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## SOME ASPECTS OF NATURE PROTECTION IN THE SCIENTIFIC HERITAGE OF ACADEMICIAN INNOKENTIIY P. GERASIMOV

Sobisiewicz A. W., Snytko W. A. **Niektóre aspekty ochrony przyrody w naukowej spuściznie akademika Innokentija P. Gierasimowa.** Rozwój przemysłu w Związku Radzieckim i rabunkowe wykorzystywanie zasobów naturalnych spowodowało antropogeniczne zmiany w środowisku naturalnym, a tym samym – pogorszenie warunków życia ludzkiej populacji. Odpowiadając na te wyzwania I. P. Gierasimow przystąpił do opracowywania metod ochrony środowiska, które uwzględniałyby najnowsze osiągnięcia z dziedziny ekologii. Zwracał on przy tym wielką uwagę na rozprzestrzenianie się substancji zanieczyszczających w łańcuchach troficznych oraz na zdolność ekosystemów do samooczyszczania się. Szczególnie interesowało go stworzenie listy obszarów, na których mogłaby zostać ograniczona antropopresja i rozpoczęto by ochronę siedlisk gatunków endemicznych. I. P. Gierasimow podkreślał konieczność prowadzenia badań nad możliwością utworzenia sztucznych ekosystemów, które mogłyby spełniać wymagania gospodarcze ludności, bez pogarszania – w trakcie wykorzystywania zasobów przyrody – jakości otaczającego człowieka środowiska.

Собисевич А. В., Снытко В. А. **Некоторые аспекты охраны окружающей среды в научном наследии академика Иннокентия Петровича Герасимова.** Развитие в Советском Союзе промышленности и чрезмерное использование ею природных ресурсов привело к антропогенному изменению природной среды и ухудшению условий жизнедеятельности человеческой популяции. Откликаясь на этот вызовы, И. П. Герасимов стал разрабатывать методы защиты окружающей среды, которые бы учитывали новейшие достижения в области экологии. При этом им уделялось большое внимание распространению веществ-поллютантов по трофическим цепям и способность экосистем к самоочищению. Особое внимание он придавал определению перечня территорий, где бы ограничивалась антропогенная активность и проводилось сохранение биоразнообразия эндемичных видов. И. П. Герасимов подчеркивал, что необходимо проводить исследования возможности создания искусственных экосистем, которые могли бы удовлетворять хозяйственные потребности населения, без ухудшения в процессе использования природных ресурсов качеств окружающей среды.

**Key words:** environmental monitoring, nature environment, biosphere reserves, problems of biosphere, Lake Baikal, Jizera Mountains

**Słowa kluczowe:** monitoring ekologiczny, środowisko naturalne, rezerваты biosfery, problemy biosfery, Bajkał, Góry Izerskie

**Ключевые слова:** экологический мониторинг, окружающая среда, биосферные заповедники, проблемы биосферы, озеро Байкал, Йизерские горы

### Annotation

Industrial development in the Soviet Union and the excessive use of natural resources led to the anthropogenic change in the natural environment and deterioration of the living conditions of the human popula-

tion. Responding to this challenge, Innokentiy P. Gerasimov developed methods of protection of biosphere that would take into account the latest achievements in the field of ecology. At the same time, they paid great attention to the distribution of pollutants on trophic chains and the ability of ecosystems to self-puri-

fication. He paid particular attention to the definition of a list of territories where the anthropogenic activity would be limited and biodiversity of endemic species would be conserved. Innokentiy Gerasimov stressed that it is necessary to conduct research into the possibility of creating artificial ecosystems that could meet the needs of the population without degrading the environmental quality in the process of that economic activity.

## INTRODUCTION

Academician Innokentiy P. Gerasimov (photo 1) made a significant contribution to physical geography, soil science, geomorphology, and paleogeography. He was a creator of "constructive geography" – a new scientific direction, which was



Photo 1. Innokentiy P. Gerasimov (1905–1985)  
 Fot. 1. Innokentij P. Gierasimow (1905–1985)  
 Рис. 1. Иннокетий Петрович Герасимов (1905–1985)

focused on the problems of conservation and using nature. According to him, constructive geography was formed in the era of the scientific and technological revolution, when geographical science had more complicated tasks, which should cover activity of many branches of the economy and change of many components of nature and society in the territory of very extensive and various regions (ARAN. F. 1850. Op. 1. D. 188).

According to Gerasimov's ideas the particular directions of geographical research should be as follows:

- to continue the work of assessing the need of society for natural resources;

- to pull greater emphasis on the comprehensive study of the impact of the productive activity of modern society on the geographical environment;
- to create a general theory of goal-oriented modification of the natural environment;
- to work out a scientific theory of rational natural-technical territorial systems;
- to further elaborate scientific principles for regional planning and modification of the environment in which people could live and work (ARMAND, GERASIMOV, PREOBRAZHENSKY, 1986).

Innokentiy Gerasimov believed that the new integrating role of geography will include the following functions: regulation of biogeophysical and biochemical processes taking place in the biosphere under the influence of a person in order to maintain it in a dynamically stable state; determination of the optimal forms of the impact of the technical and economic progress of society on the biosphere; rational transformation of existing forms and spheres of human activity to achieve the best ecological effect of global and regional levels; participation in the process of restoration of a stable dynamic state in the system of human–nature interaction (ARAN. F. 1850. Op. 1. D. 39). Those points were a reflection of a special ecological approach, developed by Innokentiy Gerasimov for applied geography, which was focused on natural resources rational usage and environment protection.

## PROTECTED TERRITORIES

On the need of environmental protection, Innokentiy Gerasimov spoke at a meeting of the Department of Earth Sciences, Soviet Academy of Sciences, on February 16, 1965. He has discussed the anthropogenic influence of paper industries on ecosystem of the Lake Baikal. In his report, there was an alarming warning about the increase of industrial and domestic wastewaters from 11 to 60 km<sup>3</sup> per year during 20 years. Taking into account the need for dilution and subsequent self-cleaning of 5–10 times the amount of clean water meant a threat of an acute water crisis in especially important industrial regions of the country. From that point, Innokentiy Gerasimov expressed the opinion that in future the clean water resources, not raw materials and energy, will dictate the placement of new industries (ARAN. F. 1850. Op. 1. D. 24).

In 1969, at the State Committee on Science and Technology of the Council of Ministers of the USSR, a special commission on problems of the biosphere was created. Innokentiy Gerasimov became the head of that commission and paid special attention of making recommendations for Soviet institutions, which will participate in international scientific research concerning problems of the biosphere. In the same year, he published in the journal "Communist", the paper on the need of general plan for the transformation of nature, where special attention will be put to the special role of nature reserves as wildlife keepers. According to Gerasimov's plan, nature reserves should become the basic type of natural ecosystems, which will be strictly protected from human activity and transformation into anthropogenic ecosystems. The comparison of natural and anthropogenic ecosystems should give an answer to the question how perfect those human-made ecosystems are (ARAN. F. 1850, Op. 1. D. 53).

Innokentiy Gerasimov believed that natural resources should be used in a rational way. In 1979, in his article "Scientific Foundations of Socialist Nature Management and the Problems of Fundamental Science" he associated the anthropogenic change of environment with the over-utilization of natural resources. He also recognized that the excessive use of natural resources took place in the Soviet Union, but it was forced decision. The creation of the Dnieper and Volga cascades of hydroelectric power led to the flooding of many settlements and agricultural land, but Innokentiy Gerasimov believed that this was justified by the creation of an energy base for the industrial development of the country. Considering the problem of reducing the area of the Aral Sea, caused by the removal of a significant part of the Syr Darya and Amu Darya rivers runoff to expand the area of irrigated lands, he called for the launch of measures to combat desertification, but only those that did not impede the growth of cotton plantations and other irrigated crops (ARAN. F. 1850, Op. 1. D. 52).

Gerasimov's viewpoint that natural resources should be used for industrial needs, but in the most rational way, was very close to the approach of the Soviet ecologist Stanislav S. Shvarts. He thought that numerous industrial and agricultural activities, which are absolutely necessary for needs of society and human population, makes impossible to preserve pure ecosystem. According to Shvarts' opi-

nion all humans' efforts to preserve natural communities in their non-anthropogenic forms will fail (SCHWARTZ, 1986).

Innokentiy Gerasimov thought that rational using of natural resources can be achieved only with the help of geographic science, which provides information on using of the environment and natural resources. The priority task of geographic science, in his opinion, would be the answer to Shwartz's questions: What is a good ecosystem (biocenose)? How can people create artificial ecosystems that would fulfill their functions no worse than natural ones? What properties and characteristics should have good artificial ecosystems, which are capable of replacing the natural ones? (ARAN. F. 1850, Op. 1. D. 53).

Stanislav Shwartz described the properties of artificial ecosystems in the very detailed way. He noted that a good human-made ecosystem should ensure the synthesis of a large amount of oxygen, animal and vegetable products. That ecosystem should have high productivity to compensate for the loss of its biomass from any external accidents. The biosystem that will be created should also have the stability of ecosystems in a wide range of environmental conditions and have some internal reserves, which will allow the rapid rearrangement of ecosystem structures, adapting them to society needs (SHWARTS, 1975).

## THE PROBLEM OF THE BIOSPHERE

In September 1972 Supreme Soviet of the USSR issued the resolution on the measures for the protection of nature and the rational use of natural resources. In December it was adopted as the resolution of the Central Committee of the Communist Party of the Soviet Union and the Council of Ministers of the USSR on strengthening environmental protection. In response to these resolutions in 1975, Innokentiy Gerasimov initiated the creation of the State Committee for Environmental Protection under Council of Ministers of the USSR. In his note to Alexander Vinogradov, the vice-president of the Academy of Sciences of the USSR he proposed among the tasks of the committee to distinguish: the control of the services of accounting for natural resources and observations of the environment; assistance in the introduction of new effective methods for cleaning industrial and household wastes (ARAN. F. 1850. Op. 1. D. 167).

Moreover, at the General Meeting of the Academy of Sciences of the USSR on March 17, 1976, Innokentiy Gerasimov reported about the possibility of catastrophic changing of the environment on a large part of the Earth. He warned that in the nearest future there could be the global changes of the atmosphere, oceans, and biosphere, which will have an extremely negative influence on human population and biota. This gave him the reason to believe that modern society has the obligation to protect the environment to preserve the health and well-being of people (ARAN. F. 1850, Op. 1. D. 53). He also paid much attention to effective environmental monitoring, which was connected with the understanding by him that anthropogenic influence on the environment will have a bad influence on people's living conditions (GERASIMOV, 1975).

At the general meeting of the Section on Earth Sciences, USSR Academy of Sciences on December 12, 1983, Innokentiy Gerasimov presented a program of complex fundamental ecological scientific research and scientific and technical developments, which was called "Biosphere". The main objectives of the program were: optimization of environment for the preservation of human health, reproduction of natural renewable resources, combating natural disruptive natural processes, conservation of wildlife's genetic diversity and preservation environment from the massive intrusion of pollutants or radionuclides (ARAN. F. 1850. Op. 1. D. 195).

## INVESTIGATION OF MODEL AREAS

The theme of environmental monitoring can be traced in the foreign studies of Innokentiy Gerasimov (photo 2). He visited Liberec and Ostrava model areas during the field part of the scientific symposium of the Commission for Environmental Problems of the International Geographical Union, which was held in Czechoslovakia from 23 to 31 May 1977. The leader of that symposium, J. DEMEK (1981), described that the main task of creating model areas was making measurements of the most important elements of the environment.

In his impressions after visiting Liberec model area, Innokentiy Gerasimov noted that the territory of research was located 100–150 km northeast of Prague. On that territory, there was a protected area the Jizera Mountains, with problems of deforestation due to the long-term anthropogenic pollution. However, that anthropogenic change in the structure of landscapes did not stimulate the development of such destructive processes as soil erosion and landside processes. I. GERASIMOV (1981) believed that in that bad conditions the natural environment continued to maintain its properties of self-recovery.

However, since 1965 the ecological situation changed in a negative direction when power stations, which were using fuel from the Turoszów brown coal basin, were built north of the Jizera Mountains. These power stations emitted various harm-



Photo 2. Innokentiy Gerasimov during the excursion abroad (phot.: archive of Russian Academy of Sciences)  
Fot. 2. Innokentij P. Gierasimow w czasie jednej z wycieczek zagranicznych (fot.: archiwum Rosyjskiej Akademii Nauk)  
Фот. 2. Иннокетий Петрович Герасимов во время зарубежной поездки (фот.: архив Российской Академии наук)

ful gaseous substances, but the sulfur dioxide (SO<sub>2</sub>) was very dangerous for the local ecosystem because it turned into sulfuric acid (H<sub>2</sub>SO<sub>4</sub>), which damaged forests on the slopes of the Jizera Massif. Czechoslovakian government had to reduce emissions of pollutants by improving technologies for neutralizing gaseous emissions. Very useful could be planting forests, which will be more resistant to acid precipitation. During that symposium, Innokentiy Gerasimov noted that the forecast of the ecological situation of the territory is impossible without spatial information. These information geographers could obtain from digital maps, which are modeling processes occurring in the landscape and in the environment (DEMEK, 1981).

## CONCLUSION

Ecological approaches of Innokentiy Gerasimov were a rejection of conquering the nature in favor of managing environment to create the most favorable conditions for human life and its economic needs. His proposal on the creation of the Baikal National Park and the development of a network of biosphere reserves had the goal to save natural diversity when natural resources were used by local industry.

The project of Baikal National Park had its main goal to protect drainage basin of the lake and its ultra-clean water from pollution. The model areas in Czechoslovakia could support the local industry with water, so protection of forests had great importance because trees could reduce soil erosion and keep water reservoirs from siltation. The planting of trees, which will have resistant to sulfuric acid, could provide sustainable development of slopes of the Jizera Massif.

According to Gerasimov's minds, the territories of rich biodiversity should be protected as the parts of national parks. Those territories could be visited by tourists for recreation purposes. Some renewable resources of national parks (ground and mineral waters, agriculture products, timber, and est.) could be used by local industry, but the anthropogenic influence of that process should be very limited. Innokentiy Gerasimov also thought that national parks could not protect those endemic species, which were at the risk of extinction.

Nature reserves were the main form of conservation activity, but their scientific resources were very limited. Biosphere reserves had much more

research functions and gave scientists an opportunity to compare those protected territories and the places where the environmental load was very high. The Gerasimov idea was in supplementing nature reserves with some research functions, which biosphere reserves already had.

A well-established scientific typology of natural ecosystem did not exist in the beginning of 1970<sup>th</sup>. Geographers identified major types of natural ecosystems by using geobotanic, soil-geographic and physical geographic data. That determined the fact that Gerasimov's ecological approaches were very close to ideas of such Soviet scientists as Stanislav S. Shwarts, Victor B. Sochava, David L. Armand and Vladimir S. Preobrazhensky.

Innokentiy Gerasimov thought that there were many people in the world, who considered that geographic science was a descriptive, chiefly educational and informative field of knowledge without fundamental significance. His efforts were focused to provide that people a better understanding of importance geography, because according to him only that discipline have mechanisms to reduce human impact on the environment.

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