The surrounding environment monitoring in the Soviet Union: a review of establishing new “ecological” science

A V Sobisevich¹, V A Snytko¹,² and A V Postnikov¹

¹S. I. Vavilov Institute for the History of Science and Technology RAS, 14, Baltijskaia street, Moscow, 125315, Russia
²V.B. Sochava Institute of Geography SB RAS, 1, Ulan-Batorskaia street, Irkutsk, 664033, Russia

E-mail: alex.v.sobis@gmail.com

Abstract. The programs of surrounding environment monitoring were presented in 1972 at UN Conference on the Human Environment in Stockholm. When the Soviet Union adopted a resolution of the conference, it became obligatory to establish biosphere reserves and provide environmental monitoring. The ideas of such monitoring in the Soviet Union were promoted by two scientists - Innokentiy Gerasimov and Yuri Israel.

1. Introduction

According to Innokentiy Gerasimov (1905 – 1985), who was the head of the Institute of Geography at the Academy of Sciences of the USSR from 1951 to 1985, ecology did not enter the scientific vocabulary until the second half of the XIX century and was defined as the interaction of vegetation and animals with their environment. Then the biologist used that term extensively as Darwin’s theory of evolution, so, for a long time “ecology” was considered to be a part of Biology. From the second half of the XX century, the term “ecology” was understood in a much wider sense. The term can be applied to nature and various forms of human activity so that preserving the existing environment is a result of both natural processes and man’s conservation efforts [1].

From the 10th to 20th of March, 1970, Soviet delegation headed by soil scientist Viktor Kovda (1904 – 1991) participated in the compilation of the program for the upcoming conference at the United Nations headquarters in New York City. Soviet delegation with the support of the delegations from France and Czechoslovakia promoted a conception of alarming destruction of the environment, which was connected with many social and economic reasons when capitalist countries and big corporations vastly exploited the nature of developing countries. At the top of the agenda of the forthcoming conference, it was proposed to put the report of the UN Secretary-General U Thant (1909 – 1974) about an analysis of the causes of the biosphere destruction and measures for its preservation [2].

In the same year, 1970, biogeographer Viktor Sochava (1905 – 1978) turned his attention to ecological issues in the Soviet Union. At the V-th Congress of the Geographical Society of the USSR he made a presentation “Geography and Ecology”, which showed some further problems of monitoring environment. The term “monitoring” was not known at that time in the Soviet Union, so Viktor Sochava said about ecological approaches to geosystems modeling. According to his views the most advanced geosystems modeling was made abroad by George M. Van Dyne (1933 – 1981) at desert-steep territories of Colorado [3]. Viktor Sochava understood human ecology as the most sophisticated
geographical direction because geographers were making research of territories and nature in terms of its relation to the human population. The advanced studies of different aspects of environment which influence human health were made in Cambridge University, where the department of human ecology was established. The importance of ecological research according to Viktor Sochava was connected with many problems of humans’ adaptation to the fast environmental changes, so geographers had to prevent the undesirable transformation of nature [4].

In 1971, at the International Council of Scientific Unions members of a Special Commission of Scientific Committee on Problems of the Environment (SCOPE) announced the main thesis of environmental monitoring which was published at a brochure “Global environmental monitoring”. Environmental monitoring was considered as systematic identifying of any environmental changes, which were caused by human activity. In 1972, at the United Nations Conference on the Human Environment in Stockholm, a professor of Chicago University Gilbert F. White (1911 – 2006) and a meteorologist Thomas Malone (1917 – 2013) proposed the program of environmental monitoring. Soviet delegation together with the delegations of other socialistic countries boycotted that conference because the Organizing Committee refused the participation of the German Democratic Republic as a non-member of the United Nations. However, despite the boycott the Soviet Union adopted the resolution of the conference and took the responsibility of establishing biosphere reserves and conducting ecological monitoring. The environmental monitoring processes were initiated by Innokentiy Gerasimov and Yuri Israel (1930 – 2014), who was at that time the head of the Hydrometeorological Service of the Soviet Union.

2. Methods and materials

The process of establishing the ecological monitoring system in the Soviet Union is the object of our research. We are using the methods of environmental history. One of them is a content analysis of scientific reports and other archival sources. According to our concept, the international science networks where Soviet scientists and officials collaborated with their Western colleagues during the time of the Cold War and Perestroika were crucially important for environmental policy. World famous scientists and politicians who understood that time was a really vital factor of environmental monitoring were important actors in the process of environmental monitoring establishing and creating biosphere reserves.

We paid attention to the problem of different dimension of scaling in environmental monitoring which was discussed at the workshop in the University of Tübingen on April 11th and 12th, 2018. At that workshop Alexey Sobisevich presented his thesis “Scaling the Black Earth. Nature Preservation in the Soviet Union”. After that presentation, it was very important to answer the following questions: How do the actors themselves perceive scales? Which viable alternatives exist to the power of the state as a focal point in the historian’s narrative? [5].

3. Results and discussion

The term “monitoring” was used in relation to the natural environment in the early 1970s. In the framework of this concept natural environment was considered to be a multicomponent aggregate of natural phenomena subject to natural dynamic changes and various effects under the influence of human activity. In 1970 the Swedish Natural Science Research Council and Special Problem Group from the USA on the creation of a global monitoring network made significant contribution to the development of environmental monitoring problems.

In 1971, the ideas of environmental monitoring were announced by Gilbert White and Tomas Malone in the brochure «Environmental Monitoring: Physical and Chemical Measurements», where environmental monitoring was understood as a systematic observation of the environment and identification of possible changes, especially in connection with human activities [6]. At the meeting participants proposed to build a system of controlling anthropogenic changes of the environment which would allow planning environmental management measures.
In 1972, at the UN Conference on the Human Environment the program of environmental monitoring and establishing biosphere reserves was accepted. Biosphere reserves were understood not only as a very essential part of conservation policy but also as a very efficient instrument of environmental monitoring. In September 1972, after UN Conference resolution ratification, Supreme Soviet of the Soviet Union issued the resolution on the measures for protection of nature and rational use of natural resources [7].

In 1973, the issue of environmental monitoring was also discussed by a group of experts from UNESCO’s Man and the Biosphere Program, who admitted the necessity of preserving biodiversity and protect the most typical territories in each bioclimatic zone of the world. In the same year a Scientific Council on the biosphere problems, headed by academician Alexander Sidorenko (1917 – 1982), was organized in the Academy of Sciences of the USSR [8].

In 1974, an intergovernmental meeting convened by the United Nations Environment Programme (UNEP) of the World considered the environmental monitoring system. In the same year, Yury Izrael became the new head of the USSR Hydrometeorological Service and after his appointment published the article «Global Observing System. Forecast and assessment of changes in the natural environment. Basics of monitoring». In this work, for the first time in the USSR, the definition of environmental monitoring was given as a system of observations, allowing identifying changes in the state of the biosphere under the influence of humans [9].

Vladimir Sokolov (1928 – 1998) headed biological section in the Scientific Council on the biosphere problems. It coordinated research on the use of biological resources, the protection of natural areas and the conservation of rare species of animals and plants. Innokenty Gerasimov headed the section of global and regional forecasts which gave forecasts on changes in environmental conditions both in the entire world and in certain areas. Yuri Izrael headed the biosphere monitoring section which coordinated problems related to the organization of biosphere reserves and assessment of the environmental state [8]. During the first meeting of the section, held on July 15, 1975, Innokenti Gerasimov and Yuri Izrael made a joint report on the basic principles and modern ideas about the state of the biosphere.

The results of Innokenti Gerasimov’s work as a part of the scientific section on biosphere monitoring were shown in the article “The Scientific Basis of Modern Environmental Monitoring” published in 1975. The article analysed international programs for creating a global environmental monitoring system but Innokenty Gerasimov believed that such observations should be carried out by the national environmental control services. Innokenty Gerasimov also advocated the creation of a separate service that would deal with environmental monitoring in the Soviet Union because the existing hydrometeorological or earthquake control services had their own tasks [11].

Innokenty Gerasimov made a proposal on the steps (blocks) of modern environmental monitoring: the first block - a bioecological, the second - a geocological, and the third - a biospheric. The role of the bioecological block is mainly to permit observations and control over the state of the environment regarding its influence on the health of the population (SO₂, CO, NO, NO₂ and others components). The functions of the geocological (natural-economic) block concern observation and control of changes in those geosystems (including both natural and antropogenic ecosystems) that constitute the environment. It is particularly important to stress the interrelations and mutual interactions among these blocks of the monitoring system. It is only in the second block (the geocological one) that the indicators of the first (bioecological block) can acquire the needed level of scientific validity and a scientific basis for spatial extrapolations. The third block of biospheric monitoring serves for observations and control of global background changes in the environment as well as an ecological evaluation of these changes. Its basic indicators must be therefore in the atmosphere, the hydrosphere, and the lithosphere [1, 12].

In 1978, Yuri Izrael proposed dividing environmental monitoring into two parts, "abiotic" and "biotic". According to him, “abiotic monitoring” meant systematic long-term observations of the pollution level in the environment, as well as concomitant geophysical observations. Yuri Israel considered it advisable to include atmospheric air and precipitation, surface water, soil, and bottom sediments and biota, when Hg, Pb, Cd, As, N, P, DDT, benzopyrene and others pollutants were monitored. Biotic monitoring assumed the studies of biota taking into account the possibility of the
spread of pollutants through food chains and concentrated toxic effects of pollutants on ecological systems. Yuri Israel argued the importance of the experimental program, which had the goal to determine the sensitivity of individuals of various species in the observed ecosystem to the effects of low, close to background concentrations of pollutants [9].

During these years, Soviet scientists take part in a number of environmental conferences. In September 1975, the Soviet-German environment forum took place in Münich. In November 1975, Soviet and British scientists took part in the meeting of the Committee for cooperation in the field of environmental protection. That cooperation had its extension when in July, 1976 members of the scientific section concerning monitoring biosphere shared their materials about ecological monitoring in the Soviet Union with British scientists. Those materials were necessary for future First Soviet-English symposium on biosphere monitoring [10].

The Presidium of the Academy of Sciences of the USSR defined the main dimensions of research, which were necessary for environmental monitoring, for the period from 1976 to 1980. The development of environmental monitoring strategies led the Academy of Sciences of the Soviet Union together with the USSR Hydrometeorological Service to the research concerning creation of a global monitoring network. The study of international environmental laws and the analysis of the advantages and disadvantages of the existing system of management in the field of environmental protection were a basis for further improvement of environmental protection in the Soviet Union [8].

4. Conclusion

According to Elena Aronova, environmental monitoring was boosted by the environmental movement of the late 1960s when people learnt about negative effects of such carcinogens as DDT and Agent Orange [13]. Gilbert White supported that environmental movement in the idea that, «We can work together and with our common natural environment for the greater benefit of ourselves and future generations. There can be water for all; the world can be a safer place with less loss of life and property from natural hazards» [14]. That was the main reason when he promoted the program of environmental monitoring at UN Conference on the Human Environment in 1972 and shortly after that he and Thomas Malone brought together SCOPE under the aegis of the International Council of Scientific Unions’ intention to create an independent scientific organization, which could offer assessments of global environmental problems [15].

In 1970, Viktor Sochava was the first in the Soviet Union who promoted environmental research in geography and had the ideas very close to «environmental monitoring». Innokentij Gerasimov emphasized that though ecology had been developed as a special discipline within the biological science then it obtained the scientific approaches in such disciplines as geography, geology, soil science and others [12]. After UN Conference on the Human Environment Yuri Israel promoted the ideas of environmental monitoring in the Soviet Union and soon Innokentij Gerasimov joined him in that activity.

Yuri Israel was supported with the resources of Hydrometeorological Service of the Soviet Union, so he had an initiative to establish the system of «anthropogenic monitoring», where the effective control over the flow of pollutants in air and surface waters would be conducted. According to his ideas, all territory of the Soviet Union should be covered with observation stations, which could provide environmental forecasts based on long-term observations. Innokentij Gerasimov proposed the method of «geosystem monitoring», which aimed primarily at the rational use of natural resources and the protection of ecosystems.

Denis Shaw, Jonathan Oldfield and Julia Lajus noted that Soviet scientists participated in many international initiatives aimed at understanding natural resources, and despite many political limits they could play a significant role in environmental initiatives [16]. Those political limits could be connected with the time of Cold War when physical data about the environment was in the sphere of military agencies’ interests. Elena Aronova noted that information on oceanography, radiology, meteorology, and data in some other fields of research had great importance and could not be shared, but biological sciences were less prohibited area for international cooperation [13]. Laura A. Henry brings attention to
environmental activism in the late Soviet period and according to her, such state-sponsored scientific organization as the All-Russian Society for Nature Protection (VOOP) and the Moscow Society of Naturalists (MOIP) were mostly the exception from the state industrial initiatives criticism [17].

The Academy of Sciences of the USSR was a state-sponsored organization ranked much higher than VOOP and MOIP. From that point academic's institutions could be much more powerful and oppositional players in environmental initiatives. Scientists could be supported in their environmental initiatives for the purpose of abroad propaganda that the Soviet state is an environmental-friendly country. Those facts show that further studies in the history of surrounding environments monitoring should focus on the study of such research questions: what were the most important factors in the existence of that international science networks? Had it been the state's interest, or scientists' intention to cooperate with their international colleagues? When such personal matters as friendship or political views were of crucial importance?

References
[1] Gerasimov I P 1983 Geography and ecology. A Collection of Articles (1971-1981) (Moscow: Progress)
[2] Archive of Russian Academy of Sciences (ARAN) 2081-1-169.
[3] Van Dyne G M 1969 Grassland Management, research and training viewed in a systems context *Range Sci., Dep. Sci.* 3 50
[4] Sochava V B 1970 Geography and Ecology Papers of V Congress of the Geographical Society of the USSR 25
[5] Schönfelder T and Sobisevich A V 2019 Playing with Scales in Environmental History: International Workshop Held at the University of Tübingen on 11-12 April 2018 *History and Biology Research* [in Russian – Istoriko-biologicheskiye issledovaniya] 1 114–118
[6] Malon T 1971 Environmental Monitoring: Physical and Chemical Measurements *Proceedings of the Scientific Program, XVII General Assembly of the International Union of Biological Sciences* pp 62-65
[7] Sobisevich A, Snytko V and Savenkova V 2018 The role of biosphere reserves in the environmental protection at the Soviet Union *GeoConference SGEM* 18(5.1) 963–969
[8] ARAN 2092-1-5
[9] Israel Y A 1974 Global system of observations. Forecasting and estimating of environment changes. Basics of monitoring *Meteorology and hydrology* [in Russian – Meteorologiya i gidrologiya] 7 3-8
[10] ARAN 2081-1-167
[11] Gerasimov I P 1975 Scientific basics of modern environmental monitoring *Izvestiya of Academy of Sciences of USSR. Geography Series* 3 13-25
[12] Gerasimov I, Annenkov V, Davitaya F, Konstantinov O, Masbits Y, Pokshishevsky V, Preobrazhansky V and Ryabchikov A 1986 Scientific and Technological Revolution and Soviet Geography *Geographical Prognostication. Problems and Prospects* (Moscow: Progress) pp 31-48
[13] Aronova E 2015 Environmental monitoring in the making: from surveying nature's resources to monitoring nature's change *Historical Social Research* 40 (2) 222-245
[14] Kates R W and Burton I 2008 Gilbert F. White, 1911–2006, Local Legacies, National Achievements, and Global Visions *Annals of the Association of American Geographers* 98(2) 1-8
[15] Kates R W 2011 Gilbert F. White, 1911-2006, A Biographical Memoir (Washington: National Academy of Sciences)
[16] Oldfield J, Lajus J and Shaw D 2015 Conceptualizing and Utilizing the Natural Environment: Critical Reflections from Imperial and Soviet Russia *Slavonic and East European Review* 93(1) 1-5
[17] Henry L A 2018 Russia’s Environment and Environmental Movement *Understanding contemporary Russia* ed Bressler M L (Boulder, Colorado: Lynne Rienner Publishers) chapter 9 pp 275-302