1. Introduction

To manage sectoral resources, including regulatory pressure on various types of tourist zones, affecting natural areas, specially protected at this stage, in order to reduce the anthropogenic load on these natural territories and to utilize the capabilities of the digital economy. There are innumerable new opportunities for resource management in various types of tourist space, including specially protected natural areas (SPNAs). The main task in this case is the guaranteed preservation and multiplication of specially protected species of plants and animals. It seems that in the case of the formation of the information framework for managing the natural resource base, due to the complexity of both the control object itself and the description of its individual characteristics, the elimination of semantic gaps is possible only when ranking the elements of the inventory system [1]. This issue can be solved with the help of blockchain technologies from the point of view of regulating these processes in the digital transformation of society.

2. Materials and Methods

The purpose of this article is to adapt the existing and develop fundamentally new approaches to managing tourism and recreation resources in SPNAs, based on spatial differentiation and integration of tourism and recreation resources, based on GIS as a geoinformatics process. Geoinformatics is closely related to computer science. Therefore, all information resources, used in computer science, such as texts, databases, information technologies and software [2], are also used in geoinformatics. Consequently, the use of blockchain technologies in GIS is an expectable fact, associated with the adaptation of blockchain technologies, with the mandatory consideration of the characteristics of specific biocoenosis.

Because GIS datasets display individual objects with their geographic location and shape, just like layers on a map, their properties are stored in explanatory information for each spatial object, including a description of the main biotopes. The geo-information model contains several levels of description:

– objective: related to the area of information processing; system, related to the organization method and processing methods;

– basic: determined by the choice of basic data models, independent of the scope of the information model [3].

BLOCCHINE TECHNOLOGY IN THE ANALYSIS OF SECTORAL INFORMATION FOR THE PURPOSE OF REGULATING THE ANTHROPOGENIC LOAD ON SPECIAL PROTECTION NATURAL AREAS

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Abstract: Subject of research is a set of organizational and economic relations arising in the process of managing the resource potential of natural territories, protected by a special law.

Aim of research is the development of scientific methodological and practical recommendations for improving the management of special territories of the tourist and recreational sphere.

Methodology of research: system-structural, comparative analysis and analysis of industry information with the use of monochrome block technologies (in studying the problems of functioning of the economic potential of natural territories, protected by a special law); economic analysis (in assessing the state and dynamics of the economic potential of natural territories, protected by a special law); modeling and forecasting (in the process of studying the dynamics of the development of resource potential of nature protection areas of the tourist and recreational sphere).

Results of research: the conceptual and theoretical bases of analysis of the tourist-recreational potential of any territorial biocenoses are determined, taking into account the international experience in the sphere of tourism and digital transformations; systematized approaches to the study and assessment of the tourism-recreational potential under changed conditions; metrics were created and the mechanism for collecting material on the tourism resources of the study areas, including specially protected natural areas, was determined (SPNA); the methodology of the research of substances of artificial ("civilization") origin are theoretically substantiated; blockade and GIS technologies in optimizing tourism activities for the purpose of preserving biological potential; blockade technology in the analysis of industry information in order to optimize the anthropogenic load on protected areas and preserve their biological potential.

Conclusions: the system of scientific principles for managing tourism and recreational resources of protected areas, the tourism and recreation sphere will allow identifying unused reserves, and also includes methods, tools and directions for solving the tasks of strategic development of the potential of natural territories, protected by a special law.

Keywords: resource potential management, geographic information systems, blockchain technology, modeling, geodata.

In essence, TIS is a graphical information system, designed to support the processes of a single geo-information space[4].

We propose to apply the blockchain technology without changing the meaning of the proven and justified concept only by arguing that it is advisable to apply modern technologies and their unique capabilities.

For example, homogeneous areas can be identified: by delineating various areas representing the predominant type of objects, or blockchain technology implementation values for analyzing spatial data (that is, layer polygons of object types and their descriptions or blockchain identification as attribute values) **Fig. 1**.

In a structured task, it is possible to express its content in the form of a mathematical model that has an exact solution algorithm. Such problems usually have to be solved many times, and they are routine. The purpose of using an information system for solving structured tasks is to fully automate their solution, i. e. reducing the role of the human factor to zero. An example of a structured task is, for example, payroll accounting [5].

These systems have a higher degree of intelligence, since they are characterized by the processing of knowledge rather than data. In total, this makes it possible to formulate and achieve specific goals:

1. The medium-term goal is to provide the main groups of consumers with relevant, reliable and comprehensive geo-information to assess the state of the territory, the current situation and make spatial decisions;

2. The long-term goal is the introduction of geo-information methods for modeling, analyzing and forecasting directly into the processes of developing spatial solutions in order to optimize them, increase efficiency and reasonableness and make more rational use of available resources.
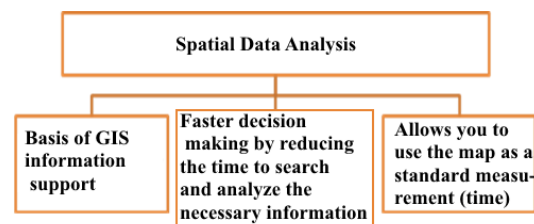
Fig. 1. Spatial Data Analysis

At all stages of the study the execution of a full-scale environmental impact assessment is planned, as well as the allocation of segments [6], associated with the development and formation of recreational activities in order to create tourist and recreational complexes, using an integrated approach and taking into account the laws, governing the formation of the tourist and recreational potential of the Republic of Belarus. Work in this area involves the adaptation of the international experience and participation in the planning of global projects, taking into account the risk of overloading specially protected natural areas (SPNAS) with excess tourism.

Geographic and environmental information is processed in a GIS using three initial data structures:

1. Spatial object classes (individual graphic elements) (**Table 1**).

Table 1

Spatial objects classes

GIS	BLOCKCHAIN
Road network	Detailing
Water system	Segmentation
Administrative boundaries	Identification
etc.	Recognition

Consequently, it is assumed that the formation of new tourist attraction management mechanisms, aimed at creating tourist and recreational complexes results in a territorial gene pool consisting of two aspects of natural and artificial ("civilizational") origin. Usually GIS is used to process several different data sets, each of which contains data on a specific set of features (for example, a road network), geographically attached to the earth's surface.

GIS data sets are logical collections of various objects [6]. A data set is a collection of homogeneous features, collected by topic. The technology of development of the information society ensures the implementation of the principles of "open data" by providing access to information-virtual resources that contribute to the development of new forms of tourism (cognitive, auxiliary, organizational), allowing management of the anthropogenic load on the territory (**Fig. 2**).
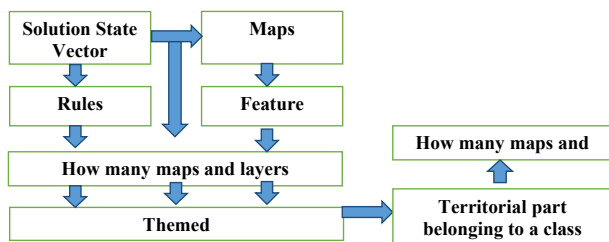

Fig. 2. State vector

2. Attribute tables (in the form of descriptive attributes)

It is assumed, that the key features will form the "core of features" [6], representing the multifactor characteristics of selected objects within individual types of tourist space, which forms the basis of the forms for characterization (object description) for solving various optimization tasks, in particular, considering the optimal anthropogenic load on the territory.

In GIS, spatial data sets are usually organized as sets. The proposed structure of the sectoral knowledge base, founded on corporate geographic information systems, as well as the studied integrated indicators for assessing the tourist and recreational potential of regions, can become the basis for supporting management decisions at various levels of building e-economy during the digital transformation of the government [7] feature classes or raster-based datasets.

3. Raster datasets "layers" (raster-based digital elevation models) (**Fig. 3**).
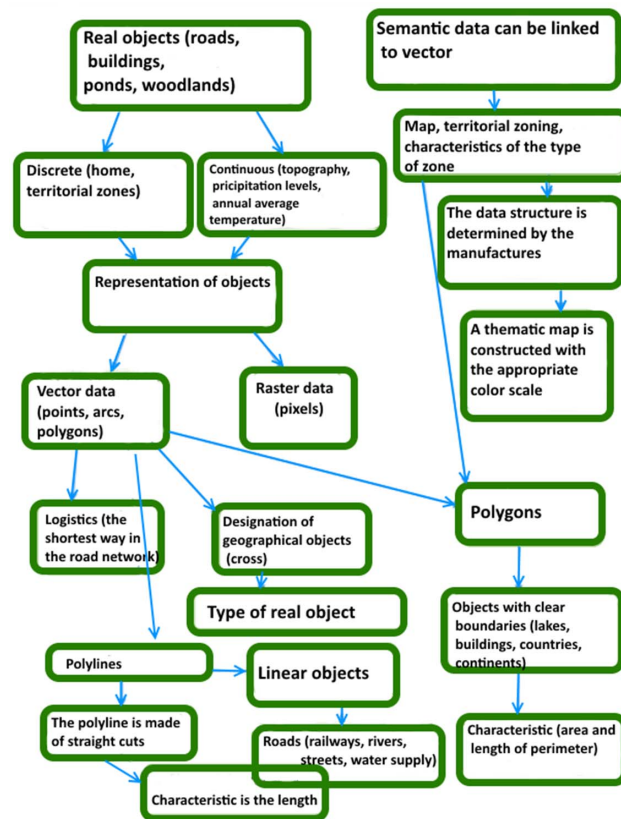
Fig. 3. Principles and algorithms for data presentation

The formation of key features of various types of the tourist space and the definition of the list of objects in the system of the chosen type of tourist space is one of the planned practical results of this work. It is assumed, that the key features will form a "core of features", characterizing the selected objects within the individual types of tourist space [5], which will be the basis of the forms for characterizing the object. Each of these basic data types can be extended with additional features to maintain data integrity (for example, using topology), to model geographic relationships (network connectivity or flow), or to add extended behavior.

Many data topics are best represented as a single data set, for example, soil types or wells. Other topics, such as the road network, are best presented in several data sets (separate feature classes for streets, intersections, bridges, railways, etc.). For example, a transport network can be represented as several classes of street objects, intersections of streets, bridges, motorway exits, railroads, etc. The table below shows how the terrain can be represented, using several data sets.

Raster datasets are used to represent spatially attached images, as well as continuous surfaces of heights, slopes, and aspects (**Table 2**).

This principle of organizing information layers with address decoding by means of blockchain technology can become the main universal principle of GIS, which determines the structure

of geographic information systems, operations and management, as well as the application of geographic information

Table 2
Graphic representation of the main parameters of the database

Geographic representations	Characteristics	Blockchain
Streams	Lines	Detailing
Large water bodies	Polygons	Identification
Vegetation	Polygons	Segmentation
Built-up area	Polygons	Detailing
Central lines of roads	Lines	Recognition
Wells	Points	Identification
Orthophoto	Rasters	Details of
Satellite image	Rasters	Identification
Ground height	Rasters DEM	Identification
Isolines	Digital	Recognition
Elevation points	Models	Detailing
Rasters of relief with washing	Relieflines	Segmentation
Land	Polygons	Identification
Records of the value of land, etc.	Tables	Identification

3. Result

The principal novelty of the studies, conducted to date:

1) the conceptual and theoretical foundations of the analysis of the tourist and recreational potential of any territorial biocoenosis have been determined, taking into account the international experience in the field of tourism and digital transformations;

2) systematized approaches to the study and assessment of tourist and recreational potential in altered conditions;

3) metric indicators were built and the mechanism for collecting material on the tourism resources of the studied areas, including SPNAs, was determined;

4) a theoretical substantiation of the methodology for the study of substances of artificial ("civilizational") origin has been developed;

5) blockchain and GIS technologies in the optimization of tourism activities in order to preserve the biological potential;

6) blockchain technology in the analysis of sectoral information in order to optimize the anthropogenic load on SPNAS and preserve their biological potential.

4. Discussion

The system of scientific principles for managing tourism and recreational resources of protected areas, the tourism and recreation sphere will allow identifying unused reserves, and also includes methods, tools and directions for solving the tasks of strategic development of the potential of natural territories protected by a special law.

When applying the results of this research, the understanding of the need for a clearer conceptual distinction between tourism and recreation and the elimination of significant scientific differences in the correlation of these terms increases significantly, the differences between them relate primarily to the scope of concepts and meaningful content of the industry knowledge base, I can throw a flowchart.

Further, when studying patterns of formation, analyzing the state, modeling the development dynamics of the sectoral (tourist and recreational potential), it is advisable to analyze the methodology of a more detailed content of individual factographic and heuristic forecasting methods, which are most often and effectively used in practice when analyzing industry information on protected SPNAS.)

This activity in a targeted way is aimed at protecting entire sectoral natural ecosystems (at the level of biotopes) with all their components, interconnections and processes occurring in them and forming them in SPNAS.

The use of sectoral management methods will improve the efficiency and simplify the achievement of goals in the processing of large amounts of information and the development of long-term forecasts, in addition to the formal, based on scientific methods of sectoral management. A competent analysis of construction and forecasting methods will be presented, forming a sectoral combination of natural and socio-cultural prerequisites for the organization of tourist and recreational activities in a certain administrative territory, taking into account the permissible anthropogenic load on SPNAS with the use of a map-scheme of tourism and recreational infrastructure and areas with signs of tactile transformation of landscapes.

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