЫ ҚАЗІРГІ ЗАМАНДАҒЫ ТЕНДЕНЦИЯ МЕН ГЕОГРАФИЯЛЫҚ ҒЫЛЫМНЫҢ ДАМУЫ»

атты халықаралық ғылыми-практикалық конференция
М А Т Е Р И А Л Д А Р Ы

28 сәуір 2010 ж.

М А Т Е Р И А Л Ы
международной научно-практической конференции

«СОВРЕМЕННЫЕ ТЕНДЕНЦИИ И ЗАКОНОМЕРНОСТИ В РАЗВИТИИ ГЕОГРАФИЧЕСКОЙ НАУКИ В РЕСПУБЛИКЕ КАЗАХСТАН»

28 апреля 2010 г.

Алматы
«Қазақ университеті»
2010

СОДЕРЖАНИЕ

ПРИВЕТСТВЕННОЕ СЛОВО

ФИЗИЧЕСКАЯ ГЕОГРАФИЯ

ГЕОЭКОЛОГИЯ

ГЕОЭКОЛОГИЯ

M. Clarke, V. Salnikov, M. Karatayev

AIR POLLUTION IMPACTS ON HUMAN HEALTH: FOCUSING ON THE RUDNYI ALTAY INDUSTRIAL AREA

University of Nottingham, University Park, Nottingham NG7 2RD
al-Farabi Kazakh National University, Almaty, Kazakhstan

Introduction: The condition of the population's health depends on social-economical circumstance, sanitary and epidemiological situation, preventive public health measures and the ecological conditions of the territory. One of the main ecological factors increasing the population's morbidity and influencing its physical level of development, possibility of reproduction, liability to morbidity and life duration seems to be the high level of air pollution on the atmosphere (Tokmagambetova, 2007).

Between the population's health and the quality of atmosphere, they have a close connection. Dispersing harmful substance into the atmosphere creates a greater concentration of pollutions, striking on the first turn upper airways and other parts of human's organs. Inhaling polluted air into the windpipe and bronchial tubes affects alveoli, where the dirt will enter in the blood and lymph. Consequences on the people are extremely adverse (Seinfeld and Pandis, 1998).

Looking at the world organization of public health, they need to incorporate the correlated connection between the respiration diseases, cardiovascular system, allergy disease and air pollution suspended substances, nitrogen dioxide, sulphur dioxide, carbon dioxide phenol, floride hydrogen and lead (Brunekreef and Holgate, 2002; Poschl, 2005).

Pollution in Kazakhstan now threatens the health of thousands of citizens. In 21 of Kazakhstan's cities the air pollution is ten times the accepted safety levels. The World Health Organization states that more 100 thousand people of Kazakhstan die each year from causes directly attributable to air pollution (Cohen et al., 2004; Health Effects Institute, 2004).

Study region: Rudnyi Altay industrial area is historically well-established and associatively stabilized aggregation, man-made, natural and agricultural complex; characterize the ability to function the environment, to fulfill the definite natural, agricultural and geoecological function.

In organization structure, Rudnyi Altay industrial area consists from natural-resources (natural recourses and conditions, raw materials, affected geosystems, human), industry (architecture and industrial objects, transport, energy, technology and product) and spatial block (geopolitics and economic-geographical regulations conservation strategy, conception, rules, spatial-territory placement) (Nadyrov, 2008).

The Rudnyi Altay industrial region is located in eastern Kazakhstan. The region borders Russia and China. Rudnyi Altay's economy is based primarily on its natural resources, particularly nonferrous metallurgical resources. This region plays an important role in the economy of Kazakhstan. The total population of this region is 671 200, of whom 68 % are urban dwellers and 32 % rural. About 79 % of the population lives in the industrialized cities, which qualify as zones of ecological calamity. The majority of the Rudnyi Altay industrial region of population resides in areas around or near industrial centers, due to the job opportunities offered in these areas. According to national ecological standards, cities such as Ust-Kamenogorsk, Ridder, Zyryanovsk and Shemonaiha have critical environmental indicators (deep ecological changes in all natural systems). The region produces the most lead, zinc, gold, silver, sulphuric acid and also atomic

energy raw materials in the country.

The Rudnyi Altay industrial area is well-known just like West-Altai mountains (urbanized industry-mining) regions which includes Ust-Kamenogorsk industrial region, Ridder industrial region, Zyryanovsk industrial region, Shemonaiha industrial region, Glubokovsky industrial region and Irtysh River (Nadyrov, 2008; Chigarkin, 2006).

Ust-Kamenogrsk industrial area is an urbarized industry area which includes Ust-Kamenogrsk with suburbs, a powerful complex of the industrial enterprises rendering the extremely negative influence on a condition of an environment: Titan-magnesium combine, Ulba metallurgy factory, chemical-metallurgical and cement factories, thermal power station, lead-zinc combine. The level of ecological intensity is aggravated with steady ground inversions (Nadyrov, 2008; Chigarkin, 2006; Bayandinova, 2007).

Ridder industrial area is covered by Ridder and the mining enterprises of nonferrous metallurgy. A level of ecological intensity is critical. Factors of ecological destabilization are as follows: Ridder polymetallic combine and its structure of lead-zinc factory, mines, career, dead rock burrow. It is extremely high level of air pollution in the atmosphere. The intermountain hollow defines adverse climatic conditions for dispersion of air pollution (Chigarkin, 2006; Bayandinova, 2007).

Zyryanovsk industrial area is included with Zhyryanovsk city, the mining enterprises of nonferrous metallurgy. The greatest negative influence renders lead combine. The level of ecological intensity is critical. The cores pollution natural components: mines and deep career of open-cast mining of ore deposits (Chigarkin, 2006).

Glubokoe industrial area includes the Irtysh polymetallic combine (on reservation), the adjoining mining enterprises and the East Kazakhstan Copper-chemical combine. A level of ecological intensity is critical

Shemonaukh, the urbanized industrial mining enterprises, connects with extraction and processing of copper and zinc ores. Highly disturbed relief and bowels, environmental contamination industrial burrow. The level of ecological intensity is critical.

The Irtysh River is within the limits of Rudnyi Altay industrial area. Strong pollution of the river by industry and household from the cities also effects the Bukhtar, Ulba, Krasnoyask rivers (Chigarkin, 2006).

The Rudnyi Altay industrial area is characterized by the destabilized geoecological situation and remains a region with unresolved environmental problems.

Air quality: Monitoring of the atmospheric condition is conducted on stationary posts in 3 cities in region: Ridder, Ust-Kamenogorsk and Glubokoe (Bayandinova, 2007)

The main air pollutants are non-ferrous metals and mining industry, their share in total emissions is 69 %, enterprise distribution of electricity, gas and water – 22.4 %, transport and communications – 6.4 %, others – 2.2 % (Bayandinova, 2007; Data of Agency of Statistics, 2008).

Of the total amount of pollutants emitted substances (>160 tons) 81 % were gaseous and liquid substances, 19 %-solid. Of 130 tonnes of gaseous and liquid emissions. 54.8 % was sulfur dioxide, 20.4 %-for carbon monoxide, 14.5 %-for nitrogen dioxide, 10.3 %-for hydrocarbons (excluding volatile organic compounds) (Bayandinova, 2007; Data of Agency of Statistics, 2008).

The greatest contributors to air pollution of the Rudnyi Altay industrial area are Ust-Kamenogrsk (17 %), Ridder (17 %) and Glubokoe (16 %).

The list of polluting substances is established in view of volume and structure of emissions in an atmosphere and also results of pilot survey of air pollution in concrete settlement.

The basic criteria of quality are values of Maximum Admissible Concentration (MAC) of polluting substances in the air of the occupied places. The level of pollution on the atmosphere is estimated on size of a complex Index of Air Pollution (IAP5) which pays off on five substances with the greatest rating on maximum concentration limit values in view of their class of danger. Air pollution index is calculated as the sum of the average concentrations of substances for the period divided by maximum admissible concentration reduced to a single indicator (Salnikov, 2006):

$$IAP = \sum_{i=1}^{n} \left(\frac{q_{cp.i}}{MPC_{c.ci}} \right)^{C_i},$$

Where: $q_{cp.i}$ = Average for the month, season or year the concentration of i-th substance;
$MAC_{c.ci}$ = Daily average maximum admissible concentration of i-th substance;
C_i = The exponent, depending on the class of dangerous substance.

Table 1

Dynamics of change in the level of atmospheric pollution of Rudnyi Altay industrial area (IAPs) (Data of the Agency of Statistics of the East Kazakhstan Region Statistical Annual Report «East Kazakhstan 2004-2008»)

City, settlement	*IAP$_s$*					*Branch of industry, turning out influence of air pollution*
	2004	*2006*	*2005*	*2007*	*2008*	
Ust-Kamenogorsk	6.5	6.3	6.5	7.2	7.8	non-ferrous metallurgy, energy
Ridder	8.3	7.9	7.6	7.4	6.9	non-ferrous metallurgy, energy
Glubokoe	4.7	4.0	4.6	3.0	3.1	non-ferrous metallurgy

Table 2

Number of days and percentage in 2008 when the level of pollution of an atmosphere exceeds maximum-admissible is maximal-single concentration (Data of the Agency of Statistics of the East Kazakhstan Region Statistical Annual Report «East Kazakhstan 2004-2008»)

City, settlement	*Name of dirt, exceeding MAC*	*No. of days*	*Percentage*	*Maximum concentration*	
				mg m^3	*exceeded MAC*
Ust-Kamenogorsk	Suspension	153	43.8	2.000	4.0
	Sulphur dioxide	8	2.3	1.530	3.1
	Carbon dioxide	27	7.7	12.000	2.4
	Nitrogen dioxide	278	79.7	0.460	5.4
	Phenol	176	50.4	0.039	3.9
	Floride hydrogen	26	7.4	0.051	2.6
	On all impurity	303	86.8		
Ridder	Nitrogen dioxide	181	59.9		
	Phenol	1	0.3	0.170	2.0
	All of the dirt	181	59.9	0.011	1.1
Glubokoe	Suspension	2	0.6	0.900	1.8
	Nitrogen dioxide	136	45.0	0.220	2.6
	Phenol	37	12.3	0.028	2.8
	On all impurity	153	50.6		

Table 3

Emissions of air pollutants from stationary sources of pollution, thousand tons (Data of the Agency of Statistics of the East Kazakhstan Region Statistical Annual Report «East Kazakhstan 2004-2008»)

	2004	*2005*	*2006*	*2007*	*2008*
Ust-Kamenogorsk	96.3	71.1	72.8	70.6	65.2
Ridder	11.3	11.2	11.1	10.8	10.6
Glubokoe	3.7	3.9	3.9	4.3	4.2
Zyryanovsk	13.4	12.2	14.6	17.4	14.5
Shemonaiha	4.4	4.4	4.1	5.1	5.2
Total	129.1	102.8	106.5	108.2	99.7

Table 4

Emissions of air pollutants from stationary sources of pollution (solid), thousand tons (Data of the Agency of Statistics of the East Kazakhstan Region Statistical Annual Report «East Kazakhstan 2004-2008»)

	2004	*2005*	*2006*	*2007*	*2008*
Ust-Kamenogorsk	7.3	6.6	7.2	5.7	4.7
Ridder	2.0	2.1	1.9	2.0	2.3
Glubokoe	1.7	1.9	1.5	1.7	1.7
Zyryanovsk	6.9	6.6	7.8	8.9	6.9
Shemonaiha	1.8	1.9	1.7	2.5	2.6
Total	19.7	19.1	20.1	20.8	18.2

In all cities of the Rudnyi Altay industrial area, the concentration of MAC is above three and more substances.

The maintenance of polluting substances in the atmosphere of the cities of the Rudnyi Altay

industrial area remained high in 2008. Average and maximal values of harmful impurity in cities changed in greater limits, depending on the size of emissions of the industrial enterprises and also an arrangement of cities in various physical-geographical areas (Iskakov and Medeu, 2006).

The essential part of environmental contamination is connected with dust formation. In atmosphere venomous enrichments, mountain burrows and metallurgical manufactures act from technical waste and breeds from industrial plants. Calculations show that allocation of a dust from decomposition of waste which contains practically all toxic components of mountain-metallurgical manufactures Rudnyi Altay industrial area in a year makes 113 thousand tons. For all the period of mining manufacture in region, dust has exceeded 10 million tones, which means 1% from all volume of waste. Thus, proceeding from quantity of the extracted ores, the received concentrates and their metallurgical repartition, emissions in the atmosphere only last for 50 years which totals between 8 and 10 million tons.

Table 5

Emissions of air pollutants from stationary sources of pollution (gaseous and liquid), thousand tons (Data of the Agency of Statistics of the East Kazakhstan Region Statistical Annual Report «East Kazakhstan 2004-2008»)

	2004	*2005*	*2006*	*2007*	*2008*
Ust-Kamenogorsk	89.0	64.5	65.6	64.9	60.5
Ridder	9.3	9.1	9.2	8.8	8.3
Glubokoe	2.1	2.0	2.3	2.6	2.4
Zyryanovsk	6.5	5.6	6.8	8.5	7.7
Shemonaiha	2.6	2.5	2.4	2.7	2.6
Total	109.5	83.7	86.3	87.5	81.5

Average concentration of the weighed substances (dust) on cities of Rudnyi Altay industrial area has reached 1.2 MAC. Average concentration of the weighed substances in the cities of Ridder, Ust-Kamengorsk has reached 1.0–1.8 MAC. In Ust-Kamengorsk, the maximum from a single concentration of the weighed substances reached 4.0–4.8 MAC, in Glubokoe-exceeded 1 MAC.

Average concentration of sulfur dioxide in Ridder and Ust-Kamenogorsk was 1.0-1.8 MAC. In Ust-Kamenogorsk, it is noted that the maximal of single concentration sulphur dioxide equal 3.1 MAC (Iskakov and Medeu, 2006; Data of Agency of Statistics, 2008).

Average concentration of sulfates has made 0.006 mg m^{-3} (MAC is not present).

Maximal from single concentration carbon dioxide in Ust-Kamenogorsk was more than 1.0–2.4 MAC.

Average concentration of nitrogen dioxide has reached 1.1 MAC. Average concentration of nitrogen dioxide in the cities of Ridder, Ust-Kamenogorsk and Glubokoe was within the limits of 1.0–1.7 MAC. In Ust-Kamenogorsk, it was observed maximal of single concentration nitrogen dioxide equal 5.4 MAC, in the city of Ridder and Glubokoe-within the limits of 2.0–2.9 MAC.

Average concentration of phenol has reached 1.2 MAC. Average concentration of phenol in Ridder holds at 1.7 MAC, in Ust-Kamenogorsk – 1.0 MAC. In Ust-Kamenogorsk, a maximal of single concentration of phenol equal to 3.9 MAC was observed, in the city of Ridder – 1.1–2.0 MAC.

Average concentration of formaldehyde has reached 2.7 MAC. Average concentration of formaldehyde in Ust-Kamenogorsk – 2.0 MAC.

In Ust-Kamenogorsk, the average maintenance of fluoric hydrogen was within the limits of norm. In Ust-Kamenogorsk, maximal from single concentration of fluoric hydrogen has made 2.6 MAC.

Maximal from single concentration of chloride hydrogen in Ust-Kamenogorsk reached 1.9 MAC.

In Ridder, Ust-Kamenogorsk and Glubokoe, the average level of air pollution by arsenic was within the limits of admissible standard.

In 2008, comparison with 2007, in the cities of Ridder and Ust-Kamenogorsk, the level of pollution AB considerably did not change, in Glubokoe it decreased.

In 2008, comparison with 2007, in Ridder, Ust-Kamenogorsk and Glubokoe, it is noted that the level of pollution is decreased.

The main air polluters are the enterprises of nonferrous metallurgy and the mining industry,

their relative density in total amount of emissions of polluting substances makes 69 %, the enterprises of distribution of the electric power, gas and water – 22.4 %, transport and communication – 6.4 %, other – 2.2 %.

Table 6

Pollution of air pool of cities of Rudnyi Altay industrial area in 2008 (Data of the Agency of Statistics of the East Kazakhstan Region Statistical Annual Report «East Kazakhstan 2004-2008»)

City, settlement	Name of dirt, exceeding MAC	Average concentration		Maximum concentration		Periodicity of concentration over MAC (%)
		mg m^3	exceeded MAC	mg m^3	exceeded MAC	
Ust-Kamenogorsk	Suspension	0.150	1.0	2.000	4.0	6.0
	Sulphur dioxide	0.048	1.0	1.530	3.1	0.4
	Carbon dioxide	0.800		12.000	2.4	1.0
	Nitrogen dioxide	0.060	1.5	0.460	5.4	23.0
	Phenol	0.003	1.0	0.039	3.9	6.0
	Chloride	0.004		0.190	1.9	0.1
	Formaldehyde	0.006	2.0	0.056	1.6	0.1
	Hydrogen fluoride	0.002		0.051	2.6	1.0
Ridder	Suspension	0.150	1.0	0.300		
	Sulphur dioxide	0.092	1.8	0.243		
	Nitrogen dioxide	0.070	1.7	0.170	2.0	21.0
	Phenol	0.005	1.7	0.011	1.1	0.1
Glubokoe	Suspension	0.050		0.900	1.8	0.3
	Nitrogen dioxide	0.060	1.5	0.220	2.6	24.0
	Phenol	0.002		0.028	2.8	4.0

(>160 thousand tons) 81 % have made gaseous and liquid substances of total amount of the thrown out substances of polluting substances, 19 %-firm. In composition of 130 thousand tons of gaseous and liquid emissions of 54.8 and 20.4 %-on carbon oxide, 14.5 %-on nitrogen dioxide, 10.3 %-on hydrocarbons (without volatile organic connections) are necessary on sulphur dioxide (Bayandinova, 2007; Iskakov and Medeu, 2006; Data of Agency of Statistics, 2008).

The greatest contribution to air pollution of Rudnyi Altay industrial area was Ust-Kamenogorsk (47 %), Ridder (17 %) and settlement of Glubokoe (16 %).

Ust-Kamenogorsk is the regional center characterized by presence of a large number of technical pollution among which it is possible to distinguish the industrial enterprises, transport, gasoline stations, the enterprises of food branch, private inhabited sector. Features of city are the physical-geographical conditions of its arrangement which do not promote the dispersion of polluting substances and also concentration of industrial productions in city boundaries (Nadyrov, 2008; Chigarkin, 2006).

Ridder is considered among the most polluted cities of Kazakhstan. In 2007, emissions have made 10.8 thousand tons. The physical-geographical position and a city climate promote that polluting impurity from a lead factory act in city at northeast winds, from the enterprises of a zinc factory, thermal power station at northwest, western directions of a wind. At the developments of stagnation, all polluting impurity remains in city since the city is located in a hollow (Nadyrov, 2008; Chigarkin, 2006).

The level of air pollution in settlement Glubokoe remains very high. A high level of organic pollutants and also sulfur dioxide and nitrogen is caused by character of dispersion of harmful impurities from the main industry of Ust-Kamengorsk in the Irtysh river valley in a direction prevailing with the wind. Vertical and horizontal wind vectors carry pollutants greater distances (some hundreds in km).

The ten years of analyzing emissions of polluting substances from stationary sources in an atmosphere of Rudnyi Altay industrial area shows gradual increase in quantity of emissions from 1997-2001 and decrease in emissions 2002-2008 and the maximal capacities of the enterprises of nonferrous metallurgy century accordingly quantity of the emissions defining intensity of environmental contamination have been reached in the beginning of 20th century has reached the

maximal sizes. With the approach of industrial recession, decrease in investment activity in the middle and the end of 20th century, the volume of emissions has decreased 2.8 times comparing in 1990 Economic growth of industry in 2000 has led to increase in emissions in an atmosphere.

In basic volume structure of polluting substances in the Rudnyi Altay industrial area is 4th place with emissions of 162.7 thousand tons, exceeding Karaganda (1415.4 thousand tons.), Pavlodar (556.8 thousand tons) and Aktyubinsk (168.2 thousand tons).

A significant source of air pollution in the Rudnyi Altay industrial area is motor transport. By virtue of constructive imperfection and lacks of operation, transport emits into the atmosphere more than 200 chemical compounds. Considering motor vehicles as a whole in the region 62 % use gasoline, 36 %-diesel and only 0.2 %-the most ecologically safe natural gas.

At the moment, cars use gasoline, lead, chlorine, bromine and diesel engines, causing a significant amount of soot. And practically all types of transport emits into the atmosphere cancerogenic hydrocarbons causing development of cancer.

From 1995-2008 the pollutions have considerably increased emissions from motor transport: On 56 thousand tons a year or 41.7 %. The fact shows the increase quantity of vehicles.

In that case, fulfilling gases of cars act in the bottom layer of an atmosphere and process of their dispersion considerably differs from process of dispersion of the high stationary sources, harmful substances are practically in a zone of respiration on the human. Therefore the motor transport should be carried to a category of the most dangerous sources of pollution in the atmosphere.

Health effects: To retrace dynamics of a natural growth of the population for last 10 years from 1996, the death rate exceeds birth rate. And only in 2008, this picture has changed in the positive way (Data of Information Medical Center of the East Kazakhstan Region, 2008). In recent years, vital statistics have continued to deteriorate at a rapid rate due to multiple factors, including the high level of air pollution. For example, birth rates decreased from 18.9 in 2001 to 13.9 in 2008 (down by 24.1 %). Mortality rate increased from 9.8 in 2001 to 12.3 (up by 24.7 %). The incidence rates of communicable and non-communicable diseases have increased. Natural population growth has dropped from 11.8 % in 2001 to 4.6 % in 2008 (or by 3.5 times). Deterioration of various health factors have been mainly caused by both natural and occupational environmental influences.

The structure analysis and level of disease for last years shows direct dependence on a degree of influence of a complex of harmful polluting substances, adverse meteorological conditions and of some other factors rendering combined influence on health of the population. It leads to high level of disease (Bayandinova, 2007; Data of Information Medical Center of the East Kazakhstan Region, 2008).

In the statistical data of information center-medical of East Kazakhstan, on region, growth of respiration disease,

Table 7

Average population, thousand people (Data of Information Medical Center of the East Kazakhstan Region, 2008)

	2004	*2005*	*2006*	*2007*	*2008*
Average population, thousand people					
Ust-Kamenogorsk	303.6	300.8	299.1	298.5	298.5
Ridder	61.7	61.1	60.4	59.7	59.0
Glubokoe	65.9	65.9	65.7	65.5	65.4
Zyryanovsk	87.2	86.2	85.3	84.5	83.6
Shemonaiha	52.3	51.2	50.4	49.8	49.2
Total	570.7	565.2	560.9	558.0	555.7
Natural increase (decrease) of the population, people					
Ust-Kamenogorsk	-693.0	-778.0	-275.0	251.0	484.0
Ridder	-637.0	-674.0	-651.0	-722.0	-476.0
Glubokoe	-602.0	-578.0	-559.0	-547.0	-398.0
Zyryanovsk	-685.0	-712.0	-739.0	-664.0	-596.0
Shemonaiha	-387.0	-344.0	-373.0	-329.0	-246.0

Table 8

The incidence of tumors per 100 thousand people (Data of the Agency of Statistics of the East Kazakhstan Region Statistical Annual Report «East Kazakhstan 2004-2008»)

	2004	*2005*	*2006*	*2007*	*2008*
Ust-Kamenogorsk	406.1	418.2	401.7	378.3	382.3
Ridder	384.1	388.1	369.8	414.0	385.5
Glubokoe	388.5	395.8	352.1	338.9	393.9
Zyryanovsk	432.3	424.8	362.7	314.9	325.4
Shemonaiha	414.9	359.3	373.8	334.0	360.3
Total	2025.9	1986.2	1860.1	1780.1	1847.4

allergic displays of various degrees, skin disease and system of blood circulation is marked. Of the registered diseases from a year in a year in region the largest percentage is respiration diseases, the region ranks first among areas of Kazakhstan; the regional parameter of the given disease has exceeded a republican parameter on 87% (Iskakov and Medeu, 2006).

To monitor the process as there is a connection between the phenomena of a correlation analysis of the region: To calculate the correlation coefficients between the level of incidence of malignant tumors and the amount of emissions from stationary sources of Rudnyi Altay industrial area.

Higher morbidity rates have beer linked to increasing incidences of conditions such as tumors, respiratory disease, nervous system and sensory organ disturbances, gastrointestinal disease and circulatory disease. Poor air quality has been cited as a factor in these conditions.

Pollution has been found to have a chronically damaging impact on the health of the general population of Kazakhstan (tumors, cancer, respiratory diseases, damage of organs and systems, reduction of total resistance and cardio-vascular diseases).

Table 9

Disease of the population East Kazakhstan region on classes of illnesses (Registered in the treatment-and-prophylactic organizations (Data of Information Medical Center of the East Kazakhstan Region, 2008; Data of Regional Information Center for Environmental Monitoring. 2008)

Disease	*Total*	*Adult*	*Teenager*	*Children*
All disease	66835.8	19110.8	90800.0	123396.1
Tumors	1046.1	1383.9	99.1	104.1
Disease on blood and blood-forming organ	1467.2	704.0	2487.5	3953.7
Endocrine diseases	995.5	722.3	1969.9	1690.4
Blood circulation system disease	1915.9	2307.1	1330.2	661.5
Respiration disease	27359.8	13434.5	40351.3	74533.9
Digestion disease	3019.2	1904.8	4895.7	6526.4
Skin disease	4822.3	3899.7	6464.8	7697.4
Congenital abnor mal, deformation and chromosome damages	91.8	25.3	176.2	310.1
Traumas and poisoning	4963.0	4760.9	8657.2	4524.5

Health status of the populations is negatively affected by the unfavorable environmental situation, emissions in general and technogenic hotspots.

As seen from the Table, there is a significant strong direct correlation between the incidence of malignant tumors and the amount of emissions from stationary sources of Rudnyi Altay industrial area (correlation coefficient R = 0.6). In this work was not considered part of emissions of the chemicals, but considered, does aggregate state of substances that make up the emissions at the level of morbidity. Reliably very high positive correlation between the incidence of malignant neoplasms of the population and the number of emissions of substances in gaseous and liquid state (R = 0.6) and a weak correlation with the solids (R = –0.2). Slow connection with the incidence of solids due to the low percentage of emissions. The bulk of the emissions accounted for gaseous and liquid substances. The coefficients of correlation made it possible to assess the direction and strength of the relationship between rates of morbidity and the level of risk to health.

The model indicates the incidence of malignant tumors and the amount of emissions from stationary sources of Rudnyi Altay industrial area $y = 5.625x + 1519$, $R^2 = 0.671$, y – the value of malignant tumors per 100000 population; x – emissions from stationary sources, thousands ton per year.

The model indicates the incidence of malignant tumors and the amount of emissions (gaseous and liquid) from stationary sources of Rudnyi Altay industrial area $y = 5.458x + 1543$, $R^2 = 0.651$, y – the value of malignant tumors per 100000 population; x – emissions from stationary sources, thousands ton per year.

The model relates the incidence of malignant tumors and the amount of emissions (solid) from stationary sources of Rudnyi Altay industrial area $y = 2554.8 – 26.6x$, $R^2 = 0.3$, y – the value

of malignant tumors per 100000 population; x – emissions from stationary sources, thousands ton per year.

Selection on the influence of suspension particles in the air surface on the people's population condition.

Dusty atmosphere allow bad ultraviolet radiation, possessing bacterial properties and inhibiting auto purification atmosphere. Dust clogs mucous membrane respiration system and eyes, irritates covering of person and appears to carrier of bacteria and virus. Carbon-black, component dust and present itself nearly pure carbon atmosphere, increasing readily morbidity (Localization malignant cancer of morbidity respiration in Rudnyi Altay industrial area occupies first place) (Bradl, 2005; Yang and Omaye Stanley, 2009).

The Rudnyi Altay industrial area occupies second place in the republic on the morbidity malignant tumors after the Karaganda region in respiration diseases after Almaty. This fact is shown in unfavorable ecological situation in the region; especially as concerning death from malignant tumors, the region ranks first in the country.

Conclusion:

1. Industrial enterprises have an adverse impact on air quality in the region.
2. The main sources of air pollution are non-ferrous metallurgy.
3. Established stable air pollution in the region includes a broad spectrum of chemical compounds, such as: Balanced, nitrogen dioxide and sulfur dioxide the levels of these pollutants in the atmosphere exceed maximum admissible standards by a factor of 1.5–2 times.
4. In 2008, the level of air pollution in the region was high ($IAP_5 = 7–13$).
5. It was demonstrated that a causal relationship between the amounts of emissions from malignant diseases exists.
6. The influence of air pollution on the status of population's health really depends on ecological situations, same as to other factors, conditional territory spatial organization individual potential architectural, meteorological and others especially of territory areas. As a result, in a concern of improving ecological scenery and the quality of the population people's condition must be solved while calculating the effect of specific factors.

Materials and methods: To reveal the quantitative relationship between the disease of malignant tumors and the change in the quantity of emissions was carried out regression analysis and a regression model was constructed.

Database: literature resources, planning and cartographic material, statistical reporting, archival materials, materials of geo-ecological, landscape, soil and other studies, field studies, analysis of the natural landscape differentiation, the analysis of ecological and resource potential of the territory of the study, assessment of landscape resistance to anthropogenic influences analysis of the territorial structure of nature.

Results: The cities of Rudnyi Altay industrial area are a typical example of the urban environment where air pollution is caused by industrial, power and transportation sources. Results demonstrate that current emissions trends create an enormous health burden in three of the largest urban zones in Rudnyi Altay industrial area. Statistics data show that air contamination is quite high according to the national standards accepted in Kazakhstan; it is main cause of high rates of diseases in the human population. The nonferrous metallurgy and industrial dust are the main sources of air pollution in Rudnyi Altay industrial area.

The environmental conditions impact the human population living in Rudnyi Altay industrial area. The human health also depends on economical and social factors, economic development and quality of soil, quality of water. The health of the population of Rudnyi Altay industrial area is equally dependent on all these indicators.

Discussion: Today, with a more open society, awareness about health risks may further increase the emigration from the region. Such uncontrolled emigration has already started in Rudnyi Altay industrial area during the economic meltdown period. There is high concern among the population about ecosystem health and the connections to the human health, especially population living in cities monopolized by the industry.

Air-pollution-related health effects can be reduced through policies that curb emissions, many of which would also have long-term benefits through mitigated climate change. Among measures that can be undertaken to achieve these reductions is the use technology in nonferrous metallurgy, improved public transportation systems, and programs to increase public awareness. Results from this research indicate that even modest policies aimed at mitigating air pollution can provide a broad range of immediate benefits on public health.

1. Chigarkin A.V. Geoecology of Kazakhstan. – Almaty, 2006. – 310 p.
2. Salnikov V.G. Ecological climatic potential of Kazakhstan. – Almaty, 2006. – 263 p..
3. Iskakov N.A., Medeu A.R. Environment and Ecology. – Almaty, 2006. – 518 p..
4. Nadyrov S.M.Spatial organization of the territory and the resettlement of the population of the Republic of Kazakhstan. – Almaty, 2008. – 326 p.
5. Bayandinova S.M. Technogenic conditionality of geosystems East Kazakhstan. – Almaty, 2005. – 185 p.
6. Bradl H.B. Heavy Metals in the Environment: Origin, Interaction and Remediation. – Elsevier: Amsterdam Press, 2005. – 120 p.
7. Brunekreef B., Holgate S.T. Air pollution and health. – Lancet, 2002. – 1233 p.
8. Cohen A.J., Anderson H.R., Ostro B., Pandey K.D., Krzyzanowski M. et al. Mortality Impacts of Urban Air Pollution. In: Comparative Quantification of Health Risks: Global and Regional Burden of Disease Due to Selected Major Risk Factors, Ezzati, M., A.D. Lopez, A. Rodgers and C.U.J.L. Murray (Eds.), Vol. 2, World Health Organization. – Geneva, 2002. – 358 p.
9. Seinfeld J.H., Pandis S.N. Atmospheric Chemistry and Physics // John Wiley and Sons. – New York, 1998. – 1326 p.
10. Tokmagambetova R.Y. Effect of environmental conditions on health Akmola region-Hydrometeorology and ecology. – Almaty, 2007. – 560 p.
11. Yang W., Omaye T. StanleyAir pollutants, oxidative stress and human health. Mutat. Res. / Genet. Toxicol. Environ. – Mutagenes, 2009. – 674 p.
12. Data of Agency of Statistics, 2008. Environmental protection and sustainable development of Kazakhstan. – Almaty, 1990–2008.
13. Data of Information Medical Center of the East Kazakhstan Region, 2008. – Ust-Kamenogorsk, 2008.
14. Data of Regional Information Center for Environmental Monitoring, 2008. – Ust-Kamenogorsk, 2008.
15. Data of the Agency of Statistics of the East Kazakhstan Region Statistical Compilation «East Kazakhstan 2004-2008».
16. Health Effects Institute. Health effects of outdoor air pollution in developing countries of Asia: A literature review. Special Report 15, 2004.

М.С. Панин, М.И. Панина

ЗАПАСЫ ПОДЗЕМНЫХ ВОД КАЗАХСТАНА И ИХ КАЧЕСТВО

Семипалатинский государственный педагогический институт, г. Семей

Человечество – главный потребитель воды. Общий объем гидросферы составляет 1,5 млрд. км^3. Гидросфера – это единая непрерывная оболочка Земли, образованная совокупностью всех ее вод: материковых (подземных, почвенных, поверхностных, содержащихся в ледниках), океанических и атмосферных. Все воды Земли едины, все они участвуют в постоянно действующем круговороте, движущие силы которого – солнечная энергия, сила тяжести, энергия земных недр.

Почти вся вода сосредоточена в океанах и морях (96,5 %), в ледниках (1,74 %), в подземных водоносных горизонтах (1,7 %), в подземных льдах (0,02 %) и лишь незначительная ее часть (около 0,02 %) приходится на поверхностные воды суши – реки, озера, болота, водохранилища.

На долю пресной воды в мировых ее запасах приходится 2,53 % (35 млн. км^3), это более 8 млн. м^3 на каждого жителя земли, причем более $^2/_3$ ее хранится в ледниках и 30 % – в водоносных слоях под землей и лишь 0,006 % в руслах рек.