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INSTITUT DE RADIOPROTECTION ET DE SÛRETÉ NUCLÉAIRE

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Scientific Committee:

Nick BERESFORD	Natural Environment Research Council Centre for Ecology and Hydrology (NERC-CEH), UK
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Jacqueline GARNIER-LAPLACE	Institut de Radioprotection et de Sureté Nucléaire (IRSN), France European Radioecology Alliance (ALLIANCE)
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Boguslaw MICHALIK	Główny Instytut Górnictwa (GIG), Poland
Wolfgang RASKOB	European Platform on preparedness for nuclear and radiological emergency response and recovery (NERIS)

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Boguslaw MICHALIK	Gtówny Instytut Górnictwa (GIG), Poland
Wolfgang RASKOB	European Platform on preparedness for nuclear and radiological emergency response and recovery (NERIS)

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- **Session 1 - Radiation risk at nuclear legacy sites: assessment, remediation and regulation**

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- **Session 2 – NORM and TENORM with respect to long-term human and environmental protection**

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Evaluation of distribution in the landscape of radionuclides and other pollutants using analytical GIS technology

Y. Kutlakhmedov [1,*], I. Matveeva [2,*]

[1]Institute of Cell Biology and Genetic Engineering of National Academy of Sciences - Kyiv (Ukraine), [2]Institute of Ecological Safety of the National Aviation University - Kyiv (Ukraine)

*Corresponding authors, email addresses: ecoetic@yandex.ru (Y.Kutlakhmedov), ecoetic@yandex.ru (I.Matveeva)

Introduction

To assess the state of ecosystems and the welfare of using 30 different indicators and parameters: From a variety of indicator species to biomass, etc. An important feature of these indicators is the fact that almost all of them begin to change substantially only when Biota shows significant changes. From a practical point of view it is important to have indicators and parameters, which would allow a leading way to assess the state of ecosystems and biotic features of the distribution and redistribution of pollutants in real landscapes. On the basis of experimental research and theoretical analysis proposed to use such a measure as radiocapacity and / or factor radiocapacity ecosystems and its components. It developed and applied analytical method GIS technology to establish the distribution and redistribution of radionuclides - tracer (^{137}Cs) in real landscapes. It is shown that the dynamics of migration of radionuclide-tracer in real landscapes and ecosystems is correlated with the behavior of other pollutants (heavy metals, for example).With the help of an analytical GIS technology can estimate radiation exposure and environmental risks on biota, communities and staff in the area of influence of nuclear technology.

Materials and Methods

Analysis of the behavior of pollutants in the slope ecosystems, which form the basis of almost any terrestrial landscape of Ukraine, showed the ability to describe the distribution and redistribution of radionuclides methods radiocapacity theory using boxes models. Studies have shown that the rate of movement of radionuclides in the landscape is mainly determined by: the steepness of the slope (P1), type of coverage (P2), the density of plantings in the landscape (P3), vertical (P4) and horizontal (P5) migration. Methods rank evaluation assessed the likely impact of these indicators on landscape redistribution of radionuclides. Each of the indicators measured in the range from 0 to 1. By virtue of the practical independence of the indicators of the landscape, the overall assessment of the likelihood of migration of radionuclides on the elements of the landscape is defined as the probability and is calculated as follows:

- $P = P1\ P2\ P3\ P4\ P5.$ (1)

Particular problems are real landscapes, when evaluating radiocapacity parameters relate to large areas, which are factors of the system that affect the redistribution of radionuclides biotic and abiotic components of ecosystems.

Results and Discussion

As a result, we obtained estimates and forecast maps for the selected polygon (reserve "Foresters" in Koncha Zaspa near Kiev on the banks of the Dnieper River). Using the parameters that affect the redistribution of radionuclides in the terrain maps of the original uniform ^{137}Cs contamination of the landscape, and a map of redistribution of radionuclides on the basis of parameters, 10 years after the accident. It was found that the expected significant redistribution of pollutant in the studied landscape.

This process is enhanced through the evaluation of 20 years and 30 years after the Chernobyl's accident forecast map shows the sharply marked concentration of radionuclides in the areas of landscape reduction, which in this range actually relates to the swamp.

Conclusions

In addition to evaluation and prediction maps we have developed a technique that makes it possible to carry out the reconstruction of the territory of the contamination process, radiation exposure, environmental risks, as well as on the results of point measurements obtained in the field, to realize the extrapolation of pollution indicators at the whole area of research and in their temporal dynamics. It is shown that using Chernobyl fallout ^{137}Cs, both tracers may establish the fundamental characteristics of landscapes for their ability to allocate and reallocate pollutants. This method can be successfully used for the distribution of forecast and other pollutants (for example - heavy metals). This makes it possible to develop and offer specific techniques and methods of remediation of contaminated components of ecosystems in the areas of deposit of pollutants in order to minimize environmental risks.