



30TH BSPC: THIRD SESSION

Climate change and biodiversity

Speaker: ***Dr Vadim V. Sivkov***, *Director of the Atlantic Branch of the Shirshov Institute of Oceanology of Russian Academy of Science and the Federal State Budgetary Institution of Science, Kaliningrad region*

The problem of greenhouse gas emissions and the carbon polygon in the Kaliningrad oblast

The requirements of the world community, formulated in the Paris Agreement to reduce emissions, are associated with serious financial and economic regulatory instruments, including emission quotas, generating the cost of gas emissions, forming a system of international payments for increasing (decreasing) emissions, and tax instruments. Although these gases are "well mixed" and their impact on the climate is global, their initial sources are tightly tied to the economies of specific countries, and, accordingly, monetization (including quotas and taxes) will also be targeted. It is planned that this practice of implementing international agreements will be put in place beginning 2023 and will be fully implemented starting from 2025-2026.

The main indicator in assessing the role of individual countries in gas emissions will be *net emissions* (that is, the difference between emissions and removals). Thus, the assessment (inventory) of the net emission of climatically active gases by each country becomes a problem of reliable quantitative accounting of anthropogenic and natural sources and sinks of gases.

Quantitative methods of the "carbon" economy should be developed, which will allow reliable economic estimates to be obtained based on the inventory of climatic gases in order to develop an effective and economical strategy in the field of emission reduction and increasing absorption (sequestration).

By order of the Government of the Russian Federation of December 25, 2019 No. 3183-r, the national action plan for the first stage of adaptation to climate change, for the period up to 2022, was approved. This corresponds to the Strategy of Scientific and Technological Development of the Russian Federation, approved by the Decree of the President of the Russian Federation of December 1, 2016 No. 642 and the Climate Doctrine of the Russian Federation, approved by the Order of the President of the Russian Federation of December 17, 2009, No. 861-rp.

In connection with the need to increase the efficiency of scientific and technical activities associated with the environmental development of the Russian Federation and climatic changes, the Ministry of Science and Higher Education of the Russian Federation

issued an order dated February 5, 2021 No. 74 "On landfills for the development and testing of carbon balance control technologies", which prescribes the implementation of a pilot project on the creation of so-called "carbon polygons" on the territory of the Russian Federation.

The carbon polygon in the Kaliningrad region, the only one from the List determined by the Ministry of Science and Higher Education of the Russian Federation, is located in the center of Europe. This location is especially important for the Russian Federation, since it is the European Union that puts forward the most acute requirements for reducing greenhouse gas emissions.

Immanuel Kant Baltic Federal University (IKBFU), located in Kaliningrad, was determined as the operator of the Kaliningrad carbon polygon, implementing the program for its creation and operation. Participating in the program is the Atlantic branch of the Shirshov Institute of Oceanology of RAS (AB IO RAS), also located in Kaliningrad.

To date, it has been determined that the Kaliningrad carbon polygon consists of two sites: *onshore* and *offshore*.

The *onshore* site is located in the central part of the Kaliningrad oblast within the Wittgirren peat bog, which is considered by the regional authorities as an experimental area for rewetting in order to increase the absorption (sequestration) of carbon from the atmosphere. To date, pre-design studies of the ecological state of the peat bog have been carried out in the area. A conceptual plan for the restoration of the natural bog ecosystem has been developed, and mapping has already been carried out. Construction of the site is currently underway.

The offshore site is organized in the territorial waters of the Russian Federation to the west of the coast of the Kaliningrad oblast. In the context of the carbon agenda, the Baltic Sea is a unique basin. It is a transboundary sea with a high anthropogenic load. Here, the level of eutrophication of waters is unprecedentedly high and, as a consequence, the rates of primary bioproduction (photosynthesis) are high. Therefore, on the scale of the World Ocean, the Baltic Sea is a pronounced maximum with regards to the absorption (sequestration) of carbon dioxide (CO₂), one of the main greenhouse

gases. The intensity of photosynthesis is highest in the southeastern part of the sea adjacent to the shores of the Kaliningrad oblast. The location of the offshore site was chosen taking into account the distribution on the seabed of bottom sediments saturated with "greenhouse" hydrocarbon gases, mainly methane (CH₄), one of the largest distributions in the Baltic Sea area. As is well known, the exploration of the largest hydrocarbon deposits in the Baltic Region off the coast of the Kaliningrad oblast, and the natural emission of hydrocarbon gases from the earth's crust require an updated assessment of emissions. In this context, attention should be paid to the great importance of the data obtained in the course of industrial environmental monitoring of offshore oil production carried out by LUKOIL-Kaliningradmorneft Ltd. from 2003 to the present.

Thanks to the interaction of IKBFU with AB IO RAS, the first measurements of key environmental parameters at the offshore site began in April this year. To date, three integrated marine environmental surveys have been completed, and a fourth survey is planned for the end of August. The first measurement results confirm the representativeness of the selected study area.

In the near future, precise measurements for the monitoring of the flows of the main climatically active gases are planned. The offshore site will be provided with a remote monitoring system based on the use of satellite and unmanned platforms equipped with the necessary set of sensor equipment. Experimental estimates of the absorption potential of marine ecosystems will be obtained in order to assess their absorption (sequestration) potential in the context of various natural and anthropogenic changes. Unified measurement methods and requirements for equipment for adaptation at other sea ranges of the country will be substantiated and developed. Thus, data will be obtained for the development of hybrid models of spatial integration of gas flows.

The successful functioning of the Kaliningrad polygon will contribute to the integration of the national climate-active gas emission control program into international observational and research programs (EU-Copernicus CO₂ Human Emissions project (CHE), Advanced Global Atmospheric Gases Experiment (AGAGE), WMO Global Atmospheric Watch (WMO-GAW), Global Climate Observing System (GCOS), etc.).

The development and maintenance monitoring of the IKBFU, in cooperation with AB IO RAS and other leading scientific organizations, including foreign ones, will create a new level of human resources that consolidate knowledge from different fields (climatology, meteorology, oceanography, numerical modeling, measurement technology, machine learning, etc.) based on the adaptation of existing, and development of new, master's and PhD programs, as well as new educational formats associated with the polygons themselves.