

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
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FACULTY OF ENVIRONMENTAL SAFETY, ENGINEERING
AND TECHNOLOGIES
DEPARTMENT OF ECOLOGY

APPROVED TO DEFENCE
Head of the Graduate Department

V.F. Frolov
« _____ » _____ 2020

MASTER THESIS

(EXPLANATORY NOTE)

SPECIALTY 101 «ECOLOGY»
Training Professional Program “ECOLOGY AND ENVIRONMENTAL PROTECTION”

**Theme: «Environmental Assessment of Ukraine Emerald Network
Objects in the Uranium Extraction Area»**

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KYIV 2020

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ФАКУЛЬТЕТ ЕКОЛОГІЧНОЇ БЕЗПЕКИ,
ІНЖЕНЕРІЇ ТА ТЕХНОЛОГІЙ
КАФЕДРА ЕКОЛОГІЇ

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« _____ » _____ 2019 р.

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(ПОЯСНЮВАЛЬНА ЗАПИСКА)

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ОПП ««ЕКОЛОГІЯ ТА ОХОРОНА НАВКОЛИШНЬОГО СЕРЕДОВИЩА»»

**Тема: «Збереження орнітофауни для забезпечення стабільності урбоекосистеми
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КИЇВ 2020

NATIONAL AVIATION UNIVERSITY

Faculty of Environmental Safety, Engineering, and Technologies

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Direction (speciality, major): specialty 101 “Ecology”, TTP “Ecology and Environmental Protection”

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« ____ » _____ 20__

MASTER THESIS ASSIGNMENT

Anna P. Karmanska

1. Theme: «Environmental Assessment of Ukraine Emerald Network Objects in the Uranium Extraction Area» approved by the Rector on October 11, 2019, № 2364/CT.

2. Duration of work: from 14.10.2019 to 09.02.2020

3. Output work (project): literary sources, mapping of the investigated territory using open source QuantumGIS software (QGIS) and ArcGIS Online Web App, data on the location of emerald network objects, analysis of the uranium industry's impact on the objects of the natural reserve fund.

4. Content of explanatory note: (list of issues): review of the territory of the uranium industry, review and evaluation of the adjacent territories of the nature reserve fund, review of biotopes of the territory, assessment of the impact of the uranium industry on natural sites, evaluation and review of emerald network objects in Ukraine and the study area, recommendations for the protection of rare natural objects in the area uranium.

5. The list of mandatory graphic (illustrated materials): tables, figures.

6. Schedule of thesis fulfillment

№ з/П	Task	Term	Advisor's signature
1	Receiving of topic assignment, search of the literature and methodology development	18.10.2018 – 20.10.2019	
2	Preparation of the main part (Chapter I)	21.10.2018 – 10.11.2019	
3	Preparation of the main part (Chapter II)	10.11.2018 – 17.11.2019	
4	Preparation of the main part (Chapter III) and drafting explanatory note for the first preliminary presentation	17.11.2018 – 10.12.2019	
5	First preliminary presentation of the diploma work	16.12.2019	
6	Preparation of the main part (Chapter IV)	12.12.2019 – 28.12.2019	
7	Preparation of the main part (Chapter V)	02.01.2020 – 09.01.2020	
8	Preparation of the main part (Chapter VI) and drafting explanatory note for the second preliminary presentation	10.01.2020 – 21.01.2020	
9	Formulation of the conclusions and recommendations of the diploma work, editing, consultation with standard's inspector, remarks and recommendations consideration	23.01.2020 – 26.01.2020	
10	Finalizing, signatures receiving, plagiarism verification, preparation to the final protection (presentation)	27.01.2020 – 04.02.2020	
11	Protection (presentation) of the final version of the diploma work at the department	05.02.2020	

7. Consultant(s) of certain chapter(s):

Chapter	Consultant (academic rank, S.N.P)	Date, signature	
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ЗАВДАННЯ

на виконання дипломної роботи

Карманська Анна Павлівна

1. Тема роботи «Екологічна оцінка об'єктів Смарагдової мережі України в районі урановидобування» затверджена наказом ректора від «11» жовтня 2019 р. №2364/ст.
2. Термін виконання роботи: з 14.10.2019 р. по 09.02.2020 р.
3. Вихідні дані роботи: літературні джерела, картографування досліджуваної території за допомогою програмного забезпечення з відкритим кодом QuantumGIS (QGIS) та веб-додатку ArcGIS Online, дані про розташування об'єктів смарагдової мережі, аналіз впливу уранової промисловості на об'єкти природно-заповідного фонду.
4. Зміст пояснювальної записки: огляд території уранової промисловості, огляд та оцінка прилеглих територій природно заповідного фонду, розгляд біотопів даної території, оцінка впливу уранової промисловості на природні об'єкти, оцінка та огляд об'єктів смарагдової мережі в Україні та на досліджуваній території, рекомендації стосовно захисту рідкісних природних об'єктів в зоні впливу видобутку урану.
5. Перелік обов'язкового графічного (ілюстративного) матеріалу: таблиці, рисунки.
6. Календарний план-графік

№ з/п	Завдання	Термін виконання	Підпис керівника
1	Отримання завдання, пошук літературних джерел по темі, напрацювання методології роботи	18.10.2018 – 20.10.2018	
2	Підготовка основної частини (Розділ I)	21.10.2018 – 10.11.2018	
3	Підготовка основної частини (Розділ II)	10.11.2018 – 17.11.2018	
4	Підготовка основної частини (Розділ III) та підготовка до першого попереднього захисту	17.11.2018 – 10.12.2018	
5	Перше попереднє представлення роботи на кафедрі	11.12.2018	
6	Підготовка основної частини (Розділ IV)	12.12.2018 – 28.12.2018	
7	Підготовка основної частини (Розділ V)	02.01.2019 – 09.01.2019	
8	Підготовка основної частини (Розділ VI) та підготовка до другого попереднього захисту	10.01.2019 – 21.01.2019	
9	Формулювання висновків та рекомендацій, косметичні правки, консультація з нормоконтролером, урахування зауважень	23.01.2019 – 26.01.2019	
10	Дооформлення, отримання підписів, перевірка на плагіат, підготовка до захисту	27.01.2019 – 04.02.2019	
11	Захист готової роботи на кафедрі	06.02.2019	

7. Консультація з окремого(мих) розділу(ів):

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8. Дата видачі завдання: « ____ » _____ 20__ р.

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ABSTRACT

Explanatory note to the Master Thesis " Environmental Assessment of Ukraine Emerald Network Objects in the Uranium Extraction Area ": table, literature.

Object of research: environment assessment of Natural Preserve Fund objects within the uranium mining area.

Subject of research: the Natural Preserve Fund objects in the vicinity of uranium mining area.

Aim of research: Natural substances within the internal antigenic load, as well as exposed elements of the Emerald Network.

Methods of research: The references to the creation of Emerald Network projects in the gloomy countries of Ukraine are very relevant today, using analytical and scientific work within the framework of a strong supervisory body, and its work on natural resources.

Analysis of the creation of the Emerald Company facilities will help to evaluate the stations that require the Council of Europe to approximate the legislation of Ukraine, which seek to investigate the Berne Convention and its necessary recommendations and recommendations.

EMERGENCY NETWORK, BIOTOPES, NPF OF UKRAINE, MINING INDUSTRY, MAPPING, BIOGRAPHICAL REGIONS.

РЕФЕРАТ

Пояснювальна записка до дипломної роботи «Екологічна оцінка об'єктів Смарагдової мережі України в районі урановидобування»: с., рисунків, таблиць, формула, літературних джерел, додатків.

Об'єкт дослідження: оцінка об'єктів Смарагдової мережі в зоні видобутку урану.

Предмет дослідження: об'єкти Смарагдової Мережі в зоні видобутку урану.

Мета роботи: оцінка природних об'єктів в межах впливу антропогенного навантаження, та розгляд об'єктів Смарагдової мережі.

Результати, новизна та значущість: завдання щодо оцінки створення об'єктів Смарагдової мережі в областях України дуже актуальне на сьогодні, особливо в межах сильного антропогенного навантаження, проведений аналіз роботи урановидобувної промисловості та її вплив на природні об'єкти.

Аналіз створення об'єктів Смарагдової мережі допоможе оцінити стан виконання вимог Ради Європи щодо апроксимації законодавства України, яке необхідно для виконання Бернської конвенції та її відповідних резолюцій та рекомендацій.

СМАРАГДОВА МЕРЕЖА, БІОТОПИ, ПЗФ УКРАЇНИ, УРАНОВИДОБУВНА ПРОМИСЛОВІСТЬ, КАРТУВАННЯ, БІОГЕОГРАФІЧНІ РЕГІОНИ.

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LIST OF SYMBOLIC NOTATIONS, ABBREVIATIONS AND NOTIONS

ROI - regions of interest

NPF - Naturally Protected Fund

RS - Remote sensing of the earth

GIS - Geographic Information System

QGIS - QuantumGIS software

EIA - Environmental Impact Assessment

INTRODUCTION

Relevance of theme. Ukraine has the largest uranium ore resources and reserves in Europe. The biggest environmental problems are caused by environmental pollution during the extraction and processing of radioactive ores. For many years in the area of operation of uranium mining enterprises exposed to the dangerous effects of objects of the nature reserve fund.

Aim and tasks of the diploma work: to assess the Natural Reserve Fund (NRF) objects within the uranium mining area for the purpose of including them into the Emerald Network

Tasks of the work:

1. To analyze biogeographical regions of Ukraine and location of regions of interest (ROI) on the border between the Continental and Steppic zones.
2. To overview the NRF objects located within the uranium mining area.
3. To identify the typical and specific biotopes within the study area.
4. To create a raster format map and identify the locations of all the ROI for the purpose of spatial assessment of ROI.

Object of research: environment assessment of Emerald Network objects within the uranium mining area.

Subject of research: the Emerald Network objects in the vicinity of uranium mining area.

Methods of research. To solve the tasks used:

1. analysis of literary data;
2. perform research using open source QuantumGIS software (QGIS) and ArcGIS Online Web App.

The choice and correct use of well-known and repeatedly verified methods of research provided the validity of the results and conclusions obtained in the thesis.

Remote methods of research, including those used in this work, allow to detect and map the process of impact on biotops under the influence of anthropogenic

activities.

The first section of the dissertation provides a general description of the emerald network in Europe and Ukraine. The objects of the nature reserve fund and the emerald network on the territory of the mining industry are considered.

The second section of the paper analyzes the methods of remote research, sets the task of studying the state of landscapes using multispectral space images, examining image processing and calculating vegetation indices.

In the third section a remote Environmental Assessment of Ukraine Emerald Network Objects in the Uranium Extraction Area.

Personal contributeon of the graduate:

Independently worked and systematized materials of the owners of the work - mapping of the investigated territory, an assessment of the location and condition of the objects of nature reserve fund of Ukraine and objects of the Emerald Network.

Publications: The results of the research were reported to the International Scientific Conference of Young Scientists "Regional Environmental Problems" (2018), the V International Scientific Conference of Young Scientists "Ecology, Neoecology, Environmental Protection and Balanced Natural Resources" (Kharkiv, 2017), the XI All-Ukrainian Scientific and Practical Conference of Young Scientists Scientists and students "ENVIRONMENTAL SAFETY OF THE STATE" (2017).

CHAPTER 1. GENERAL CHARACTERISTICS OF THE EMERGENCY NETWORK

1.1. Emerald network characteristics

The rate at which various species of animals and plants disappear in Europe and around the world is steadily increasing. It has been estimated that today the extinction rates of different species of animals and plants are 100, or even 1000 times higher than the rates of natural changes in species and far exceed the rates of occurrence of new species of animals and plants.

According to the World Union for Conservation of Nature, 15% of mammals, 13% of birds, 37% of freshwater fish and 23% of amphibians in Europe are endangered. Biodiversity is a natural heritage that must be preserved and passed on to future generations, especially given its inherent value and the ecosystem services it provides (such as food supply, air quality, water purification, pollination of plants and rest)[2].

1.1.1. Legal bases of formation of ecological network

The legal foundations for the formation of the ecological network were first laid down in the Law of Ukraine "On Environmental Protection" (1991), which refers to a single territorial system of specially protected areas. Subsequently, this idea is timely enshrined in the Law of Ukraine "On the Nature Reserve Fund of Ukraine" (1992), as well as the Program of Prospective Development of the Nature Reserve in Ukraine "Reserves" (1994), which outlined the general - the territorial concept of the ecological network in the context of the development of the system of nature reserves. This program stipulates that "the development of the network of nature reserve fund should be combined with optimization of the structure of other areas, which are especially protected and have ecological, protective functions (forests of I group, green zones of cities and towns, water protection zones , forest protection

strips and others), with the purpose of formation taking into account landscape conditions, structure of hydrological basins, dynamic and other peculiarities of natural complexes of the territorial basis of the national system of environmental protection of natural environment *eredovyscha*, which are particularly valuable ecologically territory ("environmental units") are connected by "ecological corridors", including transnational ".

In 1995, the Pan-European Strategy for the Conservation of Biological and Landscape Diversity was adopted by the Ministers of the Environment and the Environment in 1995 for the implementation of the Convention on Biodiversity within the European Continent, although work on its creation began 10 years earlier. The strategy has been endorsed by 54 countries that want the network to cover as much of the diversity of national nature protection systems as possible, although they are usually quite complex in terms of classification and structure of conservation areas, and sometimes incompatible with one another[2].

The following international instruments are also relevant to the legal bases: Convention on Wetlands of International Importance, Mainly as Waterfowl Habitats, Convention on the Conservation of Migratory Species of Wild Animals, Convention on the Conservation of Wild Flora and Fauna and habitats in Europe, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the World Heritage Convention, the Convention on Biological Diversity, the EU Directives Conservation of habitats and wild fauna and flora, Natura-2000 within the framework of the European Union Directives on Habitats and Wild Birds, Council of Europe Resolution on Biogenetic Reserves and the awarding of conservation areas with a European Diploma adopted by the European Union agri-environmental regulations, the Maastricht Declaration "Preserving Europe's Natural Heritage: Creating a European Eco-Network", IUCN reports "Parks for Life: A Plan of Action for Conservation Areas vropy "and so on[2].

The first special document in Ukraine for the implementation of the European Biodiversity and Landscape Diversity Strategy was the Biodiversity Conservation Concept, which was approved by the Cabinet of Ministers of Ukraine on May 12,

1997. Its norms at the national level proclaim the creation of a national ecological network - one of the main areas of activity in the field of biodiversity conservation. This important document also emphasized that the National Ecological Network "is being established to restore the natural habitats of wild flora and fauna, to improve the conservation status of individual components of biological diversity, to strengthen ecological links and the integrity of ecosystems", and , must comply with international requirements and be compatible with similar networks of neighboring countries. In the same 1997, on November 12, the Resolution of the Cabinet of Ministers of Ukraine "On Improvement of State Management of the Reserve Business in Ukraine" defined the task - to develop the National Program of formation of the national ecological network of Ukraine, which was adopted by a separate relevant law of Ukraine in 2000. In 2004, the Law of Ukraine "On the Ecological Network of Ukraine" was adopted, which defined the structure, its constituent elements, principles of formation, preservation, use, management, means of providing the ecological network. Special rules of this law are designing, schemes and order of formation, state monitoring and accounting of territories and objects of eco-network. Thus, the principle of inheritance between the state program "Reserves" and the Law of Ukraine "On the National-National Program of Formation of the National Ecological Network of Ukraine for 2000-2015" was maintained, the latter document being of unique importance for the post-Soviet space, since it unites the taxonomic and territorial direction in nature protection, is unconventional, focused on the large-scale and rapid enhancement of the role of nature conservation in the country, opens a new world view in greening nature conservation[2].

The main basis for designing the national eco-network of Ukraine should be the Consolidated scheme of formation of the ecological network of Ukraine, which is part of the General scheme of planning of the territory of Ukraine, developed by the Dipromisto Institute and approved in 2002 by the relevant Law of Ukraine "On the General scheme of planning of the territory of Ukraine". That is, the basic directions of state planning include the establishment of a single territorial system of the national ecological network with the need to use the territories and objects of the

nature reserve fund. For the implementation of this law a special monitoring is organized, the basics of its implementation are regulated by the Government of Ukraine. The consolidated scheme of forming the ecological network of Ukraine is approved by the Verkhovna Rada of Ukraine.

Therefore, the nature conservation business has today significantly expanded the scope of its facilities, it is not only a nature reserve fund, but also all other natural areas, which are especially protected and are spatial components of the ecological network.

1.1.2. Elements of the eco-network

The idea of the eco-network comes from the theoretical foundations of the system of nature reserves. It originated in the scientific works of Soviet scientists in the field of protected geosology in the 70s of the XX century, who understood by this phenomenon the biogeographic system of nature reserves, which should be connected together by "natural corridors". The ecological network, as a means of maintaining the continuity of vegetation in landscaped anthropogenic landscapes, is a collection of nodal territories whose landscape and biotopic organization is undisturbed or more or less approaching its natural state. In addition to the nationally-protected nature reserve territories, which represent the highest concentration of biodiversity and are important nodal elements, other natural territories that have not undergone significant anthropogenic transformation are also included in the ecological network. In the national ecological network of Ukraine, each geosozological category of the nature reserve fund must have its own status and functions, which are fixed by law. Therefore, the national ecological network should become a real national property of the Ukrainian people, the guarantee of the environmental stability of the entire territory of the state. The structural elements of the eco-network include key, connecting, buffer and restoration territories and others (Fig. 1.1.).

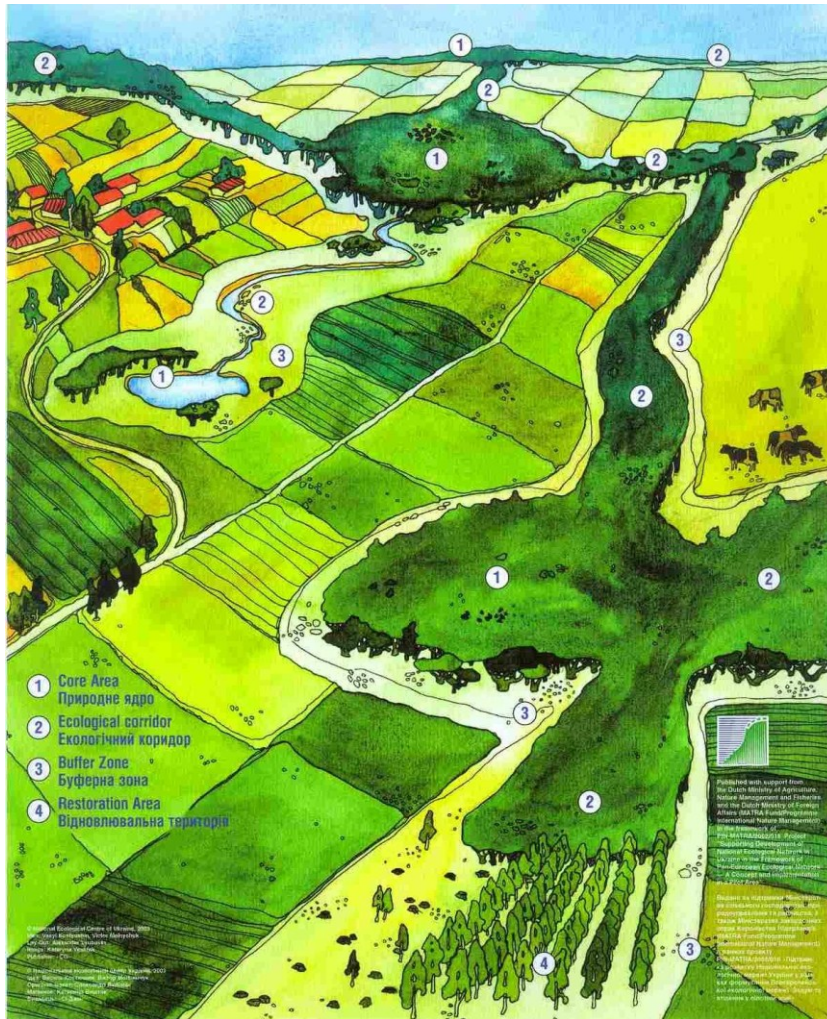


Fig. 1.1. Basic elements of the eco-network natural cores (№ 1), connecting territories environmental corridors (№ 2), buffer zones (№3) and renewable territories (№ 4).

In their unity, they create an eco-network that functionally integrates the diversity cells into a single spatial system.

Key areas (natural cores) ensure the conservation of the most valuable and typical components of biological and landscape diversity in the region, including habitats for rare and endangered species of plants and animals[2].

As a rule, natural nuclei include:

- Legal status areas - international and national nature conservation areas of various categories;
- large unfragmented habitats of species;

- important for certain species, identified as a result of species distribution analysis;

- valuable landscapes;

- territories with certain geomorphological characteristics.

Interconnected territories (ecological corridors) combine key territories to ensure animal migration and the exchange of genetic material. The following types of environmental corridors are identified: migration, pendulum migration corridors, distribution corridors, and connecting corridors.

Main features of eco-corridors:

- ensuring the distribution of species;

- maintaining species reproduction processes and promoting genetic exchange;

- ensuring migration of species;

- ensuring the experience of types of adverse conditions and hiding;

- maintenance of ecological balance.

Buffer territories protect key and connecting territories from anthropogenic impact. These are the transition lanes between natural and commercial areas. The purpose of creating buffer zones is to control economic activity on lands adjacent to natural nuclei, which should be implemented through quality management on these lands, which will reduce the negative impact on natural nuclei and reduce the likelihood of their isolation.

Restoration territories - territories whose natural state is disturbed by anthropogenic influence; territories with active manifestations of unfavorable geodynamic processes for which priority must be given to restoration of the natural state, in which it is necessary and possible to restore the natural vegetation cover and to repatriate plant and animal species (transfer of artificially propagated plants to natural conditions).

These four elements of the ecological network reflect, to some extent, the habitats of plant species and communities, fauna, and their migratory routes. Natural areas that are small in area may enter natural corridors and buffer zones with a special conservation regime. The transboundary nature reserves are the connecting links

between the national eco-networks of the neighboring countries with Ukraine in the common pan-European ecological network.

1.1.3. European Ecological Network

The European Ecological Network is an integrated concept. The resources of its formation should be understood, first of all, the protected areas protected and managed on the basis of European environmental law. The pan-European ecological network will contribute to the achievement of the main goals of the European fundamental document - the European Strategy for the Conservation of Biological and Landscape Diversity by safeguarding the entire complex of ecosystems, habitats, species diversity and landscapes of European importance; control over the provision of sufficient territorial space for environments to conserve biotic species; creating opportunities for their resettlement and migration; ensuring the restoration of damaged components of key ecosystems and protecting them from potential hazards.

European Ecological Network. Structural elements: natural nuclei (cells of holistic nature, key areas, may be quasi-natural) - allocated to conserve biotic and landscape diversity, ecosystems, habitats, species and landscapes; ecological corridors (transition zones) are allocated to improve the interoperability of natural systems; restoration areas are established to restore the natural state or complete reproduction of disturbed ecosystems, habitats and landscapes of European importance; buffer zones are allocated to maintain and protect the network from harmful external influence[3].

The EU-wide networking program includes the development of a physical network of natural nuclei, ecological corridors, redevelopment areas and buffer zones. The implementation of this mechanism should take place in the following areas of development:

- developing criteria for identifying natural nuclei, ecological corridors, restoration areas and buffer zones, taking into account the biogeographic areas of Europe;

- selection of ecosystems, types of habitats, species and landscapes of European importance;
- identifying specific areas and corridors that will preserve and, in individual cases, improve or restore the corresponding ecosystems, habitats, species, their genetic diversity and landscapes of European importance;
- developing guidelines that ensure the most consistent and effective implementation of eco-networking measures. The pan-European eco-network must meet a number of requirements: the conservation and restoration of biodiversity, the adaptation of the structure to the natural and economic conditions of the territories, the integration of conservation areas into an ecologically balanced economy, and the mobility of the mechanism of nature protection policy[2].

A very important aspect in the formation of the pan-European eco-network is the consideration of considerations for the conservation of biotic and landscape diversity in different sectors of the economy. The main pan-European tasks in this activity are:

- appeal to each industry (agrarian, aquatic, fishery, forestry, energy, industry, tourism, defense, structural and regional policy, urban and rural development) to submit their own biodiversity and landscape diversity plan, which should consist of the following components: activity description, characterization of positive and negative impacts on biotic and landscape diversity; consideration of the importance of biotic and landscape diversity in the field; identifying objectives that include goals for strategy in Europe and national goals for biodiversity and landscape diversity, defined by official levels, etc .;
- promoting the rational use of particularly environmentally valuable (well-preserved) territories in agricultural areas;
- ensuring proper use of funding mechanisms;
- ensuring the necessary guarantees for biotic and landscape diversity during the privatization process.

For example, the forestry that has the most responsible role in the conservation of forests within the Pan-European Ecological Network, where for centuries intensive

management of monoculture, depletion of ground water, forest fragmentation, forest melioration has occurred. etc. To improve the situation on the European continent, there are common tools such as the Forest Principles of the United Nations Conference on the Environment and Development (UNCED), the resolution of the Conference of Ministers of the Environment on the Protection of Forests in Europe; Convention on Environmental Impact Assessment (EIA) in a Transboundary Context; Convention on Long-range Transboundary Air Pollution; Protocol on Nitrogen Emissions, Protocols 1985 in Helsinki and 1994 in Oslo, European Parliament Resolution on European Forests, Annual Reports on the State of Forests in Europe and the like. There are nine main tasks in this aspect:

- the allocation of natural areas that ensure the conservation of all types of forests in Europe, as well as the establishment of specific priorities aimed at fully maintaining the conservation of existing forests;

- Conservation of forested natural areas in accordance with the requirements of the Berne Convention (habitats), the European Union Directive and the United Nations Economic Commission for Europe (UNECE) on endangered species;

- development and implementation of an action plan, national policy for the conservation of biotic and landscape diversity in forest management, utilization and restoration of their resources, with the advantage of forming afforestation of indigenous species of plants;

- organizing and conducting scientific research on balanced forestry, adjusting its systems in Europe to optimally adapt to climate change, providing healing and many other forest functions, developing a rational approach to forest carbon maintenance and accumulation, and also other scientific research foreseen in 1993 by the resolution of the Fourth Helsinki Conference of Ministers of the Environment on the protection of Europe's forests;

- formation of an effective network of nature conservation areas to preserve the northern boreal forests;

- Improvement of the mechanisms of environmentally balanced use, protection of the mature and overgrown natural forests of the southwestern and southeastern parts of the Mediterranean;

- identifying and organizing plans for the restoration of the most valuable fragmented forests in Central and Eastern Europe and the Atlantic region;

- developing a program for assessing and defining biodiversity and landscape diversity conservation measures, taking into account market mechanisms and privatization that affect the balanced use of forests in Central and Eastern Europe;

- Introduce procedures to ensure closer cooperation with indigenous and local populations for the effective and balanced use of forest biodiversity for economic and social purposes in the Arctic and Northern regions, Central and Eastern Europe.

Therefore, adopting a Pan-European Biodiversity and Landscape Diversity Strategy is of historic importance for the formation of a system of nature reserves in Ukraine as part of a global process for building the Pan-European Ecological Network, which provides for: practical practical measures), stimulating efforts to build national eco-networks of countries and strengthen their European ties, promoting the dissemination of environmental information on the phenomenon ecological network[2].

1.1.4. Emerald Network in Ukraine

Designing of regional ecological networks of Ukraine is carried out in accordance with international documents, national regulatory framework and decisions of local authorities for individual administrative units of subdivision (territories, districts, forestry enterprises), as well as natural regions (zones , mountainous countries, plains, lowlands, highlands, littoral strips, basins, etc.). The design is based on the need to implement regional programs for the formation of ecological networks, which are based on regional schemes as the main planning materials, respectively. To develop regional schemes for the formation of ecological networks, they use biosozological information on biodiversity conservation ("red lists", catalogs, conservation programs, etc.), general information about nature

conservation areas, legal, statistical and cadastral documents, mapping, land surveying materials, conservation plans, land reclamation, landscaping, use and reproduction of natural resources, and other materials. All this organizational work is provided by territorial executive authorities in the field of environmental protection with the participation of design and research institutions. Therefore, the following land categories are included in the regional eco-networks:

- territories and objects of nature reserve fund of international, national and local importance, as well as reserved lands;
- natural areas not included in the Nature Conservation Fund and growing natural plant communities listed in the Green Paper of Ukraine, as well as rare species of fauna and flora that are included in the Red Book of Ukraine and relevant international them "red lists" and other environmental documents;
- Forest lands (forest protection strips, protective and forest plantations, subalpine meadows and woodlands, green forest and sanitary protection zones, water forests, forest strips along transport paths, most valuable forest areas and other valuable forest areas);
- waters of the water fund (wetlands of international, national and local importance, wetlands, water protection zones, higher watersheds, rivers, lakes, coastal natural stripes);
- lands of meadow, steppe and other ecofunds with natural grass vegetation (steppe, halophytic, meadow, petrophytic, psamophytic, ie vegetation of pastures, hayfields, stone scattering of floors, sands, salt marshes, etc.);
- recreational and recreational land with their natural resources, forest parks and landscaped parks;
- re-naturalized, reclaimed and conserved lands, natural areas of military training sites, etc .;
- radioactive and other contaminated lands that are not used but are protected as natural territories with a special special status.

In addition, regional ecosystems can be associated with natural areas with historical and cultural sites, designated areas for afforestation, land with elements of soil erosion, chemical contamination, abandoned agricultural lands, etc.

Formation of regional eco-networks is usually based on regional environmental programs, such as "Ecology 2010". In Soviet times, these were mainly integrated territorial programs for environmental protection. In this plan, particularly active work on the development of programs for the formation of ecosystems at the regional level began in the Carpathian region (Chernivtsi region), Donbass (Donetsk region), Polissya (Chernihiv region), in the city of Kiev. Current programs include implementation of measures for the use of semi-natural territories for the balanced conservation of biodiversity, restoration of the ecological balance of degraded ecotopes and biotopes, restoration of biotic resources.

1.2. Biogeographical region

Biogeographical region is a territory with relatively homogeneous environmental conditions and similar characteristics of natural vegetation, animal communities and natural and climatic conditions. Legally, the definition of the biogeographic region has not been approved.

The division into biogeographic regions is applied when designing the Natura 2000 network in EU Member States and when designing the Emerald network in other countries[28].

The territory of Ukraine is divided between the continental biogeographic region (approximately coincides with the Polissia and Forest-steppe climatic zones), the steppe (coincides with the Steppe climatic zone and the subtropics zone in the Mountain Crimea), the Alpine (Ukrainian Carpathian, and the Rhodopes), .

The Black Sea biogeographic region was not singled out on the territory of Ukraine, so the Black Sea coastal zone in Ukraine, as well as the whole of Crimea, are now part of the Steppe Biogeographical Region[29].

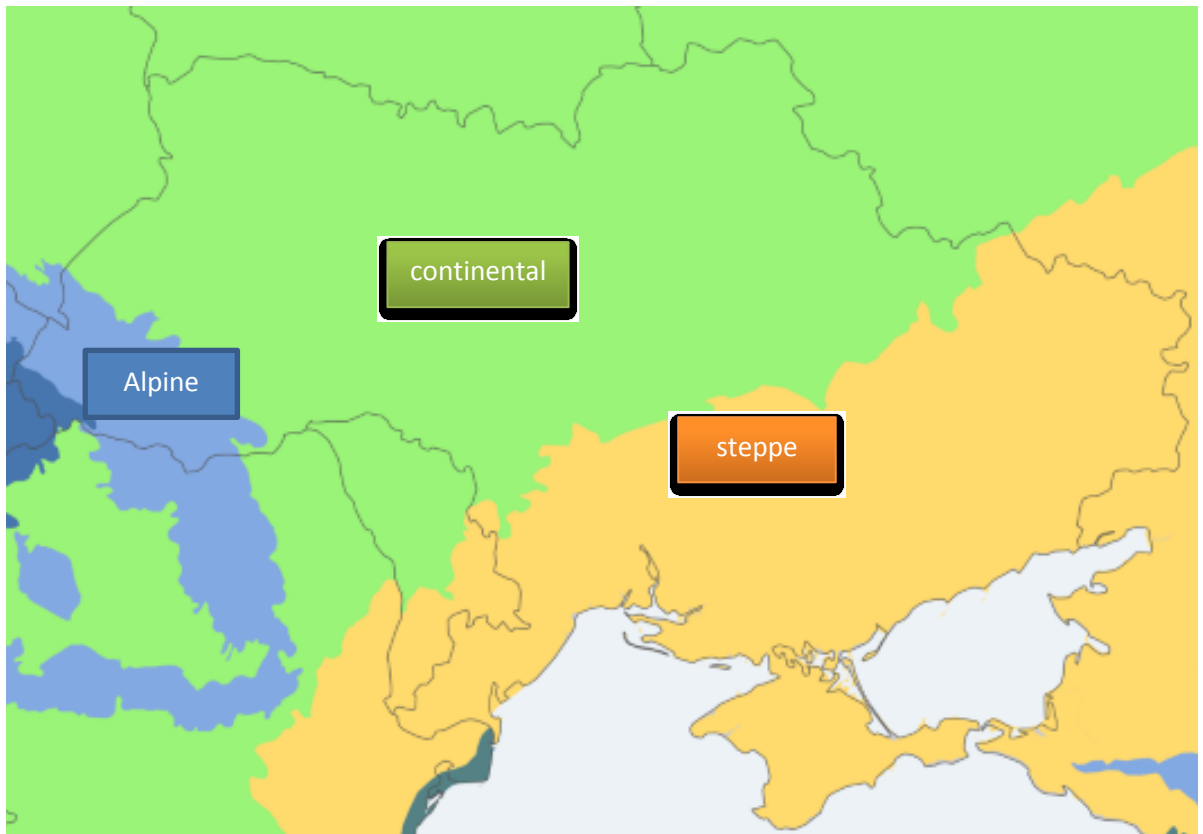


Fig. 1.2. Biogeographical regions of Ukraine

1.3. Conclusion

The Emerald Network of Europe is an ecological network comprising Special Areas of Special Conservation .

Ecological network is a system of interconnected territories subject to management, monitoring and accounting. The purpose created under the Berne Convention Emerald Network is to ensure the long-term survival of species and natural habitats (habitats or habitats) that require special conservation measures (eg falcon falcon or loose coastal dunes).

Inclusion of territories in the Emerald network is based on the so-called biogeographic approach. The biogeographic approach means that the assessment of the adequacy of designated areas of the Emerald network for the long-term conservation of species and habitats is carried out within biogeographic regions.

The territory of Ukraine is divided between the continental biogeographic region (approximately coincides with the Polissia and Forest-steppe climatic zones),

the steppe (coincides with the Steppe climatic zone and the subtropics zone in the Mountain Crimea), the Alpine (Ukrainian Carpathian), the Pannonian region, and the Pannonian .

CHAPTER 2. DISTANCE LEARNING METHODS

METHODS OF DISTANCE RESEARCH

2.1. Distant research methods

The geoinformation system is a modern computer technology that allows you to combine the model image of the territory (electronic mapping of maps, diagrams, cosmic and aero-images of the earth's surface) with tabular type information (various statistical data, lists, economic indicators, etc.). Also, the geographic information system is understood as a system for managing spatial data and associated attributes. More specifically, it is a computer system that enables the use, storage, editing, analysis and display of geographic data[45].

Geographic information technologies, GIS technologies are the technological basis for the creation of geographic information systems that enable their functional capabilities to be realized.

Distinctive feature of geographical information systems is the presence in their composition of specific methods of analysis of spatial data, which together with the means of input, preservation, manipulation and presentation of spatially coordinated information form the basis of technology of geographical information systems, or GIS-technologies. It is the existence of a set of capable of generating new knowledge of specific methods of analysis using both spatial and non-spatial attributes, which determines the main difference of GIS technology from technologies such as automated mapping or automated design systems[46].

Remote sensing of land is a way of obtaining information about the earth's surface and objects located on it by registering electromagnetic radiation that is reflected from them, without direct contact.

Quite often, talking about remote sensing, involves removing the Earth from outer space. To date, in the space there are dozens of different types of devices that perform data collection using various remote methods[47].

Among them, commercial vehicles, whose images are available for use not only to government and military structures, but also to a wide range of users worldwide, play a significant role.

Data obtained through remote sensing of land from space and airborne, are widely used in various fields of activity: creation and updating of maps; inventory, planning and management of territories; ecological and environmental monitoring; estimation of the state of crops, forecasting of the crop; forest control, monitoring of felling and forest fire consequences assessment; observing and forecasting weather, controlling climate change; prediction and observation of natural disasters; geological exploration, exploration of minerals; study of atmosphere and world ocean[48].

Within the study of the earth's surface there are various problems associated with anthropogenic and natural changes in environmental conditions. Some of these conditions can be detected directly by space images, others only by indirectly identifying interactions, some require analytical means of research.

The ecological informativeness of the same materials of space photography is diverse for various natural objects, as well as the methods of remote sensing that are used to obtain this information.

The most complete concept is studied for plants, that is, their requirements for abiotic environmental conditions and reactions to anthropogenic influence are known. Since vegetation is the most vivid indicator of the ecological state of natural complexes of different hierarchical rank [49].

Geographic information technologies, GIS technologies are the technological basis for the creation of geographic information systems that enable them to realize their functional capabilities. Distinctive feature of geographical information systems is the presence in their composition of specific methods of analysis of spatial data, which together with the means of input, conservation, manipulation and presentation of spatially-coordinated information form the basis of technology of geographical information systems, or GIS-technologie. Remote sensing of land is a way of obtaining information about the earth's surface and objects located on it by

registering electromagnetic radiation that is reflected from them, without direct contact. Data obtained through remote sensing of land from space and airborne, are widely used in various fields of activity: creation and updating of maps; inventory, planning and management of territories; environmental and environmental monitoring; estimation of the state of crops, forecasting of the crop; control of forest condition, monitoring of felling and assessment of the consequences of forest fires; observation and forecasting of weather, control of climate change; prediction and observation of natural disasters; geological exploration, exploration of minerals; study of atmosphere and world ocean [50].

Ecological informativity of the same materials of space photography is diverse for various natural objects, as well as remote sensing methods used to obtain this information. The most complete concept is studied for plants, that is, their requirements for abiotic environmental conditions and reactions to anthropogenic influence are known.

2.2. Justification of the choice of maps and their pre-processing

The use of remote research methods enables the processing of space images of medium and high spatial resolution, revealing the smallest details of landscape changes, caused in particular by human activity. The subject of study is the territory of development of mining and extraction of uranium industry. Uranium deposits in Ukraine are being developed underground in large volumes and are therefore fairly considered as objects of environmental and radiation hazards for the environment and public health. The main extraction of uranium ores is carried out in the Kirovograd region - Ingul'skaya, Smolinskaya and Novokonstantinovskaya mines[51].

The use of remote research methods is the most advantageous option because access to objects of study is impossible due to the danger of the object and the complex system of organization of mines.

The study of the state of natural complexes will be based on the study of ArcGIS geographic information program. These programs are public and reliable. Preprocessing is mapping, tracking, and digitizing [52].

First, we tied the map, for this we determine the exact coordinates of the studied place, and translate them into decimal numbers.

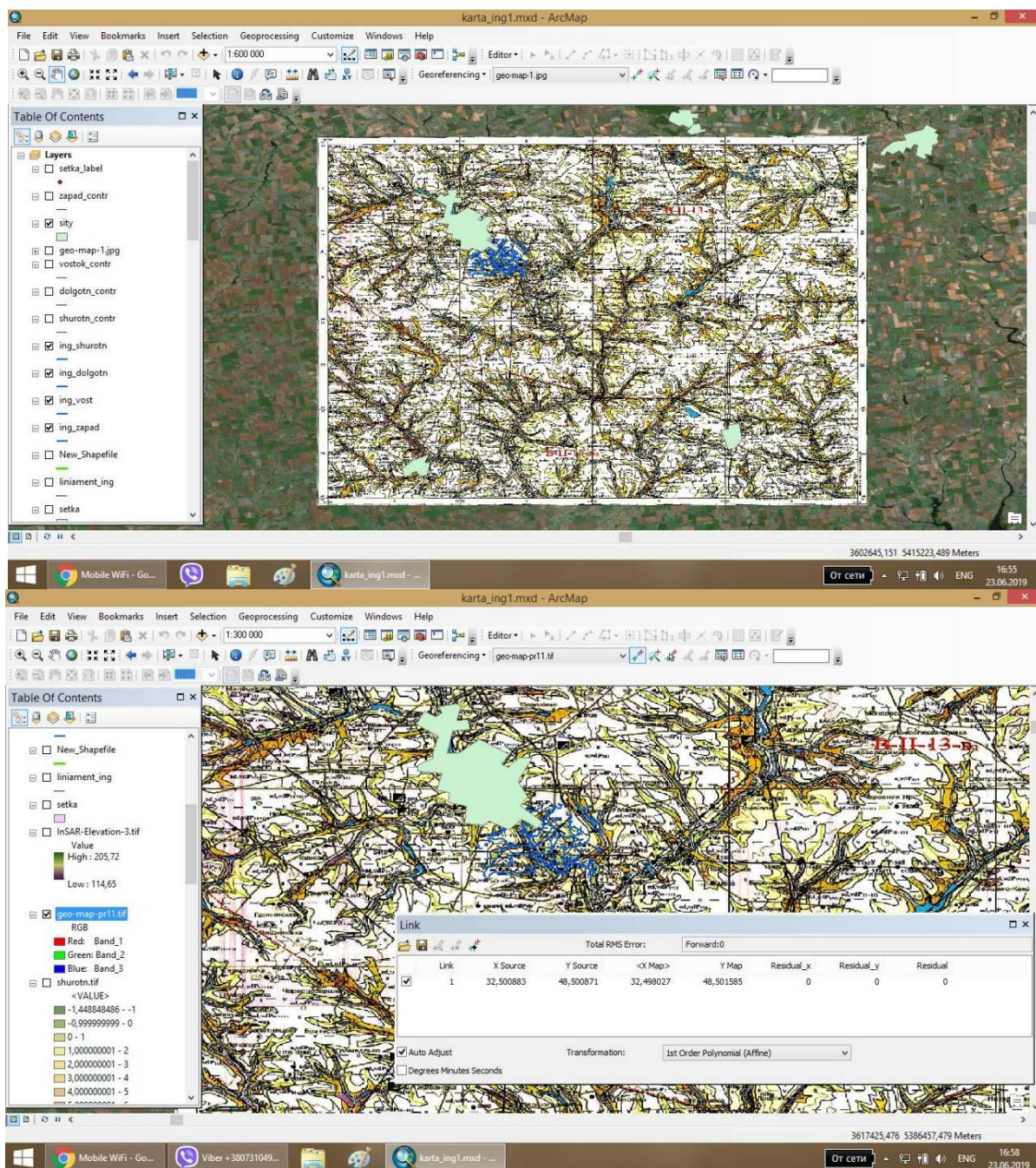


Fig. 2.1. the process of binding the card to the location of the object

2.2. The task of studying the state of landscapes of urbanized territories using multispectral space images

According to the results of specialized processing of multispectral space images, it is possible to determine the total area of projective vegetation cover, determine its quantity and qualitative state.

Objective assessment of vegetation is an effective tool for environmental display of a natural urban environment and a description of the overall quality of life in the city.

But to date there has not yet been developed a holistic integrated method or geoinformation technology that would allow to objectively, reliably and promptly assess the vegetation state of urbanized territories on the basis of a definite single integral indicator that would take into account not only the quantity but also the quality of plantings.

The use of data and methods of remote sensing of the Earth (DZZ) allow to identify and map the processes of changing geosystems under the influence of anthropogenic activity. The results obtained by remote sensing methods and confirmed by ground measurements are the most reliable. At the same time, they are designing nature reserve fund (PFP) assets based on them, especially in conjunction with space digital imaging technologies [53].

The study is based on the open source software QuantumGIS (QGIS) and ArcGIS Online Web App. A raster format map was created, locations of uranium industry objects were identified, and borders of biogeographic regions of Ukraine were identified [54].

In the first stage, a project was created in the WGS 84 / UTM metric 36N EPSG coordinate system 36N EPSG: 32636 and a map of biogeographic regions of Ukraine was uploaded. The following is a spatial anchorage of the image using the software modules.

In order to assess the state of the natural complexes in the studied area, a number of scientific studies are required in accordance with the research scheme presented in fig. 2.1.

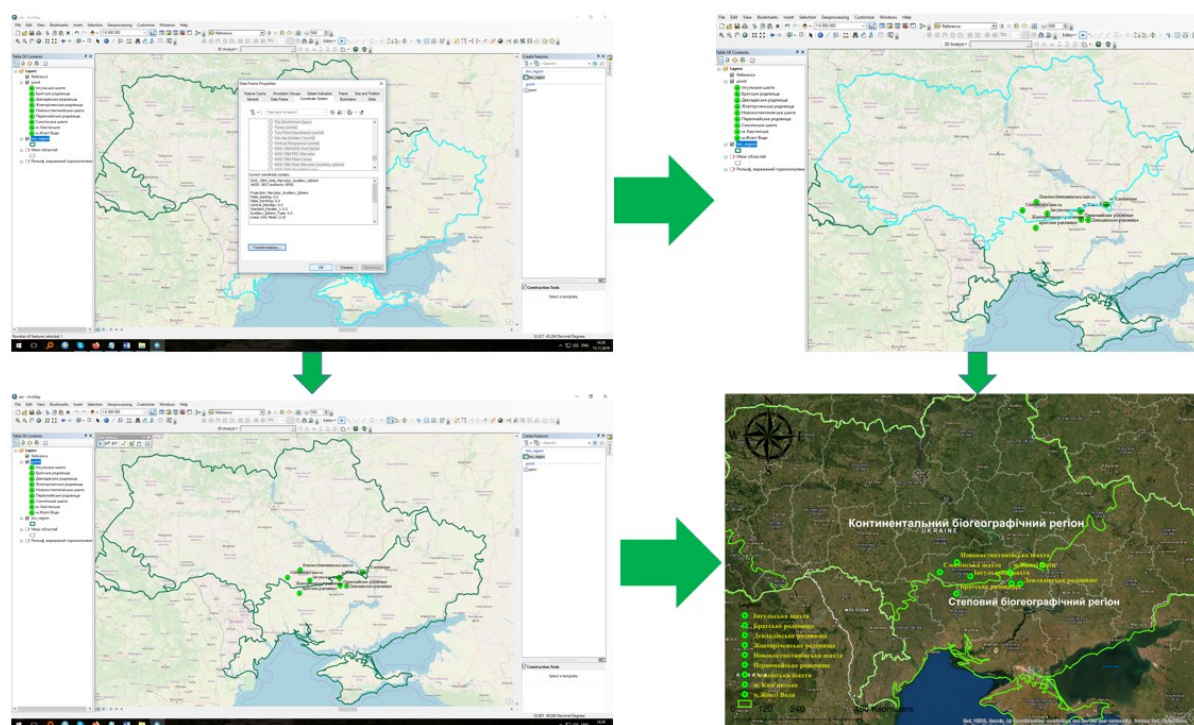


Fig. 2.2. General scheme of research

The basis for further research should be the development of classification parameters and the construction of map of changes on their basis for remote evaluation of vegetation. On the basis of the conducted analysis, the integral quantitative indicators of the vegetation state, which can be calculated remotely, are determined. Also, explore the processes of changes in geosystems and draw conclusions about their resilience [55].

The main advantage of GIS against other information technologies is contained in a set of means of creating and merging databases with the capabilities of their geographic analysis and visual visualization in the form of various maps, charts, diagrams, direct linking each other with all attribute and graphic data. GIS allows you to display and analyze information with new methods, to identify the latent interconnections, examples [56].

The methods of remote sensing of the earth that are widely used for solving ecological problems, in particular, map creation and updating, are analyzed. inventory, planning and management of territories; ecological and environmental monitoring; geological exploration, exploration of minerals.

2.3 Conclusions

The use of Earth remote sensing data for mineral exploration, the study of the tectonic structure of the region and its geodynamics, including neotectonics, is becoming increasingly widespread in geological forecasting and modeling organizations.

РОЗДІЛ 3. ENVIRONMENTAL ASSESSMENT OF UKRAINE EMERALD NETWORK OBJECTS IN THE URANIUM EXTRACTION AREA

3.1. General characteristics of the study area

Ukraine has the largest resources and reserves of uranium ore in Europe. Uranium deposits are located within the Kropyvnytskyi region in the deposits of the Ukrainian Shield. The biggest environmental problems arise from environmental pollution during the extraction and processing of radioactive ores. For many years, landscaping complexes have changed in the area of operation of uranium mining enterprises [1].

The central regions of Ukraine were taken for the study, namely Kamianske, Smolino Village (Kropyvnytskyi Region). Neopalimivka (Dnipropetrovsk region). Among the main biotopes of the region are: wetlands, steppes and forests.

The biotope distribution by vegetation types within natural zones is analyzed. It has been found that forest steppe and wetland habitats are best represented in all areas. In specified territories, biotopes are to a large extent protected within the limits of the Nature Reserve Fund of Ukraine. It is a national reserve of the Kamensky coastal and river complex and the Neopalimivka Village Dendrology Park. However, the analysis revealed that there are a minimum number of emerald network objects in the Kirovohrad Oblast.

In the territory of the eco-corridor is represented by only one natural core Kamyansky coastal-river complex [5].

The customer includes the territory of the previously established ornithological reserve of the local value of the "Float of the Bazavluk River", which despite this formally remains registered in the official register of the NRF objects of the Dnipropetrovsk region.

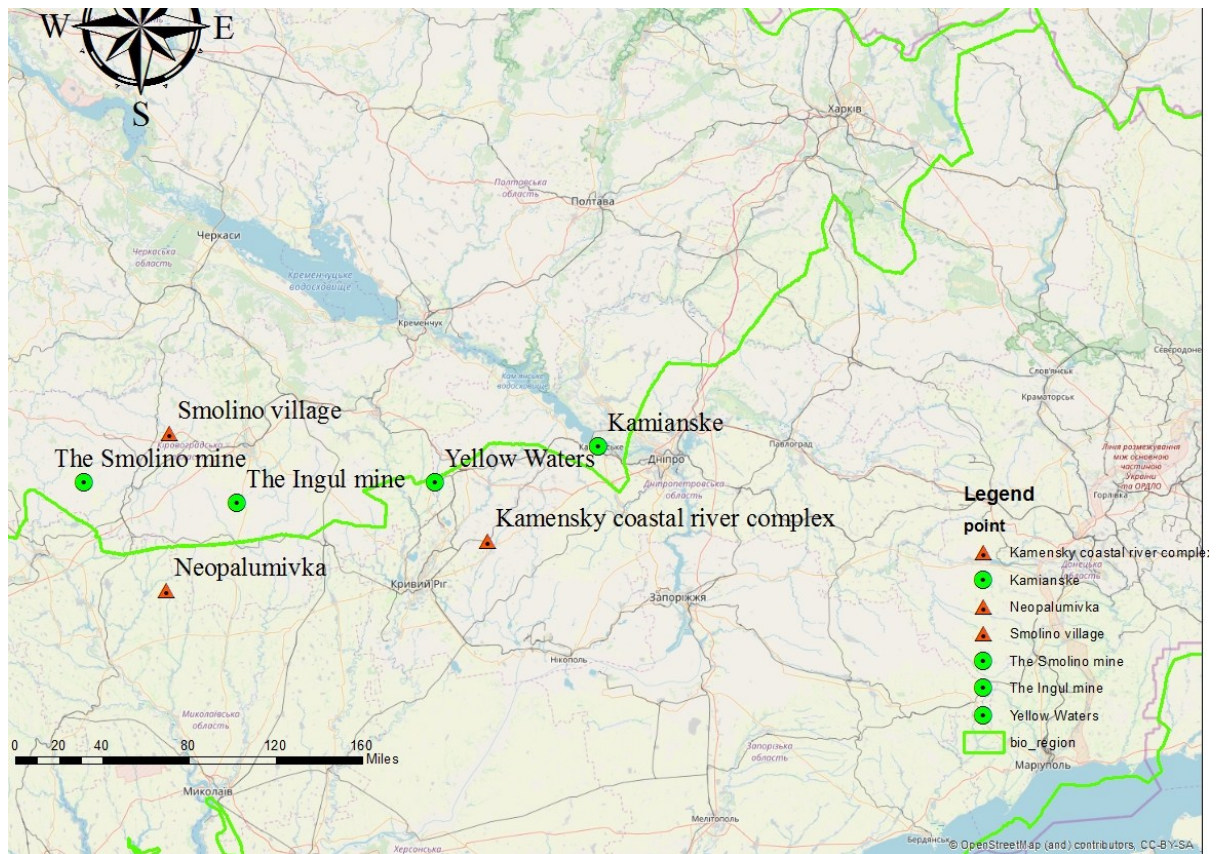


Fig. 3.1. Location of study objects

There are also two nature monuments within the reserve - the Picturesque Canyon on the Kamianets River in Tokivsky Granites and the Waterfall on the Kamianka River, which retain the status of individual monuments while being elements of the reserve.

3.1.1. The city of Kamianske

The report of the territory of the National Nature Reserve "Kamyansky coastal and river complex" includes the following sites of the NRF of Ukraine:

- Ornithological Reserve of the local significance of the "FloatersBazavluk"
- Hydrological siteNatural value "Waterfall on the Kamenka River"
- GeologicalNaturalNational Value "ScenicCanyon on the Kamenets River in the Toki Granites"

According to the physical-geographical zoning, this area belongs to the steppe zone. However, the presence of river valleys determines the mosaic character of the

relief, the varied soil, the diversity of vegetation, which in turn contributed to the formation of a rich animal world.

The peculiarity of this area is the processes of xerophytization and halophytization, which affect the distribution of herbaceous and woody vegetation. The right bank of the Kamyanka River, which is a part of the reserve, is elevated and occupied by medieval hardwood stands, fragments of steppe vegetation have been preserved on the open tops of hills. The main areas of the reserve are floodplains - swamps, meadows, deciduous forests. Along the valley of the Kamyanka River, which has a winding nature, and around the old women, coenoses of high-altitude bogs are formed, dominated by common and rugose narrow-leaved, with an admixture of salt-loving hydrophilic species (seaweed, Tabernemontan plague). For the flooded areas, 2–3 layers of hydrophytes are characteristic. The highest tier is formed by the indicated species, the second tier is composed of representatives of the cereal family (large petal, common mullet), umbrella (milestone broad-leaved, omega watery), shamrock (verbose weevil), labia (myopia). Water, cleaner swamp), third tier - forget-me-not swamp, marshmallow swamp. In the coastal water area, groups of common air are sporadically distributed.

Water and coastal-water complex is typical. Of the rare species, an aquatic fern of salvinia floating and a water lily were discovered, the groupings of which are included in the Green Paper of Ukraine.

The fauna of the four-legged vertebrate water-swamp complex of the reserve is rich and represented by 84 species. Birds form the main nucleus of this coenosis - 74 species, of which up to 40 can be found in the breeding season. Extremely high numbers in this period reaches the fox. Numerous nightingale and meadow reeds are also numerous in breeding wetlands. A special feature of the reserve is the unique breeding stock of black ruffles now. Common in breeding season are the Chomga, Boogie, Bugachyk, Quack, Heron ore, Mallard, Cricket, Moons, mahogany, Little hen, Pashtushk, Water hen, Small snapper, Black, Carrier, Snipe, Terns - Black and small, swallow, swallow, mustache, cane - pelvic and thrush, strap, white flap. The low-abundance groupings include the foxglove, the mute swan, the gray goose, the

broad-legged, the tail-worm, the red-headed mob, the common martin, the river tern, and the blue-tailed fish. Rare are the black-nosed nigger, the whistle tear, and the big heron.

Typical wetland mammals are represented here by a few species - common, mullet, watering water, raccoon and otter. Amphibians are represented by two widespread and quite numerous species here - the frog lake and the red-bellied spring. As for the herpetofauna of the water reserves of the reserve, in addition to the turtle marsh and common snapper, which are characteristic of these biotopes, there are also water aquifers.

The vegetation of meadow ecosystems is dominated by halophilic groupings, dominated by the Southern Bug kermak, Bessa-slave dandelion, Gerard's shtick, leafy and leafy flowering.

The vertebrate meadow fauna has up to 39 species. Birds are represented by 29 species, of which about two dozen species can be found in breeding season. The most numerous on the meadows of the reserve are yellow, coated meadow and reed oat. Quite common inhabitants of meadow-steppe lands of the sanctuary are partridge gray, quail, derkach, gull, herb, common bee, field lark, blue-collar, river mare, yellowfin tuna and meadow-grass. The group of small birds of these ecotopes consists of species such as marsh owl, larks - steppe, crested and small, coated black-headed, mare, lentil and millet. Occasionally, in the breeding season, moons and meadows are common.

Typical mammals are represented by 8 species, the most numerous of which are the Eastern European, the mouse, and the hare. The few here are the commoner and the hamster gray. Occasionally there are small squirrels, common hamster and steppe.

The amphibian and reptile classes are represented by each one of the widespread species - Burdock and Lizard. On sandy areas of the meadows, it is possible to find a lizard of multicolored and large lizard.

In the southeastern part of the reserve, Kamyanka River adjoins an array of deciduous forests. The tree tier is formed by an oak common, tall ash, Tatar maple,

field maple. The shrubbery tier is not expressed. The grassy cover is sparse, spotted, represented by a star-shaped cerebrosipinal, a spotted grungy, a sedge of Mikel, places with anthropo-film species (nettle two-domed, city gravity, deaf nettle purple, etc.). In the area where the valley of the Orel River forms a loop in the south, artificial pine plantations are growing. their grass cover is formed only partially and includes a number of meadow-steppe species.

On the tops of the hills on the right root bank of the Kamianka River, the remnants of the steppe vegetation, including fragments of groupings of wetland grasshoppers, and small populations of some typical steppe species - tadpoles of St. John's wort, shingles of early, ferret, and lily of the valley, were noted. ordinary and hairy, which are characteristic of the southern part of the region, and in other areas are widespread.

The forest faunal complex of the reserve is characterized by the largest variety of forms and is represented by at least 94 species of vertebrates. Particularly diverse are the birds of this complex, numbering up to 79 species, including 59 breeding species in the breeding season. The dominant ones in this period, as in most such biotopes, are finches, blackbirds, blackbirds. About 40 species of birds are quite common in the forest biotopes of the reserve, in particular, the hawk, the common buzzard, the buzzard, the owls - gray and ears, the dormouse, the odud, the marsh nut, the tit - the big and blue, Sheepskin is yellow-billed, wood-bark, black-legged magpie and others. The few species that inhabit the forest plantations include the hawk, the common hawk, the woodpecker - the green, the gray and the small, the long-tailed tit, the shrub reed, the white-tailed flycatcher, the gray flycatcher, and the gloryhole.

The mammals of the forest complex are represented by 8 species, of which only the ore are numerous. Extraordinary inhabitants are common and small bugs, forest marten, roe deer, ferret. Occasional squirrel and elk come across.

From amphibians, common ferns are common, frogs are sharp-headed and herbaceous; in some places, the common toad is gray and the newt; Of the typical reptiles in the forests, only the lizard is viviparous.

In total, the current fauna of the reserve has about 248 species of vertebrates: birds - 192, mammals - 41, reptiles ~ 5 and amphibians - 10 species.

Table 3.1.

Objects of the NRF near the city of Kamenskoe

з/п	Number	The name of the object	Type	Location	
<i>National Value - 1</i>					
1	1	Kamiansky	Landscape reserve	Apostolic district	
<i>Local Value - 3</i>					
2	1	Basavluk River Float	Ornithological reserve		
3	2	Waterfall on Kamyanka River	Hydrological monument of nature		
4	3	Canyon on Kamyants River in Tokyo Granites			

Due to the large number of industrial enterprises, the environmental status of Kamiansky is rather poor. The city is among the ten cities in Ukraine with the highest amount of harmful emissions. According to the Central Geophysical Observatory, the atmospheric pollution index in Kamiansky is rated as “very high” [6].

Due to the large volumes of wastewater discharges by the enterprises of the city into the Dnieper River (only the Dniprovsky Metallurgical Works discharges more than 120 million cubic meters annually), there are problems with providing the city with clean drinking water. The territory of the former Prydniprovsk plant stores more than 30 million tons of radioactive waste from uranium ore processing.

In 2008, an interagency commission was set up to address Kamyansky's environmental problems [7].

2.1.2. Neopalimivka

Neopalimivka is a village in Ukraine, in the Kropyvnytskyi district of Kirovograd region. Local self-government body - Pervozvansk village council. The population is 40 people.

Mine "Ingulskaia" - an enterprise for the extraction of uranium and thorium ore. Structural subdivision of the ore mining and processing combine. Established in 1967 [8].

The modern collection of the park's dendro-flora includes about 230 species, varieties and forms of trees and shrubs that represent the flora of Europe (overwhelmingly, including different regions of Ukraine), the Caucasus (5 species), the Far East (7), and North America (33), China (11), Japan (8), Central Asia (9), Siberia (6 species).

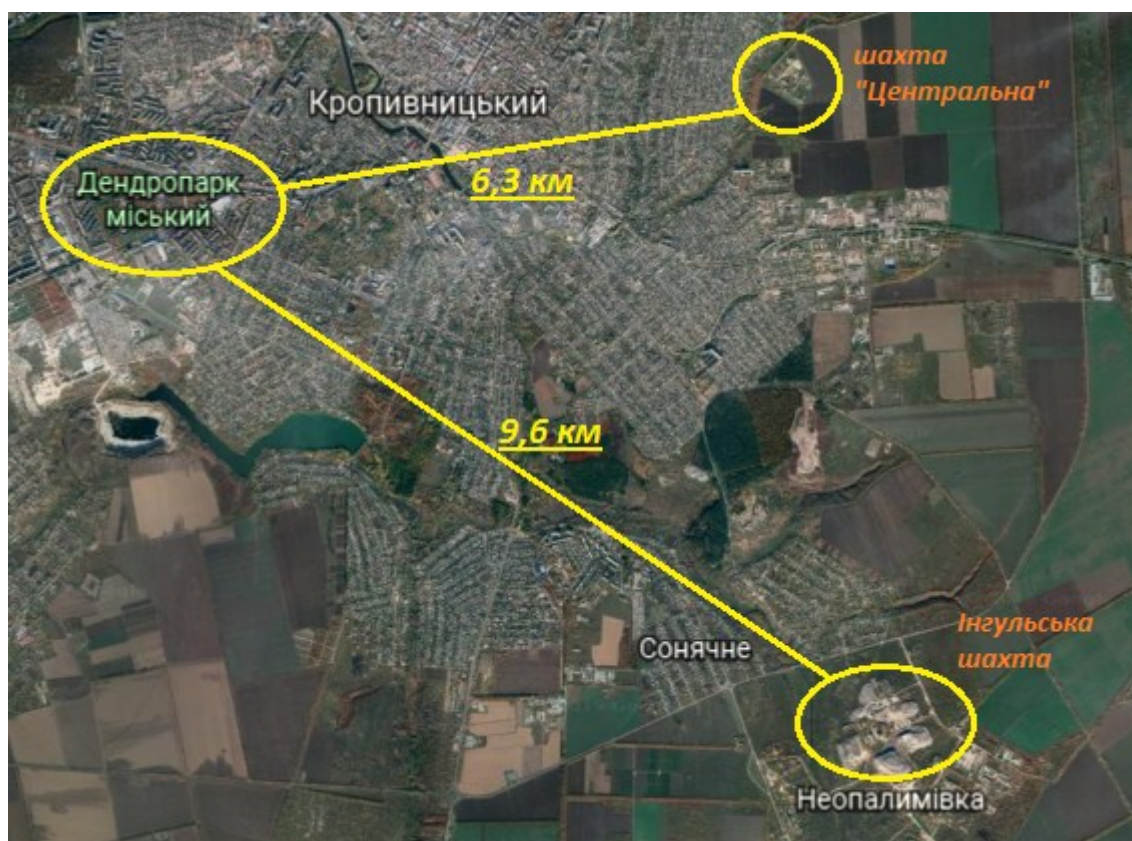


Fig. 3.2. Object of NRF and uranium industry

The basis of the park's dendroflora is angiosperms. The plantations of the park are dominated by representatives of families of pink (about 25% of the total species

composition), maple, walnut, willow, honeysuckle. The special decoration of the park are decorative bushes (about 100 species) of the genera Spirea (10 species), lilac (4 species, 7 forms), Weigel (2 species), eco-chord, forzia and more. The coniferous collection is represented by 21 species and 9 forms from pine and cypress families: pine (5 species), spruce (3 species, 6 forms), juniper (3 species), thuja (2 species, 2 forms).

The presence of a large number of stumps, dry branches contributes to the settlement of xylotrophic fungi of the genus Mycenae, pluti, folio, slurry and others. In places, oaks are damaged by trumpet mushrooms - the liver, the trout flat, the false bast, the sponge, and the poplar - the hull scaly. Interesting rare finds include honey-brown mushroom (on meadows), woolen, summer honeycomb (in birch planting), larch buttercup (in larch plantations). There are poisonous mushroom species growing in the park - red fly agaric and pantherpy, brick-cherry and gray-yellow, mushroom red. As the park is located near the industrial area of the city, mushroom picking is not recommended.

The diversity of the dendroflora and terrain of the park contributes to the formation of rich fauna. There are 148 species of terrestrial vertebrates in the park. The largest number of species is represented by the class of birds.

The most numerous are the group of forest birds (71 species). In all parts of the forest plantations you can see and hear the finches, big tits and sheepdog. Often there are specimens, cuckoos, woodpeckers - big colorful and Syriac, Ivolga, jay, magpie, blue tit, crimson, robin, nightingale, blackbird, songbird and chickweed, sluts - blackhead, gray and redhead, willow, sheep and gooseberry -bush, green, snap, bone-gnawing, common oatmeal and hook. Species with small numbers - Common Necklace, Horsehead, Woodpeckers - Green and Gray, Crow Gray, Undergrowth, Gloryhole, Flycatchers - Gray and Spotted, Woodpecker, Shrimp and Hemp Occasionally nested (marked) nesting and birch. Of the 22 species of birds that live in the wetland ecotope of the park, namely on the ponds, there are frequent mugs, mallards, hens - small and water and canebirds, occasionally - coot, harp, mare, and white squirrel.

The fauna of meadow-steppe areas is depleted and has 11 species. These are birds such as the lark of the field, wait for the black-headed, the common stone, the splash of yellow and the partridge gray. Of the mammals, 22 species have been recorded in the park, including: squirrel, brown tooth — normal and small; in the spring, there were occasions of moose and roe deer activities. Water and muskrat are settled in the ponds. On the meadow-steppe sites there is a hare of Rusak, the wolf is Eastern European.

2.1.3. Smolino in the Kropyvnytskyi region

The largest enterprise located near the village and is the main employment center of the population - the Smolensk Uranium Ore Mine, which is part of the state-owned enterprise East Ore Mining and Processing Plant (VostokHZK) [10].

In October 2010, Ukraine's Nuclear Fuel and TVEL signed an agreement on the construction of uranium ore processing enterprises in Ukraine.

The commission for the selection of the site for the location of the enterprise for the production of nuclear fuel for the VVER-1000 reactors at the final meeting on August 18, 2011 recommended to place the facility in the area of Smolino (Maloviskivskyi district of Kirovohrad region). This decision is stated in a press release on the site of the state concern "Nuclear Fuel of Ukraine".

This decision was made on the basis of the study of three possible sites: in the area of Yellow Waters (Dnipropetrovsk region), Slavutichi (Kiev region) and Smolin (Kirovograd region) [11].

The territory contains a large number of NRF sites, and a very diverse flora and fauna of the territory.

The forest vegetation is represented here by typical medieval natural forests. They occupy the middle and lower parts of the slopes, the bottom is occupied by groups dominated by common juniper, which has a wide range and attests to the hydraulic regime of fresh oak.

Table 3.1.

Objects of the NRF near the city of Smolino

3/II	Name object	Category, status	Square, ha	Administrative location and location of the NRF facility
	2	3	4	5
1	Krasnopilska Beam	landscape reserve of local importance	50,0	Malovisky district, Krasnopilka village
2	“Wicker Tashlik”	botanical reserve of local importance	5,0	Malovysk district, village. Wicker Tashlik
3	Birzulov hills	a comprehensive natural monument of local importance	1,70	1 km north of the village. Komsomolsk
4	“Protection band 1”	a botanical natural monument of local importance	14,0	territory of Onikievsky state forestry 600 m. north of the village. Onikiyevo Onikiyevo forestry square 32 type 1-11
5	“protection band №2”	a botanical natural monument of local importance	16,0	Onikiyevsky forestry kv.32 type 1-11
6	“Protection band 3”	a botanical natural monument of local importance	9,4	territory of Onikievsky state forestry 600 m. north of the village. Onikiyevo Onikiyevo forestry square 32 type 1-11
7	“Protection band 4”	a botanical natural monument of local importance	4,1	Onikiyevsky forestry kv.32 type 1-11
8	Oman is tall	a botanical natural monument of local importance	2,0	southern outskirts of the village Lutkovka
9	Cascades	a geological site of nature of local importance	2,5	3 km. southwest of the village. Pale
10	“The origins of the Mala Vysya River”	landscape reserve of local importance	2,5	0.5 km from the village. Lutkovka
11	Karpenk Krai	landscape reserve of local importance	164,2	between the villages of Maryanivka, Kovalivka, Veselivka

The upper tiers of the stands form the common oak, the heartwood and small-leaved lindens, the maple acutiform, and in the higher areas there is a considerable participation of the common ash. In the second tier, the pear is wild, mountain ash, and apple orchard. Its dominant is the maple field. The undergrowth tier is thinner. It is formed by common hazel shrubs, warty and Euro-peii berries, and sometimes Tatar maple [12].

The grass cover is well developed and has a clear tier structure. In some areas, it is spotty in nature, as individual clumps form different species: the starfish are forest, the tinnitus is oak, the perennial perennial, the common eagle, and the smell of odor. The slopes of the elevated areas under the Yasen are dominated by the Mediterranean species of the Mikeli sedge. Among other things, there are quite often the common jellyfish, European ungulates, grunts, grunts, woodland, common grass, common lily, lily of the valley, spreading hills, bellflowers and towers, bell spring and others.

Sinusia of early spring ephemeroids are quite numerous - the snowdrops of the Siberian, the shoots of the compacted, the anemogs of the jaundice, the wheat of spring, the asterisks of yellow. In the composition of the spring flora are characteristic for such coenoses tulip oak and crow's eye ordinary.

The forest areas of the reserve are marked by the largest species of various terrestrial vertebrates (up to 100 species), among which birds represent the largest number of species - about 83. During the breeding season, up to 58 species can be threshed here. Among the most numerous inhabitants of the forest are finches, big tit, common bunting and sheepdog. Typical representatives of forest biotopes are dormouse, black-headed, woodpecker, blackbird, blackbird and songbird, black-headed and gray glory, robin, costar-rhizome, greenhorn and several others. The few populations within the reserve are typical for the hawks of large and small, the hawthorn, the owl, the woodpecker, the yellow-bellied sheep, the shrub cane, and others. Among the rare birds of the reserve during this period can be noted medium-sized woodpeckers, long-tailed tit, white-tailed blackbird, spring shepherd and garden oat.

Typical inhabitants of the forests are common and small, roe deer. Seldom come across marten, ferret, squirrel and nightshade.

From amphibians, you can often find common shark and frog. The reptiles here are represented by the lizard viviparous and the viper common.

The steppe areas on the territory of the reserve represent the typical for the left-bank forest-steppe flora and the vegetation of the grass-and-pole-and-grass steppes. On the slopes, there is a grouping of thin-leafed narrow-leaved with a typical floristic nucleus, consisting of crested combs, Welsh shellfish, steppe Timothy, creeping creep, sedge early, medium-sized plantain, yellow-tailed liliaceae, shanty-flowering, ordinary cutter, Romanian alfalfa, potato iron, etc. Significant clumps form the Marshall Thyme, St. John's.

The meadow-steppe faunal complex has up to 33 species of vertebrates. Birds are represented by 25 species, of which up to 20 species can be found in breeding season. The most numerous of the latter are yellow and oatmeal. Often in the summer you can find quails, field larks, seagulls, gulls, bluetongs, prairie meadows and others. Wherever there are partridges gray, marsh owl, crested lark, common stone, lentils and others. They are occasionally noted for the breeding ground, and during the migratory period, the moons are field and meadow, gray honeysuckle and gogol, turukhtan, hollow, winged tern, black stork, osprey and magpie.

Waterfowl, muskrat, beaver, common raccoon and otter are noted among the typical mammal wetlands.

Of the reptiles, the usual inhabitants of the reserve are the marsh turtle and the common, and the amphibians are represented by a frog by a lake and a red-bellied spring, which is significantly inferior to the previous species.

Eurytopic and synanthropic mammals and birds significantly enrich the species diversity of the main wildlife species of the wildlife. In particular, they are such important hunting species as wild boar, fox, marten, stone. common wolves and wolves, which periodically visit the territory of the reserve, especially in the fall and winter. In total up to 236 species of terrestrial vertebrates can be found in the territory (birds - 179, mammals - 42, amphibians - 10 and reptiles - 5 species).

Among them, there are 14 species listed in the Red Data Book of Ukraine, 5 species listed in the European Red List, and 23 regionally rare.

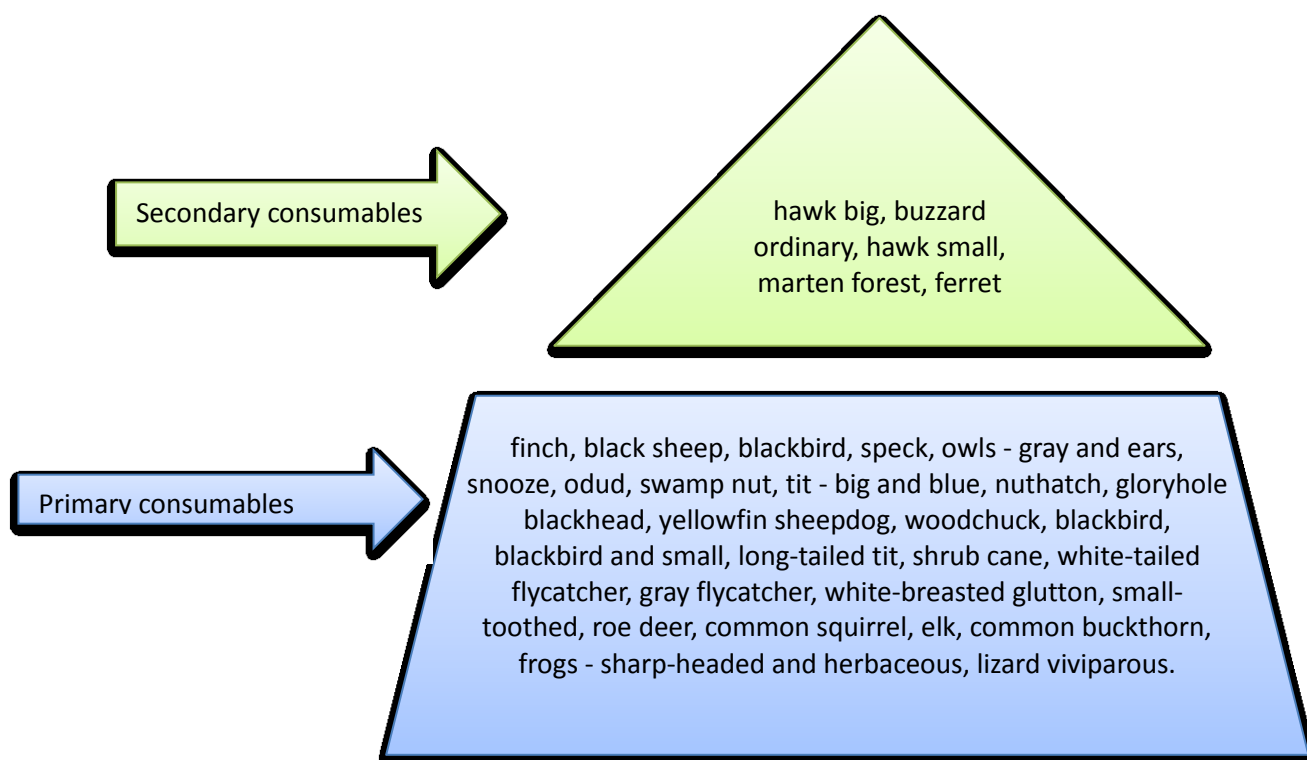
2.1.4. Biotopes of the study area

Comparison of the organic world of individual geographical areas allows us to distinguish the regions where the organic world is relatively homogeneous, and to separate them from others, which are significantly different in composition of fauna and flora. There are some differences in the distribution patterns of plants and animals due to different habitats, different environmental impacts.

The purpose of this work is to study the technogenically loaded territories of the central region of the Emerald Network of Ukraine.

The central regions of Ukraine were taken for the study, namely Kamianske, Smolino Village (Kropyvnytskyi Region). Neopalimivka (Dnipropetrovsk region). Among the main biotopes of the region are: wetlands, steppes and forests.

The biotope distribution by vegetation types within natural zones is analyzed. It has been found that forest biotopes of deciduous forests are best represented in all zones. The tree tier is formed by oak, tall ash, Tatar maple, field maple, dominated by representatives of families pink, maple, walnut, willow, honeysuckle .



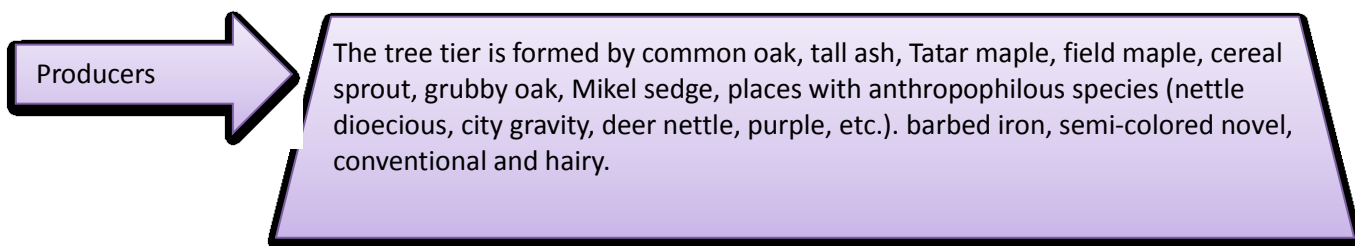
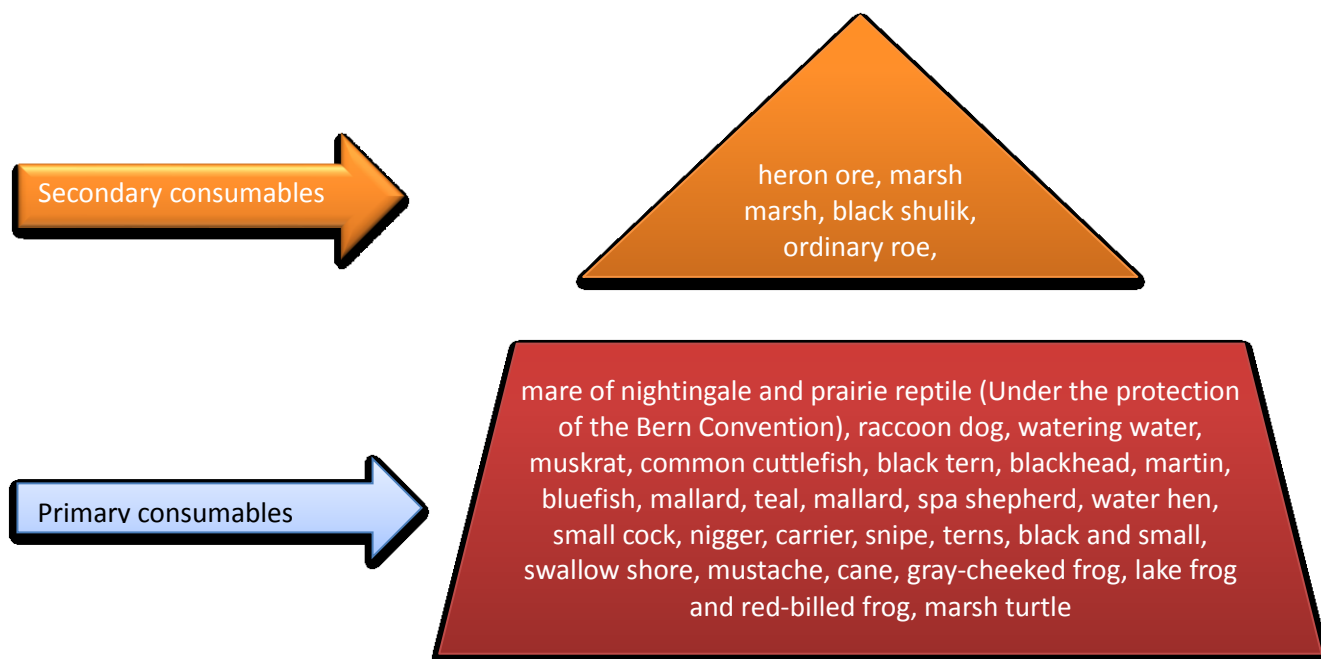


Fig. 3.3. Forest biotope

Wetland biotopes with a predominance of common cane and rugose narrow-leaved with an admixture of salt-loving hydrophilic species (sea urchin, Tabernemontan plague) are slightly less detected. For the flooded areas, 2–3 layers of hydrophytes are characteristic. The highest tier is formed by the indicated species, the second tier is composed of representatives of the cereal family (large petal, common mullet), umbrella (milestone broad-leaved, omega watery), mantelpiece (plaquid verbally), spotted (soft) Water, cleaner swamp), third tier - forget-me-not swamp, marshmallow swamp. In the coastal water area, there are sporadic groups of common air. Of the rare species, an aquatic fern of salvinium floating and a water lily were discovered, the groupings of which are included in the Green Paper of Ukraine [3].



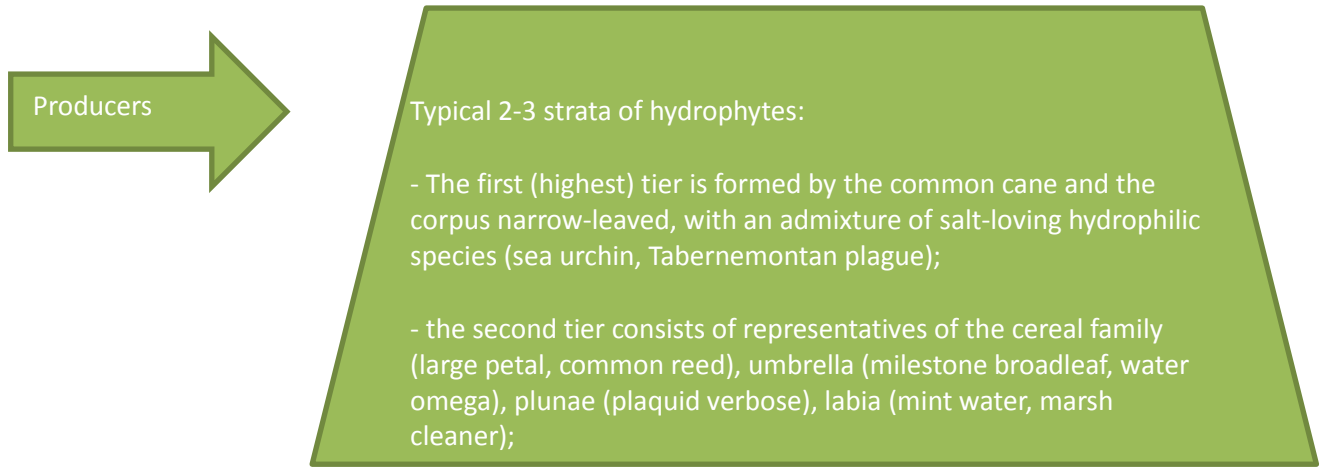


Fig. 3.4. Wetland biotope

The vegetation of meadow ecosystems is dominated by halophilic groupings, dominated by the Southern Bug kermak, Bessa-slave dandelion, Gerard's beetle, and leaf-flowering and small-flowered.

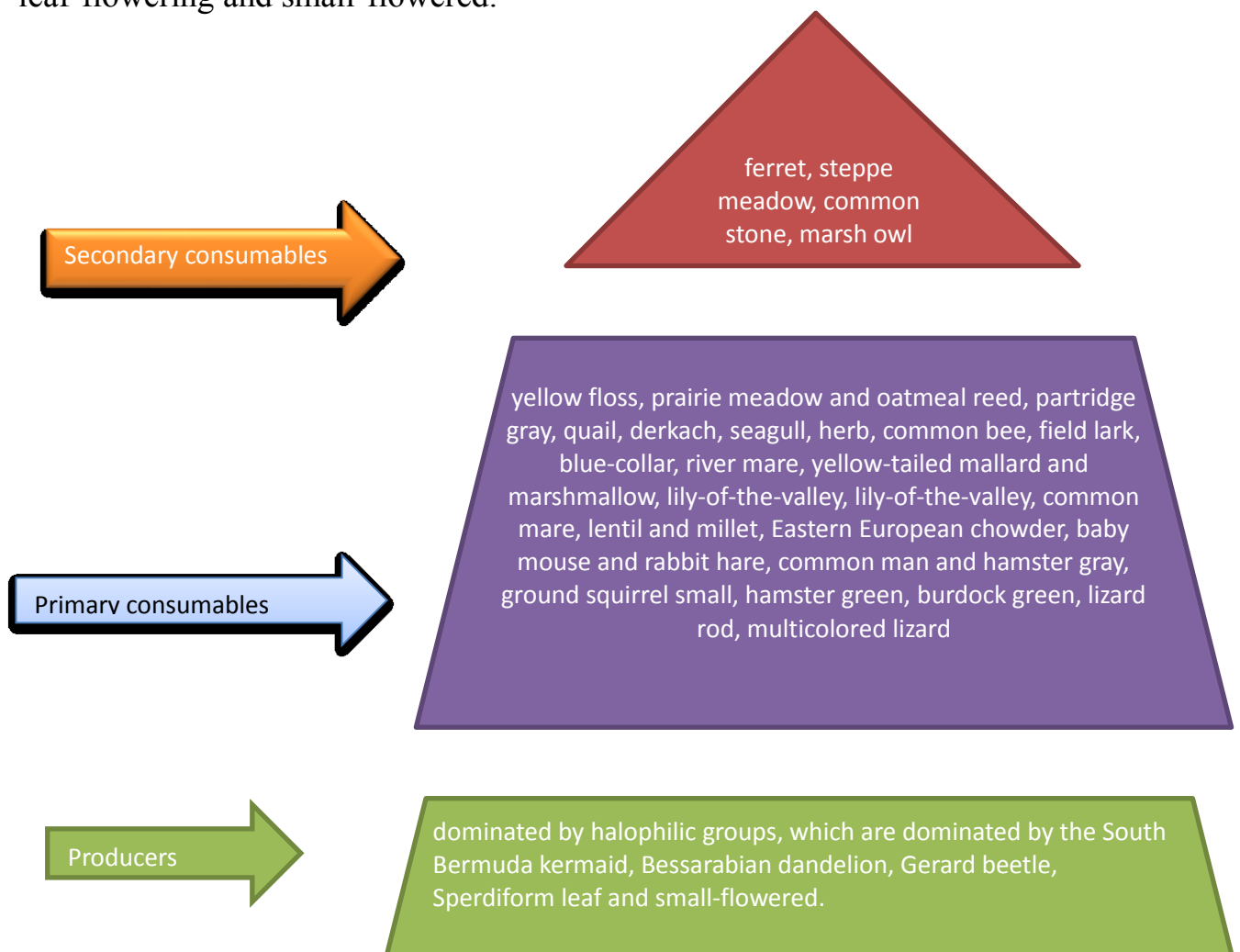


Fig. 3.5. Steppe biotope

Therefore, it was found out that in the given territories biotopes are to a large extent protected within the nature reserve fund of Ukraine. It is a national reserve of the Kamensky coastal and river complex and the Dendrological Park of the village of Neopalimivka. However, according to research by the National Aviation University, it was found that in the Kirovohrad Oblasts the minimum number of emerald network objects [20].

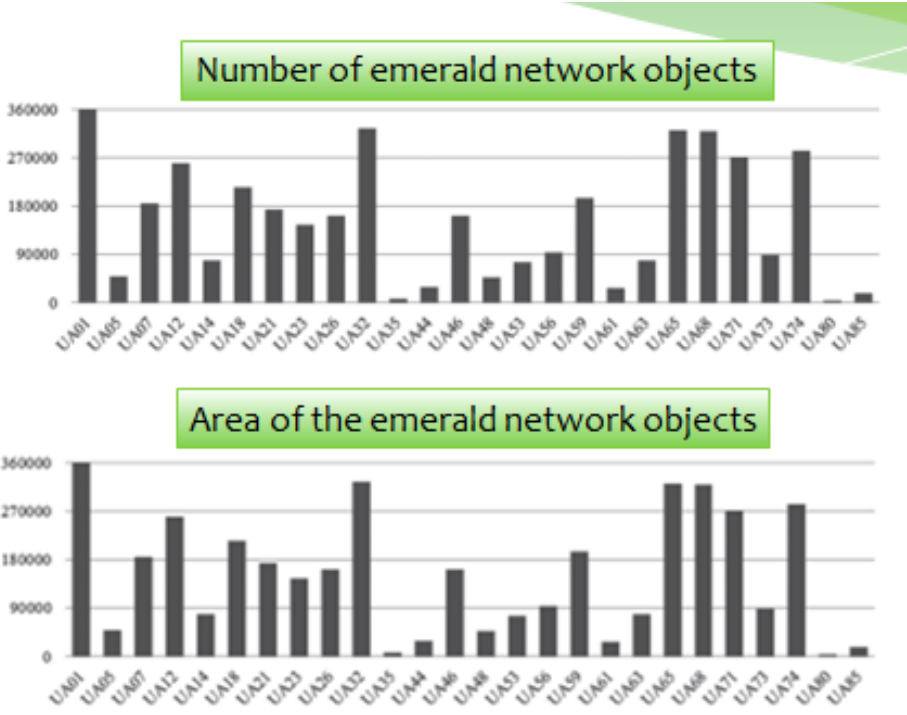


Fig. 3.6. Emerald network objects in the regions of Ukraine

Where is UA12 and UA35 of Dnipropetrovsk and Kirovograd regions.

Given that the data in the study area are of high environmental risk, more attention should be paid to the biotopes of the relevant natural areas.

Ukraine has the largest resources and reserves of uranium ore in Europe. Uranium deposits are located within the Kropyvnytskyi region in the deposits of the Ukrainian Shield. The biggest environmental problems are caused by environmental pollution during the extraction and processing of radioactive ores. For many years, landscaping complexes have changed in the area of operation of uranium mining enterprises [23].

2.1.5. Uranium deposits

The Kirovograd region is characterized by the extraction of uranium ores.

At the moment, only one company - SE "SkhidGZK" carries out a full cycle of work on the extraction and processing of uranium ores. It is still the only enterprise that produces Ukrainian uranium, which after cleaning, enrichment and production of fuel rods at the enterprises of the Russian corporation "TVEL", returns to Ukraine in the form of fuel for NPPs [51].

Processing of uranium ores and production of uranium concentrate (U_3O_8) is carried out at the Hydrometallurgical Plant in Zhovti Vody (GMZ).

SE "SkhidGZK" consists of two operating mines - Smolinskaya and Ingulskaya, which by their energy equivalent are equivalent to 60 coal mines (almost one third of the total Donbass). Ingul mine is working out Vatutin field - project capacity 460 thousand tons / year, actual - 400 thousand tons / year, and Smolensk mine is working out Michurin field - project capacity - 500 thousand tons / year, actual - 400 thousand tons / year [52].

The Central and Michurin deposits are located on the outskirts of Kropyvnytskyi (until 2016 it was called Kirovohrad). The Ingul Mine, which has been developing these fields, has been operating since 1969, and its reserves are up to 10 thousand tons in terms of enriched raw materials. Underground work at the mine is conducted at a depth of 300 m.

The Vatutine uranium deposit is located in the village. Smolino of the Malovysk district of the Kirovograd region. It belongs to the sodium-uranium formation of hydrothermal-metasomatic deposits. The deposit has been in operation since 1973. Its reserves amount to about 30 thousand tons in terms of enriched raw materials [53].

Uranium content is 1.7 times higher than in the Michurinsk and Central fields, but the most productive part of the field is depleted, mining is currently conducted at a depth of 640 m.

The main objective of the activity of SE “EastGZK” is a gradual increase in production volumes, which requires the commissioning of new prospective uranium deposits. Such a promising object is the Novokostyantynivka mine of the Novokostyantyniv uranium ore deposit, which makes it possible to cover part of the needs of all Ukrainian NPPs [54].

Its reserves are rated as the largest in Europe and ranked fifth in the world by capacity. Experts say that the development of the Novokostyantynivsky deposit (Fig.2.2.) With uranium reserves of 100-150 thousand tons. based on the enriched raw material will allow Ukraine to take the 2nd place among uranium mining countries of the world, and it was concluded that Ukraine will have enough uranium for 100 years for 20 reactors at the expense of the resources of Kirovograd region.

Today, the Severyn field is preserved and is in reserve, the Pervomayskoye field has already been used and the Zhovtoricheskiy field has been discontinued, which is connected with the unprofitable production of uranium at great depths, even with the concomitant production of iron ores. Other fields are exploited or prepared for operation [54]. Uranium ore is mined at the Smolin and Ingul mines [55].

2.2. Radiation state

The negative impact of uranium production on the environment begins with exploration.

Drainage of fertile lands to mining branches (mines, quarries, mines, dumps, tailings ponds) leads to disturbance of natural hydrogeological regimes of underground and surface watercourses, transformation or destruction of the basis of productive landscape - soil cover [56].

Changing the engineering-geological conditions of the territories that are within the area of technogenic influence of mining is associated with the violation of the earth's surface as a basis for engineering structures and communications due to deformation in areas of intensive subsidence of the earth's surface, loss of agricultural areas due to removal of mining take her to new places.

Water inflows contribute to the development and activation of subsidence of the earth's surface, uncharacteristic of the natural-historical conditions of uranium deposits, flooding of mines, the formation of lowlands and dips, causes processes of flooding and flooding.

Extraction of raw materials at uranium mines leads to the formation of large amounts of radioactive dust. This dust and the emitted radioactive gases can be released into the atmosphere while venting the mines [57].

In the processing plants, uranium ore is crushed and sprayed, and not only radioactive dust, but also toxic substances such as vanadium, arsenic, selenium and the like can get into the air. As a result, the environmental status of the environment is rapidly deteriorating.

An important factor affecting the ecological environment of uranium deposits was the creation of a kind of technogenic relief: the formation of underground produced space, storage of overburden in dumps and industrial waste, in tailings and more.

In the mining and industrial landscapes there is an energetic restructuring of the surface, resulting in the formation of the so-called technogenic relief. There are two types of forms of technogenic relief:

- positive (accumulative) - dumps, heaps, bulk and soaking surfaces;
- negative (produced) - mines, quarries, dredges, etc.

Under the influence of open development there is a complete or partial destruction of primary vegetation, soils, a sharp violation of biological productivity of ecosystems. New biocenoses, as a rule, are monotonous and random in composition, primitive in structure, fragile and often incapable of reproduction. Often, new ecotopes are digested by organisms, not on soil, but on a specific mineral substrate.

Also open developments cause significant changes in the hydrological regime of the territory. The quarries themselves consume a large amount of water, which is associated with the subsidence and depletion of groundwater in areas of existing quarries, with changes covering areas that are approximately 25 times larger than the quarry itself. On the contrary, in the lowland areas there is often local waterlogging

of the territory, which is exacerbated by disturbance of natural runoff by the accumulated forms of neo-relief. Finally, open-pit mining regions are characterized by pollution of the natural environment, ie atmospheric air, water, soil and vegetation by products of weathering of deep rocks, as well as industrial emissions, gases due to fires on dumps and waste heaps [58].

On the territory of the region there are manifestations of radon and its decay products, especially in the central part, located on an array of rocks of granitoid composition with high and high content of scattered radioactive elements of the uranium-thorium series. This problem is compounded by the use of local raw materials with a high content of natural radionuclides for construction purposes. The average radon concentrations in Kirovohrad and the oblast mostly exceed the average levels.

The behavior of uranium and other elements, both under conditions of long-term activity of natural exogenous factors and in industrial waste heaps, is determined by various factors. Of course, first of all, it is the degree of resistance of the minerals containing them to weathering and geochemical features, in part, the migratory ability of the elements themselves in natural (underground and surface) waters, together with their ability to precipitate on different geochemical barriers. Further participation of halos (and flows) of scattering of certain elements (and their associations) depending on the geodynamics of the area may be different.

First of all it is uranium and thorium. Judging from table 2, the studied deposits are quite clearly divided into two groups, namely uranium and thorium-uranium. The first group includes, as noted above, the Michurin field with the lowest thorium content, the amount of which does not exceed the first g / t here, which allowed Yu.P.

Table 3.2.1

Some Geochemical Parameters of Uranium and Satellite Elements in Uranium Deposits

Елемент	концентрація в альбітитах, варіації (г/т)	кларк [3], (г/т)	мінімальний промисловий вміст у рудах (г/т)	середній вміст в океані (мг/л)	середній вміст у річках (мг/л)	вміст в живих організмах (г/т)	клас небезпечності згідно ГДК
U	0,4-11128	2,5	300	0,003	0,001	0,013-0,038	1
Th	0,5-200	13	100	0,00001	0,00002	0,003-0,2	1
Ra	0,00028	-		$1 \cdot 10^{-10}$			
V	5-1000	90	100-1000	0,003	0,0001	0,14-2,0	1-2
Ni	4-1000	58	2000	0,002	0,005	0,4-25	2-3
Co	5-100	18	150-370	0,0005		0,03-5,0	2
Cr	5-3000	83		0,00002	0,001	0,075-1,0	2-3
Pb	5-5500, до 1%	16	1%	0,00003	0,001	0,5-8,4	1-2
Zn	0-500, до 1%	83	2%	0,01		6-1500	3
Cu	3-70	47	3000	0,003		2,4-50	2-3
Bi	15, до 0,8-1,3%	0,009	0,2-0,3%	0,0002		0,004-0,3	2
Ba	5-500, до 3200	650		0,02		0,2-30	3
Be	1-50	3,8	30-400	0,0000006	0,0006	0,0003-0,1	1

Egorov [2] attribute uranium ores of the field to the Tortium. But on the flanks of the Michurinskoye deposit (North Konoplyanskaya site) it is noticeably increasing, especially in off-balance ores, ore-bearing albites and host rocks (average 24.6-25.1

to 64 g / t), remaining low (9.5 on average) not higher than 19 g / t,) in albites of ore. The content of thorium within the Severinovsky deposit is also increased - up to 71.0 g / t.

Thorium-uranium can be safely attributed to the Yuriyev, Vatutin and Novokostyantyniv deposits with a thorium content at the level of minimum industrial, or even higher - 100 or more g / t. The highest concentrations of thorium (up to 200 g / t) were recorded at the Novokostyantyniv field.

Table 3.2.2

Geochemical characterization of the uranium deposits of the Ingul megablock of the Ukrainian Shield

Хімічні елементи	Родовища урану альбітизованої формації					
	Северинівське	Мічуринське	Коноплянське	Юріївське	Ватутинське	Новокостянтинівське
	Вміст елементів у г/т					
U	1-11128	5-1670	1-2041	1-3506	3-5140	0,4-4470
Ni	30-1000	4,0-12,0	6-100	10-200	30-1000	8,0-11,0
Cr	200-2000	6-38	30-500	5-150	200-3000	18-21
Pb	8-2000	5-810	1-1116	6-1247	18-2995	20-1130
Zn	0-500	-	0-100	0-200	0-200	34-54
Sr	1-1000	36-161	3-300	25-1626	1-300	210-730
Be	3-50	1-46	0-20	-	0-30	3,0-4,5

In host rocks, which include unmodified as well as microclinized and diaphragmed rocks, the amount of uranium varies from the first g / t to 40-53 g / t; this content often exceeds the order of magnitude of the metatherogenic formations of the USH by an order of magnitude or more. In albitized rocks and ungrounded albites of the outer parts of the ore zones, the content of uranium on the average on objects increases in 1,3 - 4,3 times [59].

Onboard content is accepted as a concentration of uranium of 300 g / t (0.03%).

Its highest content (average of objects 0.08-0.24%, in individual samples up to 0.5-1.11%) is characterized by albites with superimposed productive mineral associations, including feribiotic, ankerite, hematite and uranium minerals .

According to our data, the contrast of ores (the ratio of the average content of uranium in ores and host rocks) varies from 77-84 (Yurievskoye and Michurinskoe deposits) to 115-130 (North Konoplyanskoye and Vatutinskoe), reaches 302-376 (Novokostyantynivskoye). According to the calculations of Yu.P. Egorov, owing to the degree of concentration of uranium ($KKU = 72$) ores of the Michurin field are among the ordinary ones. It can be predicted that albites with non-industrial uranium content (20-300 g / t) will end up in dumps with a high probability of negative environmental impacts [60].

In addition to the two major radioactive elements, the analyst also records the presence of radium here. The order of the content of radium in albitite ores can be estimated by the example of the Michurin field. This assessment is based on an experiment conducted by KP Kirovgeology in mining, where according to Yu.P. Egorova, the average content of Ra in ores is $2.8 \cdot 10^{-4}$ g / t.

More important is the behavior of radium in natural waters, especially to our surprise, the correlation between uranium and radium with deuterium is very different. In aqueous halos, the scattering of Ra around uranium deposits is closer to the ores, whereas U migrates substantially further.

Within the settlements of the region and Kropyvnytskyi there are large heaps of rocks and off-balance uranium ore from the surface of which radon exits. Considering that uranium elements have a dusty shape, they can be spread over long distances.

Take the example of Kropyvnytskyi District, which houses the Ingul and Central mines, near which there is a valuable natural object like the Dendropark, which contains up to 236 species of terrestrial vertebrates (birds - 179, mammals - 42 and amphibians - 10 and reptiles). - 5 species). Among them, there are 14 species listed in the Red Data Book of Ukraine, 5 species listed in the European Red List, and 23 regionally rare [61].

Considering the distance between the objects, the speed and the direction of the wind, by constructing the wind of the terrain, we can see that the wind is heading west [63].

The size of the uranium fractions are small enough, dusty forums that can easily be transported over long distances. From the graph below, we can see that the wind direction is directed toward the Dendrological Park, which is the site of the PFP, throughout the year.

Table 3.3

Wind direction for 2019 in Kropyvnytskyi district

Місяць	Напрямок вітру (к-ть днів)								Всього днів за місяць
	пд	Пд-з	Пд-с	пн	Пн.-з	Пн.-с	з	С	
1 січень	7	4	7	4	3	1	3	2	31
2 лютий	2	3	5	5	4	1	4	2	28
3 березень	7	3	1	3	8	-	10	-	31
4 квітень	4	6	2	8	-	2	-	8	30
5 травень	8	5	5	2	2	2	-	7	31
6 червень	-	1	-	8	1	10	2	8	30
7 липень	-	2	-	5	10	-	14	-	31
8 серпень	3	1	2	9	9	5	1	1	31
9 вересень	3	-	3	6	6	1	8	3	30
10 жовтень	7	4	2	5	3	-	2	1	5 Ш Штиль
11 листопад	7	-	7	1	2	2	1	10	30
12 грудень	2	6	-	3	1	6	-	6	2019 30

Wind speed averaged over seasons (m / s)

Сезон	Середня за сезон
Літо	4.7
Осінь	4.7
Зима	5.9
Весна	5.3
	Середня за рік 5.2 м/с

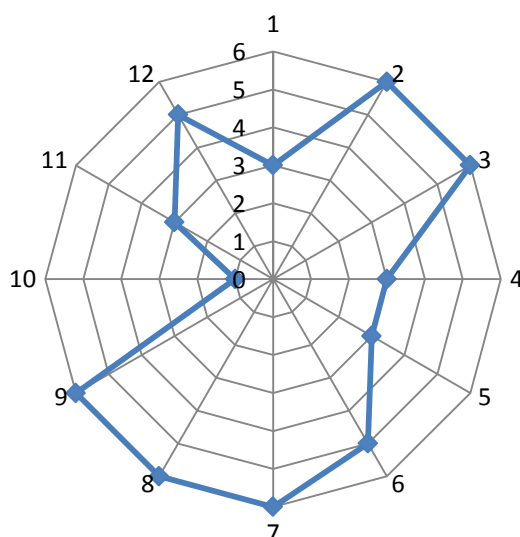


Fig. 3.4 Wind rose of Kropyvnytskyi district

2.3. Conclusions

Therefore, the study area is located in the center of Ukraine, between the Dnieper and Southern Bug rivers, in the southern part of the Dnieper Heights.

Due to the large number of industrial enterprises, the ecological status of the territory is quite poor. The city of Kamianskoe, for example, is among the ten cities in Ukraine with the highest amount of harmful emissions.

The territory contains a large number of PFP sites, and a very diverse flora and fauna of the territory.

Considering that the study area data are of high environmental risk, more attention should be paid to the biotopes of the relevant natural areas.

On the territory of the region there are manifestations of radon and its decay products, especially in the central part, located on an array of rocks of granitoid composition with high and high content of scattered radioactive elements of the uranium-thorium series.

Extraction of raw materials at uranium mines leads to the formation of large amounts of radioactive dust. This dust and the emitted radioactive gases enter the atmosphere during the ventilation of the mines. Which causes a threat to natural objects.

CHAPTER 4

OCCUPATIONAL HEALTH

4.1. Existing and potential harmful and dangerous production factors in the specialist's working area at the laboratory of the Earth Aerospace Research Center

Work is carried out using a personal computer (PC). Therefore, the specialist conducting the research may be exposed to such dangerous and harmful production factors as physical and psychophysiological [77].

4.1.1. Physically dangerous and harmful production factors

- Increased level of electromagnetic radiation.

The sources of action for this fact are the power grids and the computer. The power sockets used are made to European standards, but they do not provide the required contact with the grounding conductor of the power cord of the computer. Displays designed on the basis of an electron beam tube are sources of electrostatic field, soft X-ray, ultraviolet, infrared, visible, low-frequency, ultra-low and high-frequency electromagnetic radiation (EMR).

Low frequency radiation, in the first place, adversely affect the central nervous system, causing headaches, dizziness, nausea, depression, insomnia, lack of appetite, the emergence of stress syndrome, and the nervous system responds even for short duration of exposure to weak fields: hormonal state of the body, disrupted brain currents.

Low-frequency electromagnetic fields can cause skin diseases (acne, seborrhoeic eczema, pink lichen, etc.), diseases of the cardiovascular system and the gastrointestinal tract, affecting white blood cells, causing them to develop, or cause tumors, malignant [84].

Duration of the influence of the factor: constant throughout the working day.

- Increased level of ionizing radiation

The source of this type of exposure is a PC monitor. This fact influences when the specialist is very close to the computer monitor [84].

Duration of exposure: constant throughout the working day.

- Increased workplace noise

The work of technology, in particular PCs, and the human factor can cause increased noise at a specialist's workplace.

PC noise sources are primarily fans mounted on video adapters, processors, power supplies, and also a hard drive. In general, the magnitude of a given factor can reach 60 dB, which is commensurate with the noise on motorways and can lead to a deterioration of mental activity, attenuation of attention[84].

Duration of the factor: periodic.

- Insufficient illumination of the working area

The result of working in poor lighting conditions may be visual fatigue, impairment of vision. And the performance of visual work, especially long and intense, with insufficient quantitative and qualitative characteristics and parameters of illumination can lead to the development of a number of disorders and diseases of the visual organ.

The most commonly observed disorders and defects of vision, such as myopia (false and true - myopia), myopia (true - hypermetropia and senile - presbyopia). In some cases, the early development of presbyopia is sometimes seen as a conditioned or occupational pathology.

In the case of impaired functioning of the visual system of the body, changes in adaptation (the process of adjusting the eye to brightness, color or end state of this process), accommodation (the process of focusing the eye, which provides maximum visual acuity when changing the distance to the object of distinction).

Duration of the factor: periodic depending on the time of day.

- Increased air temperature in the work area

Since the work space has a small area (approx. 20 m²), where a large number of work equipment, including 5 computers and other office equipment are located, there is a risk of an increase in the temperature of the air in this room up to a value greater than 25 [78].

4.1.2. Psychophysiologicaly dangerous and harmful production factors

- Physical overload

Working at a computer is characterized by considerable static physical activity; insufficient locomotor activity at high local dynamic loads attributable only to the hands; tensions of the sensory apparatus, higher nervous centers, which provide functions of attention, thinking, regulation of movements.

This type of work can lead to a number of painful symptoms, which are combined by a common name - the syndrome of long-term static loads (SDSN). SDSN can manifest fatigue, stiffness, pain, convulsions, numbness, etc., localize in different parts of the body (neck, back, arms, legs, etc.) and occur individually with different frequency (never, rarely, episodically, daily).

Working position "sitting" is provided with static work of a considerable amount of muscles that is very tiring. With this position, the body of the muscles of the legs, shoulders, neck and arms are in a shortened state for a long time. As the muscles do not relax, their blood circulation deteriorates. Nutrients transmitted through the blood flow to the muscles quickly enough, but in the muscle tissues accumulate breakdown products (eg, lactic acid). As a result of such phenomena, pain may occur.

- Nervous-psychological overload

The main load falls on all elements of the visual analyzer. The constant intense gaze on the display screen reduces the frequency of blinking.

This deteriorates the moistening of the surface of the eyeball with tear fluid, which protects the cornea from drying out, dust and other contaminants. This can lead

to the appearance of the so-called Sikka syndrome: the cornea dries and blurs, until blindness occurs.

The result of intense visual work at the computer can be not only impaired visual function, but also the occurrence of headache, increased nervous and mental stress, decreased performance.

The dazzling effects of luminaires that illuminate the workplace with PCs are greater than others because the user's line of view when working with the screen is almost horizontal, resulting in a reduction in the angle of the various dazzling sources (lamps, windows, etc.) and, accordingly, to the increase in blinding. Increasing the interference of direct brightness, enhanced by adapting the user to the often low brightness of the screen, can cause not only asthenopic phenomena but also functional disorders [79].

- Monotonous work, mental overload, emotional overload

The work is characterized by the completion of one-of-a-kind tasks, constant focus on solving a certain problem.

Central nervous system (CNS) disorders are caused by:

- Informational brain overload combined with time deficiency;
- Great visual and nervous-emotional stress;
- Hypodynamia;
- Monotony;
- High responsibility for the end result;

Impact factor: periodic, long-lasting.

4.2. Measures and remedies to protect people from the effects of harmful and dangerous production factors, ways to prevent dangerous situations in the working area of the specialist in the laboratory of the Scientific Center for Aerospace Research of the Earth

- Protection against electromagnetic radiation:

For the purpose of preventing adverse effects of electromagnetic radiation, the admissible levels, which are regulated by the Order of the Ministry of Health of Ukraine of 23.08.1996 No. 239 [80], must be switched off with no computer or other equipment.

- Protection against ionizing radiation:

In order to prevent unsafe exposure from ionizing radiation, it is necessary to provide a tidal ventilation system with at least 5x air exchange. Room cleanliness, including daily wet cleaning, should also be maintained.

When working on the monitor of the computer, it is recommended to use protective goggles ZP5-90, which are covered with a semiconductor lead, which weakens the intensity of electromagnetic energy.

As an eyepiece perspective, a computer screen can be mounted on the monitor so that the center is below the level of the user's eyes.

The monitor should be at least 45 cm away and take systematic short breaks of 15 minutes. every 2 hours.

The organization of the work place of the PC user must ensure that all elements of the work place and their relative location are in conformity.

The area allocated for one working place from the PC must be at least 6 m², unless it is provided in the room where the workplace of the specialist is located (it is 4 m² at a space of 20 m² with the number of computers).

In addition, the following requirements must be met:

- the workplace of a PC specialist should be located at least 1m away from the walls;

- the distance between the side of the computer and that of the adjacent PC must be at least 1.2 m.

Noise protection:

To reduce the noise levels in the working area of the specialist it is recommended:

- use low-noise equipment, in particular PCs with built-in sound absorption systems that significantly reduce the noise generated by fans and discs;

- rational use of the equipment: switch it on when necessary and switch off at the end of the use, interruptions in the work. Take advantage of special programs that reduce the noise of the hard disk drive by reducing the data search speed;

- to regulate the number of persons in the room [81].

- Eye protection:

For the creation of favorable minds of mature work, which would exclude the rapid fatigue of the eyes, the emergence of occupational diseases, accidents and contribute to improving the productivity of work and the quality of work performed

- to create illumination on the working surface, which corresponds to the nature of the mature work and is not lower than the established norms;

- to ensure sufficient uniformity and continuity of the level of illumination in the workplace, in order to avoid partial re-adaptation of the organs of vision;

- not to create dazzling actions both from the light sources themselves and from other objects that are within sight;

- do not create sharp and deep shadows on the working surface (especially motions);

The reliability and efficiency of artificial lighting depends on the timeliness and care of their service. In fluorescent lamps, it is also necessary to monitor the proper functioning of the switching circuits (prevent the flashing of lamps and noise from other vehicles), to ensure the safety and ease of operation and servicing of the lamps, and to replace the lamps in a timely manner.

Periodically, at least once a year, it is necessary to check the level of illumination in the control points of the working area.

- Protection against electric shock:

The prevention of dangerous influence of electric current consists in:

- Application of insulation, double as required;

- "concealed" placement of current-carrying parts;
- tracing and twisting of wires;
- protective shutdown of equipment (use of uninterruptible devices).
- Protection against adverse temperature conditions:

In order to normalize the air temperature in the working zone, it is necessary to remove excess heat due to ventilation and systematic room ventilation. This will ensure the normal sanitary and hygienic conditions of the air environment.

Ventilation can be forced-air, general-purpose or local. It shall provide adequate facilities in the premises in accordance with the requirements of GOST 12.1.005-88 [82].

- CNS protection:

Preventive measures that prevent the occurrence of states of emotional and physical tension, fatigue and various types of health disorders of the user, formed under the influence of work at the computer, are:

- providing rational lighting in the workplace;
- adherence to the modes of work and rest;
- rational organization of the work place.
- Improving workplace lighting conditions:

Of all these factors, the most significant is the effect of the computer, as it is a source of electromagnetic and ionizing radiation, to some extent, of noise and thermal pollution. By the same token, constant work on the monitor leads to a clear discomfort, which becomes even more apparent when the working place of the specialist is insufficient.

In order to minimize the negative impact of this fact, others that enhance its effect should be eliminated. This, in particular, relates to the illumination of a specialist's workplace. Therefore, there is a need for adjusting it, so preliminary calculations must be made.

It is necessary to calculate the necessary natural and artificial illumination, since the workplace of a specialist during the working day is ensured by their priority, and sometimes by their combination.

Regarding the natural light, its calculation is performed in the following way:

$$e_{4,3} = e_3 \cdot m \cdot c,$$

where e_3 – is the normative value of the natural light coefficient (KPO) for the 4 and 3 light bands, respectively ($e_3 = 1,5$);

m – factor that reflects the light climate ($m = 0,85$);

c – a factor that takes into account the sunny climate and depends on the latitude and location of the windows.

For Ukraine, the value of c is between 0.75 and 1.00 for buildings 50° north of north latitude, and 0.70 to 0.95 for buildings south of this latitude. For windows facing south, the minimum value of this factor is accepted, and for windows facing north it is maximum. For the room where there is a working place of the specialist $c = 0,75$. From here:

$$e_{4,3} = 1,5 \cdot 0,85 \cdot 0,75 = 0,95625 \%.$$

The real value of KPO in the side illumination is calculated by the formula:

$$e_p = \frac{100 \cdot \tau}{S_n \cdot k \cdot r \cdot p},$$

where S_b – total area of windows ($S_b = 4 \text{ m}^2$);

τ – overall light transmittance, which depends on the type of frame and the position of the glass surface ($\tau = 0,40$);

r – a factor that takes into account the increase in the KPO by the help of reflected light and is a function of the ratio

$$\frac{L}{B} ; \frac{B}{h} ; \frac{l}{B} ;$$

where l – the distance of the design point to the wall with windows ($r = 2$).

S_n – floor area of the room ($S_n = 20 \text{ m}^2$);

k – a reserve factor that takes into account air pollution in the work area (with dust, smoke, and soot less than $k=1,3$);

η – the light characteristic of the window, which is a function of ratios $\frac{L}{B}$ and $\frac{B}{h}$;

B – the depth of the room, that is, the distance from the wall with windows to the opposite deaf wall, m.

L – the distance between the opposite walls, which are perpendicular to the walls with windows, m;

h – distance from the level of the conditional work surface to the top of the window, m ($\eta=16$);

p – a factor that takes into account the shading of the windows opposite the buildings ($p=1$);

$$\frac{1 \cdot 0 \cdot 0 \cdot 2}{p \cdot 2 \cdot 0 \cdot 1 \cdot 6} = 0,7$$

From the above calculations it follows that the value of the calculated coefficient of natural illumination is less than the normative ($e_p < e_n$). This indicates that the specialist's workplace is insufficiently provided with natural lighting.

If artificial illumination is considered, its value is determined by the method of calculating the luminous flux by the formula:

$$F = \frac{E_n \cdot S \cdot K \cdot Z}{n \cdot \eta}$$

де F – the luminous flux of the lamp, lm;

E_n – normative illumination, lux;

S – area of illumination room, m²;

K – the factor of the stock taking into account the decrease of illumination as a result of pollution and aging of lamps;

Z – coefficient of irregularity of illumination;

n – the number of lamps in the lamp;

η – coefficient of light flux utilization.

Coefficient η is determined by the lighting tables, depending on the indicator of the room and the coefficients of reflection of the walls and ceiling. Indicator of room and find with the formula:

$$i = \frac{a \cdot b}{h_p \cdot (a + b)}$$

де a і b – length and width of the room, m;

h_p – height of lamp above working surface, m.

Here are the initial data to calculate the illumination of the room where the specialist's workplace is located:

$a=5$ м; $b=4$ м; $h_p = 2,5$ м; $E_n = 300$ лк; $S=20$ м²; $K=1,3$; $Z=1,1$ (for luminescent); $n=3$; $\rho_{cm} = 0,7$ – ceiling reflectance; $\rho_{cmu} = 0,5$ – wall reflection coefficient; $\rho_p = 0,1$ – the reflection coefficient from the working surface.

We define the index of the room:

$$i = \frac{54}{25(5+4)} = 0,889$$

Тоді $\eta = 0,889$.

Find the value of the light flux:

$$F = \frac{300 \cdot 11 \cdot 3}{0,889} = 3217$$

For a light flux of $F = 3217$ lm for a voltage of 220 V we select a fluorescent lamp that would provide the obtained value of the light flux. In this case it will be LDC-80 with a specific power of 20 W / m with a light flux of $F = 3700$ lm.

In the room where the workplace of the specialist is located, fluorescent lamps LD-40, whose light flux is 2400 lm, are installed. This value is less than the calculated value, which indicates that there is insufficient artificial lighting of the specialist's workplace.

Therefore, the steps to improve the lighting in the work area of the employee should also include the replacement of lamps, and also the location of the specialist's workplace closer to the window.

That is, it is necessary to ensure a uniform illumination of the workplace. The degree of illumination of the room and the brightness of the computer screen should

be approximately the same, since bright light in the region of peripheral vision greatly increases the intensity of the eyes.

- Provision of fire and explosion safety:

The cause of fires in the workplace of the specialist may be:

- Malfunction of the power supply (short circuit, overload of the power supply);
- poor-quality electrical wiring connection;
- overload of electrical appliances available in the room;
- short circuit or spark in the on and off devices.

Fire safety at the workplace of the specialist is provided by the way of conducting annual fire safety briefings, in accordance with the Typical situation, approved by the Ministry of Emergency Situations, and in cases of emergency

The furniture and furnishings in the room are arranged in such a way that they allow free entry to the exit door. Stationary telephones with telephone number designations for calling the fire alarm are displayed. The room is provided with safety signs. There is also a system for emergency shutdown and switching of existing equipment.

In the event of a fire, it is possible to safely evacuate through the escape route. In case of a possible fire, a fire shield is installed on the storage platform, equipped with fire equipment and an OU-5 fire extinguisher and an existing drainage system with internal fire cocks.

Also, the workplace of a specialist must be provided with an electrical protection system, ie, a fire alarm system (light or sound) that converts non-electrical physical quantities (heat and light energy, smoke and heat).

There must also be an exterior fire escape, which will speed up the evacuation or become the only way out when blocking the main fire. By the way, there must be a lightning protection device and equipment [83].

To ensure fire safety in the room where the specialist's workplace is located, it is necessary to:

- the electrical system, electrical appliances and equipment should only be operated in good working order, taking into account the instructions and recommendations of the manufacturing companies. In the event of damage to the mains, switches, sockets and other electrical appliances, they must be immediately switched off and the necessary precautions should be taken to bring them into a fire condition;

- documents, paper and other flammable materials should be stored at least 1 m away from the electrical panel; 0,5 m - from electric lights; 0.6 m - from detectors of the automatic fire alarm system and 0.15 m - from central water heaters. In the event of impossibility of maintaining the specified distance to the construction structures, they must be protected by non-combustible thermal insulation materials;

- Fire protection equipment should be kept in good working order and should not be used for its intended purpose. All workers must be able to use an existing fire extinguisher, other primary fire extinguishers, and find their whereabouts. The distance from the farthest place to the location of the fire extinguisher shall not exceed 20 m;

- take steps to implement automatic means detecting and extinguishing fires and using automation for this purpose. [77].

CONCLUSIONS

As a result of this diploma thesis "Environmental Assessment of Ukraine Emerald Network Objects in the Uranium Extraction Area" was:

- 1) Thus, the study area is located in the center of Ukraine, between the Dnieper and Southern Bug rivers, in the southern part of the Dnieper Heights.
- 2) The general characteristics of the ecological network are considered, the elements and objects of the ecological network are defined, the objects in the area of uranium production are examined. The main environmental problems of the research area are identified. Biogeographical regions of Ukraine and locations of regions of interest on the border between continental and steppe zones are analyzed. Biotopes belonging to this territory have been created. A raster map is created and the locations of all trace objects are identified for spatial assessment.
- 3) As a result of the study, we can conclude that there are a large number of NRF facilities and Emerald Network sites in the uranium industry.
- 4) Creating a raster map is very useful and effective for determining the exact location of objects and spatial analysis of the territory. As a result, GIS technology has created a map for the uranium industry.
- 5) Extraction of raw materials at uranium mines leads to the formation of large amounts of radioactive dust. This dust and the emitted radioactive gases enter the atmosphere during the ventilation of the mines. Which causes a threat to natural objects.
- 6) When using mines, measures should be taken to reduce the environmental risks, among which the greatest threat are: processes of burning in separate sections of waste heaps and waste heaps, possible landslides and weathering in places where the rocks are peeling off, disturbance of hydrological regime and flooding of mine water, earth surface of radon from mines, etc.

When performing mining operations, natural objects are exposed to harmful and dangerous production factors, namely the simultaneous influence of several radioactively dangerous factors: radon; subsidiaries of its decay; ore dust.

In my opinion, natural objects (namely, NRF and Emerald network objects) are most affected by radon. Methods for solving the problem of conservation of rare flora and fauna in the study area can be the classification of NRF sites to the Emerald Network, which will allow the legal protection of valuable natural objects.

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