UNEP-GEF Project abstract

'Conserving, Enhancing and Managing Carbon Stocks and Biodiversity in the Chernobyl Exclusion Zone'

Theme: 'Assessment of the State and Trends of Natural Landscapes and Biodiversity in the Chernobyl Exclusion Zone'

Main Contractor: SSRI 'Chornobyl Center for Nuclear Safety, Radioactive Waste and Radioecology'

Agreement: SSFA/2017/14, S1-32GFL-000370/11232/SB-000687.37/14AC0003

Reporting period in 2017: 8 August − 31 December 2017

Goal: Assessment of biodiversity of the Chernobyl Exclusion Zone, trends and current state of plant and animal complexes as presuppositions for organizing environmental measures in the Chornobyl Radiation and Ecological Biosphere Reserve.

Expected results:

The detailed description of biological diversity in the Chernobyl Exclusion Zone was given as a result of the field studies and analysis of the earlier published data. Main emphasis was put on vascular plants and fauna of vertebrates as the most studied groups of the region. A review of the current state of research of the wild flora and fauna was given. Information on trends of development of the Chernobyl Zone ecosystems complexes over all period after the accident on the ChNPP was presented. A list of vertebrate species and vascular plants recorded in the Exclusion Zone was provided. A great attention was paid to the 'red book' species protected according to the national legislation and international conventions. The expected results included also the definition of the most valuable in environmental sense areas of the ChEZ with justification of such conclusion. Assessment of ecosystems in the ChEZ for support and enrichment of biodiversity and ecological balance in the Eastern European region was done.

Background for the project research

The research was initiated due to the creation of the Chernobyl Radiation and Ecological Biosphere Reserve (hereinafter referred to as the CREBR) in the Exclusion Zone and Zone of the Unconditional (Compulsory) Resettlement (hereinafter referred to as the ChEZ) in April 2016 as a logical completion of the state policy on the development of the network of the protected natural territories. As a base for the justification of the CREBR there was a large amount of

information on richness of the local flora and fauna gathered in the thirty-year post-accident period. The creation of the CREBR also solves a whole range of other problems. Firstly, there is an urgent need to define a new long-term strategy of the management of the land excluded from the traditional use after the accident at the ChNPP in the ChEZ, as the radiation situation has significantly mitigated, and the first acute phases of the accident have passed long time ago. Secondly, the radiation pollution continues to exclude the return of population and agriculture. Consequently, the most reasonable solution would be to use these lands as a huge reserve of wildlife, especially since the ChEZ land has begun to play continental significance in conservation of the great number of the rare plants and animals and the typical ecosystems of Polissia.

At the same time, the creation of CREBR in the ChEZ is consistent with the efforts of the world community to stop the negative trends in the development of climate on the Earth. Along with the efforts to reduce carbon dioxide and other greenhouse gases emissions into the atmosphere, an important role is given to the carbon immobilization in the plant organic matter (primarily in the forest) and the conservation of natural waterlogging of the lands. It is these processes (increase in the area and biomass of forests, and the restoration of waterlogging of the territory) that continue in the ChEZ all years after the accident. Their protection within the CREBR frame contributes to the improvement of the climatic situation on the Earth.

Meanwhile, the CREBR activity cannot be carried out without the knowledge of the detailed information on the quality of each quarter and section, distribution and composition of the flora and fauna, the role of each site in the life of plants and animals. This should provide a base for the development of the functional zoning of the CREBR, and the directions and content of environmental measures. It is this factual material that is absent now, the available information is mostly superficial and incomplete. This was due to the following historical circumstances:

1) for a long time, the efforts of scientists were aimed at the consequences of the radiation accident and their elimination, while the wildlife had a secondary interest;
2) the economic crises in the country and in the world have caused a significant reduction of research activities in the ChEZ and insufficient material and technical support for the research projects;
3) the ChEZ has a very large area (2600 km^2), which complicates the task of studying flora and fauna; a considerable part of the territory has not been studied at all.

The research has begun just to cover such information gaps. The purpose of the work is to describe the biological diversity of the whole territory of the CREBR (and the ChEZ in general), and individual sites. The second task was to summarize the information on research activities that were conducted on flora and fauna after the accident in order to find out: what is the least

studied and / or what needs to be studied first. One of the results of the work was to summarize the knowledge about the development of the ChEZ ecosystems after the accident, their current state and development prospects. The project provides a description of the species composition of vascular plants, vertebrate animals and annotated description of species included in the Red Data Book of Ukraine (2009). A separate section of the work was to give an analysis of the level of anthropogenic transformation of the ChEZ ecosystems and current anthropogenic influence.

Results received

Description of the general conditions

According to the results of the analysis of the literary data and own observations, there was a description of the general natural conditions of the ChEZ and CREBR, in particular. According to the natural-territorial zoning, the region is a part of the Kiev subprovince of the Ukrainian Polissia. The features of the relief, geomorphology of the region and the structure of quaternary deposits are considered. There is a general description of the soil of the region, and network of the ground water. The characteristics of the climate are generalized. The general geobotanical characteristic of the region is given.

Review of the state of research of flora and fauna

The vast majority of the research and scientific works devoted to the composition and development of the ChEZ flora and fauna were conducted in the first 10-15 years after the accident. The main emphasis was put on the course of changes in the former agrocenoses after cessation of the economical activity and on the direct and secondary effects of radiation contamination. The description of the ChEZ landscape, vegetation of the former agrocenoses and settlements, general changes in the animal world of the region are given. The researchers noted the displacement of the anthropogenic complexes and species and their replacement by the forest and meadow species that are usual for this natural and geographical area. There was a fact of increasing the diversity of biological forms and mosaic of biocenoses, and the total area of forests, restoration of waterlogging of separate sites. Meanwhile, the species composition of the local flora and fauna has not been described for a long time, the vast majority of species is only known that they are present (among these plants are those, which are known only that they should be). The quantitative characteristics and territorial distribution are known only for the certain species, and the status of the majority of species is still unknown.

Review of the trends of flora and fauna development

According to the results of a large number of studies, the cessation of agricultural and forestry activities in the ChEZ and the resettlement of people from an area of more than 2500 km^2 (and along with the Belarusian part it is 4750 km^2) have begun processes of the gradual change of the artificial ecosystems of agrocenoses and urban landscapes on the natural meadow, forest and

wetlands that are usual to this natural and geographical zone. This appeared in the depletion of the complexes of synanthropic species, in the displacement of species composition to the natural one, in the gradual expansion of woody-shrub species and restoration of forest cover, in the growth of the quantity and territorial distribution of a significant number of species of plants and animals, and in the growth of biodiversity in general. The restoration of the soil horizons, water regime, and gradual waterlogging of the individual sites of the ChEZ have been noted. The number of rare species has increased significantly, there were species that had been absent for a long time (lice, bear, bison, etc.). Transformation of biocenoses occurred not only due to the natural change of the plant complexes, but also due to the active participation of animals, primarily earthmovers (ants, rodents, wild boars), beavers and those who spread seedlings. The most significant transformation took place in the first 5-10 years after the accident, in the subsequent decades it was not so noticeable. In the future, there is expectation of continuation of the processes of flooding of grasslands and waterlogging of the land, the growth of the mosaic of biogeocoenoses and the overall balance, but there will be no significant increase in the species composition.

Modern species composition of flora and fauna

Due to the lack of the relevant studies, more or less complete data on species composition exist only for the higher vascular plants and vertebrates. It is known for today that 1228 species of vascular plants, including 5 species of club-moss, 6 species of horsetails, 13 species of ferns, 7 kinds of clavates, 269 species of monocotyledonous, and 928 species of dicotyledonous plants are present in the ChEZ (or should be present, i.e. that are present in similar conditions in adjacent territories). Among them there are many that came to the region due to a man. In general, the ChEZ plant complexes are often very different from those that were a century ago. This is a result of the agricultural, forestry, reclamation and industrial activities, the consequence of the construction, transportation, cultivation of foreign crops. The species composition of vertebrate animals includes 339 species, namely: 60 species of fish, 12 species of amphibians, 7 species of reptiles, 202 species of birds, 58 species of mammals. Unlike plants, among them there are only 11-12 species that have got into biocenoses due to introduction, and 15 species have got there due to the natural invasion (the majority of them were fish). The rest of the species are local, or one that appears here during the seasonal migrations. In general, the vertebrate fauna almost corresponds to that one, which was in Polissia in the past.

‘Red book’ species of flora and fauna

According to the data for 2017, the list of vascular plants included in the Red Data Book of Ukraine (2009) and noticed in the ChEZ, has 56 species, including: 4 species of club-moss, 3 species of ferns, 32 species of monocotyledons and 17 species of dicotyledons. In addition, there

are 13 types of plant complexes included in the Green Data Book of Ukraine (2009) as those requiring protection in the region. Fauna of the ChEZ vertebrates includes 65 species included in the Red Data Book of Ukraine, including: 10 species of fish, 1 species of reptiles, 32 species of birds, 22 species of mammals. The conditions of the region are friendly to the most of them, and therefore, the ChEZ plays a significant role in their conservation. Knowledge about the number of the 'red book' plants and animals is not final, and new findings are very likely during the appropriate research.

Assessment of the anthropogenic transformation level and current influence

The research of the ChEZ landscapes and ecosystems has shown that they have numerous features of the long-term anthropogenic transformation that cannot be corrected neither 30 nor 100 years of the reservatogenic succession. This applies to the violation of the hydrological regime, destruction of wetlands, artificial forest plantations, a large number of invasive plant species, remnants of the urban and industrial landscapes, violated and depleted soils, a large number of landfills. The consequences of the former development of the region significantly restrain the reproduction of the complexes usual to the Polissia, but they are insuperable. If people do not interfere, the ChEZ land will come in almost the same kind and quality as they were hundreds of years ago. Among the modern forms of anthropogenic impact, the forestry works, fires and poaching are the most important ones, they have a significant negative impact, but they do not fundamentally alter the recovery trends for the nature of Polissia. The current economic, industrial and other activities, as a rule, have a local significance and are limited to 5-7% of the total territory.

Assessment of value of the ChEZ ecosystems for support and enrichment of biodiversity and ecological balance in the Eastern European region

The ChEZ is located in the center of the Polissian ecological corridor, crossing the north of Ukraine, and has a large number of the boreal species and communities of specific post-glacial vegetation. Here are the remains of deciduous forests, which in the past dominated the considerable area of the European continent, and now they are very fragmented. Such sites retain the potential for spontaneous reproduction of the natural mosaic-tiered structure of phytocoenoses, and, at the same time, of the boreal fauna, that is almost impossible, where forestry and agricultural activities are carried out. The size of the territory permanently withdrawn from the economic use (including the Belarusian reserve) is uniquely large (4750 km^2), and the conditions are quite diverse. Being mostly forest, the ChEZ is characterized by eight types of landscapes, by a large number of wetlands and meadow lands, by about 30 types of forest vegetation, 23 land and 7 aquatic phytocomplexes, 12 land and 8 aquatic zoocomplexes. All this ensures a stable, completely natural and independent from human development of all

kinds of species, including those with large individual sites (predatory birds and animals), it provides opportunities for the reproduction of the components (species, communities) and the relationships that existed in Polissia hundreds of years ago, and which are not possible on the lands where a man manages. The ChEZ together with the Polissian State Radiation and Ecological Reserve of Belarus is almost the only place in Europe where a large free population of bison can live on such an area without conflicting with a man. This natural reserve plays an important role both in conservation and maintenance of the growing and breeding here species and migratory species. The ChEZ is located at the crossroad of two large rivers, Pripyat and Dnieper, the region is crossed by the large migratory routes of birds flying from the north and east of Europe to the south and west. In addition to conservation and enhancing of the biological diversity, the forest and wetlands of the region play a significant role in the carbon cycle and improvement of the climatic situation on the Earth.

Definition of the most valuable in environmental sense areas of the ChEZ

The functional zoning of the CREBR should be based on the comprehensive data on the composition and quality of the natural complexes and their importance in conservation and increase of biodiversity. Such comprehensive description is currently available only to a few sites with a total area of 26,800 hectares, or only 10% of the total area of the ChEZ. They are characterized as unique in the value of the lands, and such as having a general conservation value. Another sites, worthy of a comprehensive survey and description, are on the left bank of the Pripyat River and in the northwest of the ChEZ, the work on their characterization will be carried out in the next 2018-2019.