

CURRENT ECOLOGICAL SITUATION IN THE SAKHA REPUBLIC (YAKUTIA): ASPECTS OF NUCLEAR POLLUTION

Vanda IGNATIEVA

In spite of increasing public and national interest in problems related to environmental protection and ecology, these problems remain serious in the Sakha Republic. Recently, the detrimental effect of ecological and environmental pollution on human genes - the development of mutant and cancerous changes in the genetic elements of cells - has become a serious concern. According to the data of the Sakha Republic (Yakutia) Ministry of Health, the ratio of sick people in the population is increasing and the potential of a person to be healthy is decreasing¹. It is certain that these changes will cause a further decline in the health of indigenous peoples in Yakutia.

According to experts, the radioactivity levels in Yakutia can be attributed to a number of environmental factors that have directly or indirectly influenced the health of the republic's residents. It is no secret that there are sources of radiation, other than natural sources, that has been created artificially. Radioactive pollution of the environment (air, water, soil) by radio nuclides takes place when the level of radiation exceeds admissible levels as a result of nuclear weapon tests in the atmosphere, under the ground, or under water, as well as due to radiation disasters and accidents. Radiation enters the human organism mainly through the air, water and the soil. Radiation in the soil enters the human system through plants and animals consumed as food².

It is known that from 1974 to 1987 twelve underground nuclear explosions were carried-out in the Yakutia territory (Bulunskiy, Verkhneviluiskiy, Kobyaiskiy and Mirninskiy Uluses = Districts), and some of these explosions produced nuclear waste by accident. Conclusion of the Russian researchers from the scientific production association, V.G. Khloponin Radiation Institute (Saint-Petersburg) shows the scales of the radiation pollution.

1. Plutonium-239 and 240 content in the soil sample, taken of the "trace" of the

¹ Vliyaniye ekologicheskikh faktorov na zdorovie naseleniya // Gosudarstvenniy doklad o sostoyanii okruzhayuschei sredy Respubliki Sakha (Yakutia) v 1997 [Influence of ecological factors on the population health // State report about state of environment of the Sakha Republic (Yakutia) in 1997] - Yakutsk, 1998. - P. 85-88.

² Vrednyye khimicheskie veshchestva. Radioaktivnye veshchestva: spravochnik. [Dangerous chemical substances. Radioactive substances: reference book] - L., 1990; Buldakov L.A. Radioaktivnye veshchestva i chelovek. - M., 1990.

underground nuclear explosion “Kraton - 3” and those in the 30 kilometer zone of the Chernobyl AES are similar;

2. Measurement of plutonium-239 and 240 in soils from the “Crystal” object make it possible to classify it to areas polluted by plutonium, analogue to Southern Australian region, where nuclear tests were carried out by Great Britain from 1955 to 1963.³

At this point, some climatic peculiarities of the Sakha Republic, dependent on its physical and geographical position should be noted. Yakutia natural landscapes (taiga, partially-wooded tundra districts, tundra and arctic desert) are characterized by low stability; i.e., the processes of self-cleaning and self-restoration takes place very slowly. This is due to the climate, which is sharply continental and remarkable due to long winters and short summers. Maximum differences in the average temperature in the coldest and the hottest month are between 70 - 75 °C. The minimum temperature (in the of the eastern mountain systems - in hollows it is up to 70 °C) and these temperatures continue for 6.5 to 9 months a year. In this respect, the Sakha Republic has no analogy in the northern hemisphere. Almost all Yakutia continental area is a zone of solid permafrost, limited by a zone of intermittent dissemination only in the far southwest. The frozen layer is 300-400m deep, and in the basin of the Vilui River, it is 1500m deep. It is the largest frozen area of rocks in the world. These features help decrease the speed of biological and chemical transformations and correspondingly, there is greater danger of radiation pollution in Yakutia. In this territory, the effect of most artificial radio nuclides is prolonged.

In addition to the underground nuclear explosions mentioned above, atmospheric tests of nuclear weapon in the USSR conducted from 1955 to 1962 in the New Land with calculation of “wind rose” played a significant role in the rise of natural background radiation in most parts of Yakutia. Maximum radioactive fallout from these tests occurred in two areas, the Kara Sea, and between two Yakutia towns, Yakutsk and Verkhoyansk. The effect of these tests on the population of the republic can only be guessed by the intensity of the nuclear testing program. For example, from 1958 to 1962 a total of 86 atmospheric and underwater nuclear explosions have been conducted in this area that exceeds 90 MT. According to radiologists’ no other nuclear test ground has such a huge loading. For comparison: total power of 259 explosions, conducted from 1949 to 1974 by the USA, Great Britain and France is ninety-three MT.⁴

It is significant that there are no indications in the scientific literature of a direct connection between the current health status of the republic’s residents and radioactive pollution, even though scientists have conclusively demonstrated a relationship between

³ Burtsev I.S., Kolodeznikova E.N. Radiatsionnaya obstanovka v almazonosnykh rayonakh Yakutii [Radiation situation in diamond mining districts in Yakutia] - Yakutsk, 1997. - P. 7.

⁴ Chomchoev A.I. Obzor atmosferynykh, podzemnykh yadernykh vzryvov v mirnykh, voennykh tselyakh i ikh vliyaniye na okruzhayushchyu sredu // Radiatsionnoye zagryazneniye territorii Respubliki Sakha (Yakutia): problemy radiatsionnoi bezopasnosti [Review of atmospheric, underground nuclear explosions for the peaceful, military purposes and their influence on the environment // Radiation pollution in the Sakha Republic (Yakutia): problems of radiation security] - Yakutsk, 1993. - P. 25.

radioactive fallout and the migration of biologically active radio-nuclides (strontium-90 and caesium-137) and their inclusion in the food of some members of the Yakutia population. The medical scientists of the republic have no doubt that radiation pollution is on reason for harmful mutations in humans. Ecological problems related to the atmosphere are particularly significant in this respect, because various chemical elements in the air are more readily absorbed during breathing. It is no accident that the Sakha Republic (Yakutia) and its neighboring areas of Chukchee Autonomous District, Kamchatka, Sakhalin, Magadan regions and Khabarovsk Krai are among the fifteen Russian regions with the highest rates of respiratory disease.⁵ Moreover, according to standardized indices of morbidity, Yakutia people show a higher incidence of malignant tumors and diseases of endocrine and immune systems, not only in radiation danger zones, but also in the republic as a whole.

A critical indicator of negative environmental influences on man is the quality of the genetic pool. Infant mortality and life expectancy are two important demographic indices by which the physical health of a population is judged.

According to statistics, in the Sakha Republic, there is a declining trend of mortality during the first year of life. However, a rate of 5-9 pro mils is very high compared to modern international standards. From the figure it can be seen that average Russian infant mortality rate from 1990 to 1996 fluctuated between 17.2 and 18.6 pro mil per 1000 newborn children. The average infant mortality rate in the Sakha republic was between 19.1 and 22.2 pro mil. These infant mortality rates exceed the standards adopted by the World Health Organization by a factor of 2.2 to 3.5, placing Russia and Yakutia at the bottom of the list of countries with high infant mortality. Many exogenous etiological reasons can be observed in the pattern of infant mortality in the Yakutia republic. These are complications in the neonatal and post-natal periods (45.6 %), inborn anomalies (24, 0 %): and respiratory diseases (11.4 %), among others. From 1980 to 1990 the frequency of birth defects with high possibility of death increased by 3.5 times.

According to data of the National Committee on Statistics of the Sakha Republic (Yakutia), from 1990 to 1994, life expectancy in the republic falls from 66.9 to 62.2 years. But since 1995 it began to increase and in 1997 it was 64.6 years (59.2 years for men and 70.9 for women), which is 2-3 years lower than the Russian average, and as much as 7-14 years lower than in Europe, the USA and Japan. Difference in the average life expectancy of women and men in Yakutia is 11.7 years (in Russia - 12.0 years), which is also higher than the standards of the World Health Organization, where this difference is approximately three years.⁶

⁵ *Ecologia i zdorovie naselenia // Reformirovanie Rossii: mify i real'nost'* [Ecology and the population's health] - M., 1994. - P. 341.

⁶ Ignatieva V.B. *Naselenie Respubliki Sakha (Yakutia): dinamika sovremennykh demograficheskikh processov // Etnosocial'noe razvitie Respubliki Sakha (Yakutia): potential, tendensii, perspektivy.* [The Sakha Republic (Yakutia) population: dynamics of modern demographic processes // Ethnosocial development of the Sakha Republic (Yakutia): potential, tendencies, perspectives] - Novosibirsk, 2000. - P. 27-28.

Thus, infant mortality rates and life expectancy of Yakutia population are not comparable to standards of the economically developed countries and highlight the serious problems, including ecological ones, which exist in the republic. According to workers of the Health Ministry of the Sakha Republic (Yakutia), the absence of registration and records of diseases, it is not possible to ascertain the spread and dynamics etiological pathogenesis related to radiation and toxic products.

According to medical and ecological researches, special features of settlement, way of life and diet of Yakutia indigenous population, such as the high quantity of vegetable and animal origins can be factors promoting the penetration of radio-nuclides (strontium, polonium) into the food chain. Another channel of penetration of radio-active substances into humans might be drinking water, as residents of the country-side mainly use lake water, lake bed sedimentations have ideal conditions for the accumulation of radio-nuclides and other toxins that fall as rain and snow, or are washed off from the polluted surface of the earth.

Board for Liquidation of Radiation Influence (BLRI), attached to the Emergency National Committee of the SR (Y), was established in 1997, and it is subordinate to both the Ministry of the Russian Federation of Atomic Industry and the Sakha Republic (Yakutia) government. This organization has done a number of studies: they researched radio-nuclides composition, their chemical forms, quality in soil and plant, trees bark, water, the air distribution, spread in river nets, design of motion and fall of radio-active clouds from objects. They also investigated modern geological and geographic conditions in deposits, their connection with nuclear explosions, radio-nuclides quantity and forms in oil, gas and water from the operating wells, and also the influence of nuclear explosions on seismic situations. Projects were undertaken to rehabilitate radioactive and polluted areas in Yakutia.

According to official estimates, today the total area polluted by underground explosions is more than 115 hectares. Most of this area is polluted by radioactive wastes, which need to be buried. Situation is worsened by the fact that there are no legal customers or executors of nuclear explosions and their legal successors do not recognize any responsibility, and consequently, they do not take measures to liquidate products of accidents. As recently as January 1999 an agreement on ecological rehabilitation of nuclear explosions in Yakutia was conducted between the Sakha Republic government, the Russian Federation Atomic Industry Ministry and joint-stock company "ALROSA". Today these projects are carried out under the Federal program "Nuclear and radiation security of Russia".

Sources of radioactive influence on the population also include open surface mining works - shafts, adits, channels and wells, kept open in Yakutia area after exploring for uranium deposits. Their existence was made known only in 1994, forty years after the work was carried out. Meanwhile, in Aldansky ulus alone more than one million tons of uranium ore was extracted from fifteen mines, is. According to experts, because high

isotope content has been found in moss samples near brooks in Central Aldan, indicative of the migration of radio-nuclides, it is necessary to find out if there are other, similar places to accurately assess their total number, their current condition and their effect on the ecology; It should be noted that simultaneous extraction of radioactive minerals during industrial mining of tin, gold, silver and molybdenum, lead to problems of re-cultivation of soil contaminated with uranium, particularly, in Ust-Yansky ulus. Thus, in accordance with “ Criteria of valuation of ecological situation of areas for revealing zones of ecological emergencies and zones of ecological disasters ”, some parts of deposits in Yakutia territory can be described as an ecological disaster zones, and other parts - as zones with an emergency ecological situation.⁷

According to a report of the Emergency Ministry of the Sakha Republic (Yakutia), the use of radioisotope thermoelectric generators (RITEG), intended to provide energy for running navigation equipments (radio-lighthouses, navigation signs) has not been decided. There are 75 such RITEGs within the Sakha Republic borders, on the seacoasts and islands of the Arctic seas along the Northern Sea Route. Since mid 90s, due to the establishment of satellite navigation systems and the lack of financing for maintenance, this network of navigation equipment has lost its function and has become irrelevant. As a result, there have been several cases of non-sanctioned opening of RITEGs and offenders have been exposed to radiation, resulting in burns. To the experts' opinions, all RITEGs have exceeded service life, and 41 of 75 RITEGs need immediate utilization.

In 2002-2001 an inspection of twenty-six RITEGs along the North Sea Route was conducted. These inspections revealed the following findings:

1. Loss of control in more than 25 sources of the ionized radiation.
2. Ten accidents caused by natural disasters such as landslips and crashing down of a shore.
3. Two RITEGs, each weighing 500kg has sunk in the Ust-Yansky coast.
4. Sections of RITEGs on the Preobrazhenie and Begichev islands are under flood threat. The installations of other section are in breach of sanitary rules and rules on radiation security during operation.
5. There are nine RITEGs on the Saint Nose cape, of which the biological and physical states are unknown.

More than 80% of RITEGs in Yakutia have exceeded service life and according to the Russian Federation's legislations, they should be classified as radioactive wastes and

⁷ Kriterii otsenki ekologicheskoi obstanovki territoriy dlya viyavleniya zon chrezvychainoi ekologicheskoi situatsii i zon ekologicheskogo bedstvia Ministerstva okhrany okruzhayuscei sredy i prirodnykh resursov Rossiyskoi Federatsii [Criteria of valuation of ecological situation of territories for discovery of emergency ecological situation and zones of ecological distress of the Ministry of Nature Prevention and Natural Resources of the Russian Federation] - M., 1992.

brought to specialized posts for storage across the republic.⁸ This is the duty of the operating organizations, and in this case, it the federal duty, and consequently, all works must be organized and financed by the federal center. However, neither the Defense Ministry of the Russian Federation, nor the Transport Ministry of the Russian Federation has acted on this problem. In 2003, all 75 RITEGs have to be classified as radioactive wastes. If they are not disposed, they become a temporary repository of radioactive waste in the open air and a real threat to the environment and people.⁹

Because the seacoast of the Arctic is the traditional dwelling, as well as the hunting and fishing area for the minority indigenous peoples of the North, the problem of the emergency ecological situation along the Northern Sea Route was discussed in sessions of the Control Committee of the Sakha Republic National Congress (Il Tumen). Deputies of the Yakut Parliament addressed the Russian Transport Ministry and requested them to do everything possible to dispose of radioisotope generators that are in a derelict state.

The radiation security of Yakutia population dictates needs of the vitally important to train specialists on radiation genetics, radio-geochemistry, radiochemical analysis and radioecology. This will make it possible to carry out independent scientific research and examine areas contaminated by radiation pollution, as well as to objectively evaluate their influence on the environment and humans.

In conclusion, the critical reason for the destruction of the human habitat, that is still happening, is the absence of a united and organized legal mechanism to coordinate the environmental preservation activities of the state and private organizations. This absence results in the following consequences.

- (1) Divergence between economical aims and environmental preservation. Activities to protect nature have become the victim of economic expediency, resulting in financial shortages for ecologically capacious technologies.
- (2) Inadequate attention of the Russian legislation to problems of environmental protection, which has led to legal irresponsibility for pollution of the human habitat.
- (3) Low level of the " ecological culture " of leaders in various spheres and management levels.
- (4) Weaknesses of regional nature protection services.
- (5) Lack of public information regarding these problems.

Regular opinion polls in Yakutia show that ecological problems are the most significant after the problems of high cost of living and crime for residents. A nation cannot be physically healthy under such conditions.¹⁰ Yakutia, like Russia as a whole, needs a

⁸ Federal law " About radiation security of the population ", which was adopted by the Gosudarstvennaya Duma of the Russian Federation in December 5, 1995; Federal law " About protection of the environment ", which was adopted by the Gosudarstvennaya Duma of the Russian Federation in December 20, 2001.

⁹ Ministerstvo chrezvychainykh situatsiy respubliki " ob'yavilo voynu " nevidimoi ugroze [The Emergency Ministry of the republic declared war on invisible threat]. - Yakutia. - 2002. - October, 3.

¹⁰ Maximov P.S. Vilui: znak bedy?! [Vilui: sign of disaster?!] - Yakutsk, 1992.

well-developed “ green ” movement, as well as strict legislative control of the ecological situation.

BIBLIOGRAPHY

Критерии оценки экологической обстановки территорий для выявления зон чрезвычайной экологической ситуации и зон экологического бедствия Министерства охраны окружающей среды и природных ресурсов Российской Федерации. Moscow., 1992.

Экология и здоровье населения // Реформирование России: мифы и реальность. Moscow., 1994.

Federal law “ About radiation security of the population ”, which was adopted by the Gosudarstvennaya Duma of the Russian Federation in December 5, 1995; Federal law “ About protection of the environment ”, which was adopted by the Gosudarstvennaya Duma of the Russian Federation in December 20, 2001.

Министерство чрезвычайных ситуаций республики “ об’явило войну ” невидимой угрозе. Yakutsk. October, 3, 2002.

Влияние экологических факторов на здоровье населения // Государственный доклад о состоянии окружающей среды Республики Саха (Якутия) в 1997. Yakutsk, 1998.

Вредные химические вещества. Радиоактивные вещества: справочник. L., 1990.

Buldakov L.A.

1990 Радиоактивные вещества и человек. Moscow.

Burtsev I.S., Kolodeznikova E.N.

1997 Радиационная обстановка в алмазосырьевых районах Якутии. Yakutsk.

Chomchoev A.I.

1993 Обзор атмосферных, подземных ядерных взрывов в мирных, военных тельниках и их влияние на окружающую среду // Радиационное загрязнение территории Республики Саха (Якутия): проблемы радиационной безопасности. Yakutsk.

Ignatieva V.B.

2000 Население Республики Саха (Якутия): динамика современных демографических процессов // Этносциологическое развитие Республики Саха (Якутия): потенциал, тенденции, перспективы. Novosibirsk.

Maximov P.S.

1992 Вилюй: знак бедности?! Yakutsk.