

BIOTECHNOLOGY

UDC 502.4 (477.41)

DOI: 10.18372/2306-1472.69.11060

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ESTABLISHMENT OF THE CHORNOBYL RADIOECOLOGICAL BIOSPHERE RESERVE AS RECOVERY BIOTECHNOLOGY IMPLEMENTATION OF THE EXCLUSION ZONE

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Abstract

Purpose: an article is dedicated to preservation of the unique territory that has an inimitable combination of forests, wetlands, ponds and fallow lands, which de facto became a radioecological testing ground, under current conditions it is possible by creating a biosphere reserve on a basis of the Exclusion zone, as well as existing territories and objects of the National natural reserve fund. **Methods:** cartographic evaluation methods and the methods determining the projected rate of decline in area. **Results:** improved management of existing and new protected areas, by creating a large protected natural area in the region and strengthening the monitoring of the Chornobyl tragedy event for several globally important populations of rare and endangered species and preserve some critical sites along the African-Eurasian bird migration routes. **Discussion:** proposed preliminary functional zoning of the projected Biosphere Reserve within its respective administrative areas, land users in accordance with the suggestions of stakeholders.

Keywords: Chornobyl exclusion zone; environmental protection facilities; environmental monitoring; flora; fauna; Natural Reserve Fund; Chornobyl Radiological Biosphere Reserve.

1. Introduction

Back in 2007, Ukraine among other countries joined the resolution of the 62nd session of UN General Assembly A/RES/62/9 dated December 18, 2007, in which it was declared a transition to renewable phase in overcoming the consequences of the Chornobyl disaster. But activity in the country aimed at reviving contaminated by the Chornobyl disaster environment characterized by lack of a systematic approach. Thus, activities towards

ecological recovery not included in the list of measures in the Exclusion zone and zone of unconditional (obligatory) resettlement (art. 13 of the Law of Ukraine "On legal regime of areas contaminated by the Chornobyl catastrophe") (hereinafter - Zone). Accordingly, no strategy for future of the Zone [1–6].

Thus, an ecological emergency status of the exclusion zone was waived back then and a status of territory required long-term maintenance was accepted instead.

The long-term policy towards development of the Zone has not determined yet. There is no legal numerical definition (in terms of National radiation safety standards NRSU-97) of intermediate and recovery phases of a radiation accident which could be applicable to the Chernobyl disaster. Although the national legislation establishes clearance criteria from regulatory control for contaminated areas, but procedures whether not sufficiently prescribed or do not work where they had to be implemented de facto long time ago [1–3].

The Parliament of Ukraine in its recommendations of Chernobyl parliamentary hearings taken place in 2011 clearly stated that "concept of the Chernobyl exclusion zone in Ukraine needs to be revised for further effective use and development of the industrial site and infrastructure of the Chernobyl NPP and the exclusion zone, as well as maximal engagement of qualified personnel of the Chernobyl NPP and labor force from Slavutych city". However, published so far by the State Agency for Management Exclusion Zone documents instead a development concept of the Zone actually freezes the existing status quo of long-term maintenance [1–3, 5].

For the first time it was proposed to establish an environmental preserve in 1986 by the National Academy of Science of Ukraine. Unfortunately, in Ukraine, this idea was not supported by then, but such a preserve had been created in Belarus (of 200 thousand ha with special radioecological status).

Later, in 2005–2008, based on a request of civil group "Green Ukraine" and National Ecocenter of Ukraine (NECU) a zoological reserve was created [7, 8]. Today, pursuant to recommendations of the Parliament Committee hearings "Natural Reserve Fund of Ukraine: state and prospects of development" [9] proposed a biosphere preserve in the Zone, with inclusion of existing protected areas - "Chernobyl special zoological reserve" area of 48,870 hectares in the Zone [8], other protected areas. A formal legal request for establishment of such an ecology ground was submitted by NECU on 10.01.2013. The real current status of the Zone will remain unchanged [10].

Somewhat paradoxically, but in fact the Chernobyl disaster led to a sudden and almost total protection of the vast territory from human impact by introducing severe restrictions on human presence in the Zone, thereby creating conditions for restoration of flora and fauna. As a result, the introduction of altogether measures envisaged by the

Law of Ukraine "On legal regime of the area contaminated by the Chernobyl disaster" have actually provided the regime equivalent regime of strict conservation for many years [1, 2].

2. Analysis of the latest research and publications

Expert estimates suggest that the diversity and abundance of flora and fauna have increased to levels not being reported here for centuries. In particular, it is recorded more than 320 species of vertebrates (from total of 410 found in the region), of which 55 species (of 97 possible) are in the Red Book of Ukraine.

The populations of ungulates, carnivores, and other kinds of game have risen to the highest level in the history of observations (including lynx, otters, beavers). Despite the high number of wolves the moose population density is the highest in Ukraine. Now white-tailed eagle, spotted eagle, black stork, grey crane, owl and many other rare birds are widespread within the Zone. There are 14 species of Bats, including the Pond Bat, Barbastelle Bat and big bat (Greater Noctule), which are rare in Europe. Since the zone is at the intersection of routes of migratory birds of the African-Eurasian area, it plays an important role in maintaining the populations of these birds in their seasonal migrations [11–13, 14, 15].

In addition, territories and objects of Natural Reserve Fund of national and local importance located in Kyiv region in 2011 included 13 objects with total area of over 40,000 hectares [15].

3. Research tasks

The aim of this study is scientific justification of creating the Chernobyl Radioecological Biosphere Reserve (hereinafter - ChRBR) intended to facilitate the barrier function of Zone as well as support of the implementation by Ukraine the international obligations within framework of international conventions.

4. Results

The area affected by the disaster, especially the Zone today is a part of territory of our and neighbouring countries, where processes of gradual recovery of indigenous plant and animal systems of Polissia occur with almost of no human intervention. There is the reason to expect that within 30–50 years biocenoses will be formed value of which it is difficult to assess today.

Under current conditions it is possible to save a unique territory, a complex of forests, wetlands, ponds and fallow lands, to support the Zone in

optimum condition, to study a large territory that has become *de facto* a radioecological research ground by creating a biosphere reserve (BR) on the basis of the exclusion zone, the existing territories and objects of Natural Reserve Fund (NRF) and implementation over large areas the regime of controlled ecologically reasonable usage.

It is proposed to include to ChRBR much of the exclusion zone (which is about 230 thousand ha). This area will be divided into several functional areas: the protected zone, the buffer zone and the zone of anthropogenic landscapes. The selection of functional areas has been justified taken into account environmental conditions, location, features of the natural landscape and importance of the ecosystem in terms of conservation. Some valuable areas will be highlighted particularly in terms of conservation and study.

The Zone territory includes the area covered by forests (36%); the formerly ploughed areas (38%); busy meadows (11%); areas with water (10%); settlements (5%). The specific of the region is its radioactive contamination. The density of soil contamination with radionuclide's varies in a wide range, for ^{137}Cs within the range of 20 - 30,000 kBq/m², for ^{90}Sr - from 8 to 11,000 kBq/m², for transuranic elements - from 0.5 to 500 kBq / m². Ground vegetation is characterized by high radionuclide content. When zoning the ChRBR emerged and established practice in the region has been taken into account: there are over 30 enterprises, organizations and institutions of different subordination participating in measures to minimize the consequences of the Chernobyl disaster, particularly for radioactive waste management, monitoring, forest care, fire safety, security, protection of cultural and natural heritage.

Certain territories are not foreseen to include as a part of the biosphere reserve. Among them are: industrial site of Chernobyl NPP, radioactive waste management sites "Vector", "Buriakivka", "3rd turn of ChNPP", "Pidlisny "and other facilities with a total area of over 32 thousand ha.

According to the Law of Ukraine "On Natural Reserve Fund of Ukraine" environmental, scientific, ecological and educational activities as well as activities aimed at restoring the contaminated land are planned to be carried out there.

As part of further international perspectives of creation of this reserve it is planned to create a transboundary Ukrainian-Belarusian biosphere reserve of the area about 500 thousand ha. This

reserve will bring together also Drevlyansky Natural Reserve (Zhytomyr region, Ukraine) and Poleski National Radiation and Ecological Reserve (Belarus).

National legal definition of BR corresponds very much to essential features and functions of biosphere reserves defined by UNESCO "Action Plan on Biosphere Reserves" (1984), namely [5]:

- BR - multifunctional areas that include natural and transformed landscapes, protection of which needs various modes and practical techniques as well as complex models of natural spatial objects and systems to be protected. BR should be used to address urgent practical problems of protection and use of natural resources.

- within the BR have the opportunity to explore the features of structure and functioning of natural and altered by man ecosystems. There are preconditions for implementation of environmental monitoring, experiments and observation of the environment and sources of influence that are of interest in terms of developing environmental regimes and proposals for controlled use of natural resources, including renewable ones.

- Seville strategy of BR (1995) involves the complex following main functions:

- Reserve (protection);
- Scientific;
- Functions to maintain ecologically sustainable development;
- Ecological monitoring;
- Ecological education and awareness.

The difficulties of budget funding have not been always given opportunities to support academic, social and environmental proposal. Therefore the international status of a BR, besides the above, gives a chance for additional financial and technical support.

Activities to create ChRBR moved to a more practical results by providing the Ministry of ecology and natural resources of Ukraine with authority to guide and coordinate the State agency of Ukraine for Exclusion Zone Management [16].

In 2013 the Ministry of Ecology and Natural Resources publishes an idea of a Biosphere Reserve in the Chernobyl exclusion zone during 26th Chernobyl anniversary.

In the spring of 2013 in accordance Art. 51 Law of Ukraine "On Natural Reserve Fund of Ukraine" NGO National Ecological Centre of Ukraine submitted to the Ministry of Ecology a request for the establishment of ChRBR.

Soon, the Ministry formed the Interagency Working Group on issues of ChRBR, organized and conducted a tender for “Development of materials for a project of the Chernobyl Biosphere Reserve”.

One of the results of the mentioned above research was the distribution of ChRBR areas in terms of land using (Table 1).

Also it has been proposed preliminary functional zoning of the projected Biosphere Reserve within its respective administrative areas, land users in accordance with the suggestions of stakeholders (Fig. 1).

Table 1

Distribution of ChRBR areas in terms of land using

land users number, type of land	The area, ha		
	granted for permanent use BR	BR provided without exception	is not granted BR (area of radioactive waste management)
SSE "Chornobyl NPP"			2987.4
Building Corporation Ukrtransbud			0.97
National Railway Company		202.1	123.
National Road Building Company		152.7	11.8
Territories of the exclusion zone and zone of unconditional (obligatory) resettlement	28961.1		226964.7
TOTAL	226964.7	354.8	32084.3
TOTAL provided BR	227319.5		
TOTAL within the Zone	259403.8		

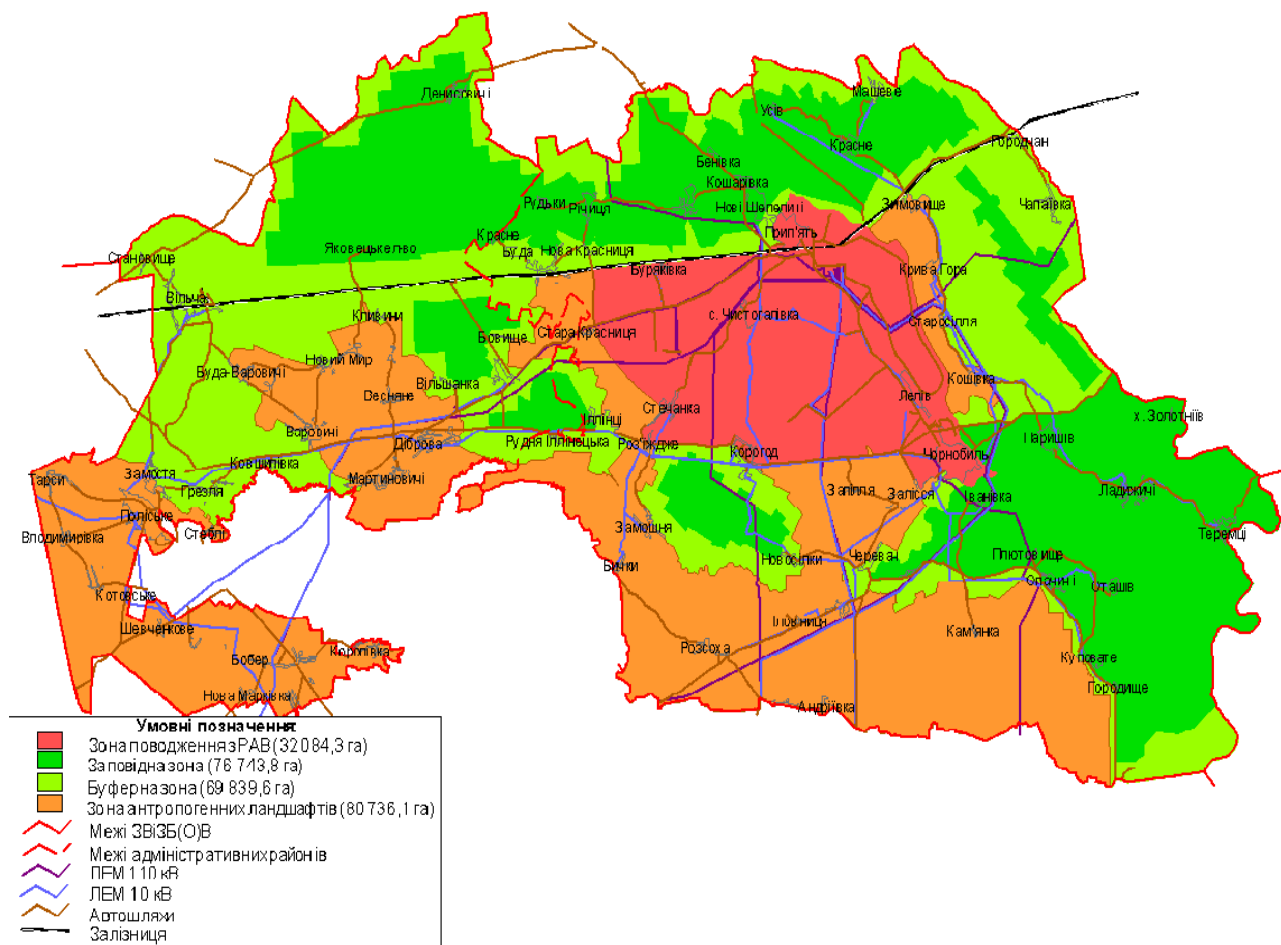


Fig. 1. Preliminary Functional Zoning of the Biosphere Reserve

5. Conclusions

Creating ChRBR will be an important step of socio-political significance and a sign of actual transition to a new phase in addressing the post-Chornobyl problems - the recovery phase.

The ChRBR launch is implementation of an idea of reasonable zoning with clearly defined borders of so called special industrial zone (for radioactive waste management) and the rest of the Zone - for the Biosphere Reserve. In such a way it will make possible conditions for safe radioactive waste management in interests of Ukraine and, at the same time, keeping unique landscapes and wildlife of Polissia, as well as putting into practice an idea of returning the restored land for common use.

Creating the ChRBR intended to facilitate the implementation by Ukraine of its international obligations within framework of international conventions and the achievement of the following specific objectives and related outcomes:

- improved management of existing and new protected areas, by creating a single large protected natural area in the region and strengthening the monitoring of the Chornobyl accident for several globally important populations of rare and endangered species and preserve some critical sites along the African-Eurasian bird migration routes.

- preservation and increase of carbon stocks through sustainable management of land use, land use change and forestry (LULUCF). Establishing monitoring and sustainable management for conservation, improvement and management of carbon stocks in forests over large areas and non-forest lands (including wetlands and peatlands).

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Створення Чорнобильського біосферного радіоекологічного заповідника як втілення біотехнології відновлення зони відчуження

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Мета: стаття присвячена збереженню унікальної території, яка має унікальне поєднання лісів, боліт, ставків і земель. Наразі дана територія стала радіоекологічним полігоном. Можливе створення біосферного заповідника на основі території зони відчуження, а також існуючих територій та об'єктів національного природно-заповідного фонду. **Методи:** оцінки на основі картографічної інформації та прогнозного визначення ступеня погіршення територій. **Результати:** поліпшення управління існуючих і нових територій зони відчуження, шляхом створення однієї великої природоохоронної території в регіоні. Посилення контролю за популяціями рідкісних і зникаючих видів. **Обговорення:** запропонована попереднє функціональне зонування біосферного заповідника в межах відповідних адміністративних районів.

Ключові слова: екомоніторинг; природно-заповідний фонд; природоохоронний об'єкт; флора; фауна; Чорнобильський біосферний радіоекологічний заповідник.

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Создание Чернобыльского биосферного радиоекологического заповедника как воплощение биотехнологии восстановления зоны отчуждения

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Цель: статья посвящена сохранению уникальной территории, имеет уникальное сочетание лесов, болот, прудов и земель. Сейчас данная территория стала радиоекологическим полигоном. Возможно создание биосферного заповедника на основе территории зоны отчуждения, а также существующих территорий и объектов национального природно-заповедного фонда. **Методы:** оценки на основе картографической информации и прогнозного определения степени ухудшения территорий. **Результаты:** улучшения управления существующих и новых территорий зоны отчуждения путем создания одной большой природоохранной территории в регионе. Усиление контроля за популяциями редких и исчезающих видов. **Обсуждение:** предложена предварительное функциональное зонирование биосферного заповедника в пределах соответствующих административных районов.

Ключевые слова: природно-заповедный фонд; природоохранный объект; екомоніторинг; флора; фауна; Чернобыльский биосферный радиоекологический заповедник.

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