GIS FOR SPATIAL PLANNING
Chemal District, Republic Of Altai, Russia

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ABSTRACT

Spatial (territorial) planning of the Chemal District aimed at determining an optimal territorial structure and organization of the district to guarantee the sustainable economic development, and at the same time to conserve beautiful nature and rich historical and cultural heritage of this area. GIS technology automates time-consuming process of creating and processing cartographic documentation for the schemes of spatial planning at all stages, from preparing and analyzing data to developing GIS applications used in the field of spatial planning and territorial management. GIS plays a predominant role in the data management in spatial planning projects.

Keywords: *spatial planning, territorial planning, cartographic documentation, geographic information systems, GIS.*

INTRODUCTION

The Chemal District is situated in the northern part of the Altai Republic which in turn is located in the south of Western Siberia (Russia), bordering Mongolia, China and Kazakhstan. The Chemal District is famous with its unique nature, picturesque midlands landscapes, mild climate and multiple archeological monuments of different époques found out in the valley of the Katun river. It is a traditional place of resorts and recreation for the people of Western Siberia and even for other parts of Russia.

According to the Russian legislation, executive bodies of all levels must have an approved spatial planning documentation that is urban planning documentation for the urbanized areas and regional or municipal planning schemes for the other areas. Otherwise, they are not allowed to perform operations with land, such as land reservation, land withdrawal, and transferring lands from one category of use to another.

The Planning Scheme for the Chemal District was developed by the Architecture and Design Institute at the Altai State Technical University together in cooperation with the Altai 21-st Century Public Fund which had been working with this territory for several years and gathered a big collection of data.

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SPATIAL PLANNING SCHEMES

It was a task of great importance because the Chemal District was considered as a problem area due to ongoing attempts to revive the construction of hydropower station on the Katun river, which were several times rejected in the past. Federal authorities and the Authorities of the Republic of the Altai continued to insist on an industrial way of development for the Chemal district. That's why; spatial planning schemes of this district were developed in two versions. Namely, the first one was called Nature Conservation and Recreation Version and the second one was called Recreation and Energy Infrastructure Version.

These two versions differed significantly. The Nature Conservation and Recreation Version determined the development of the region as a tourist zone. Recreation and Energy Infrastructure Version, which implied the construction of hydroelectric power station on the Katun river, in fact, impeded the development of recreation and tourism for the planned period and gave a direction to the industrialization of the district as a producer and supplier of electricity. Moreover, this version would lead to various negative impacts, such as destroying the economic integrity of the district due to flooding of existing roads. More than 1/3 part of

the district in the south would be cut off from administrative center and could only be reached from the neighboring districts. Meanwhile the construction of the new roads in the complicated mountainous terrain conditions would be very expensive, and the developers of hydroelectric power station gave no proposals to restore the roads.
The scientists also named various ecological impacts of the dam construction for the power station, such as deterioration of climate, disturbance of the water regime and reduction water stocks because of nonfreezing water reservoir, destroying the water regime of the Katun river and decreasing water stock. Construction of water reservoir would cause the lost of many archeological monuments in the valley of the Katun River because the most part of them would go under the water.
All these negative impacts were described and analyzed in the materials for the Spatial Planning Scheme of the Chemal District in the Recreation and Energy Infrastructure Version. The maps, developed for this version, visualized all these negative impacts and made them it easy for understanding. After a discussion the Republican and local authorities decided to decline the Recreation and Energy Infrastructure Version and Conservation and to approve Recreation and Nature Conservation Version.

GIS TECHNOLOGIES IN SPATIAL PLANNING

Spatial planning documentation must reflect economic, social, cultural and ecological policies of the area giving them geographical interpretation and visualizing. Therefore cartographic section is an important part of the spatial planning documentation. It includes two groups of schematic maps:

- schematic maps, reflecting the current status and conditions of use of the area;
- schematic maps, displaying project proposals for land use zoning, changes of boundaries and resource distribution, location of capital construction projects, etc.

GIS technology provides planners with the powerful tools for both visual and metric analysis of the territory, which help in developing project proposals on territorial structure and organization.
In the tasks of spatial planning we must analyze a lot of characteristics and peculiarities of the territory a. The problem is that this information is not always available in the digital form, and, if available, it can be often in a variety of formats. At the same time the spatial reference of the objects and phenomena can be expressed in different coordinate systems. This means that the first tasks is converting all the information about the territory into the digital form, and integrating all data sources into a database of spatial and attribute data.
The second task is developing GIS applications for spatial planning, that allows to operate with interactive maps included in territorial plan scheme and to produce their hard copies.
The set of maps in spatial planning projects is not strictly determined. It often depends on the characteristics of the particular area. Thus, one of the challenges facing developers of spatial planning projects is the determination and justification of mapping documentation set.

The structure of spatial database and GIS applications, which included interactive maps of the area, were developed for the Spatial Planning Scheme of the Chemal District.
Both paper and digital data sources were used for populating the database. All of the original cartographic materials available in paper form were digitized and registered in the corresponding coordinate system. Update of spatial data was performed with use of satellite images.
Based on the analysis of baseline data, the new map layers were derived for developing cartographic documentation of the spatial planning scheme. Table 1 shows the set of the derived layers, representing the proposed solutions on spatial planning in the Chemal District [1].

Table 1. Derived map layers, representing the proposed solutions for spatial planning scheme of the Chemal district.

Layer	Scale
Construction Zoning	1 : 100 000
Land use zoning (2 versions)	1 : 50 000
Proposals on transferring lands from one category to another (2 versions)	1 : 50 000
Recreational sustainability of the territory	1 : 100 000
Changes of boundaries of populated areas	1 : 50 000
Proposed sites of industrial construction	1 : 50 000
Proposed recreational sites	1 : 50 000
Proposed development of the road network (2 versions)	1 : 100 000
Proposed organization of the territory (2 versions)	1 : 100 000

The set of main maps, determined for the scheme of spatial planning of the Chemal district, is shown in Table 2.

Table 2. The set of maps, determined for the scheme of spatial planning of the Chemal district.

Map	Scale
Proposals (Main Plan) (2 versions)	1 : 50 000
Proposals on transferring lands from one category to another (2 versions)	1 : 50 000
Recreational development of the area (2 versions)	1 : 100 000
Engineering infrastructure (2 versions)	1 : 100 000
Proposed development of the road network (2 versions)	1 : 100 000
Proposed organization of the territory (2 versions)	1 : 100 000

Figure 1 shows a schematic map of proposals for Recreation and Nature Conservation Version of spatial planning project for the Chemal District which was approved as main document.

CONCLUSION

GIS technology automates time-consuming process of creating and processing cartographic documentation for the schemes of spatial planning at all stages, from preparing and analyzing data to developing GIS applications used in the field of spatial planning and territorial management.

GIS plays a predominant role in the data management in spatial planning projects. The maps produced by GIS help to plan developers, local and regional authorities and other stakeholders in decision making process concerning territorial development and management.

In particular the Planning Scheme for the Chemal District developed by the Architecture and Design Institute at the Altai State Technical University helped to estimate natural and cultural potential of the Chemal District that led to rejecting the project of the Katun Power station and determined development of the district as the area of nature conservation and recreation.

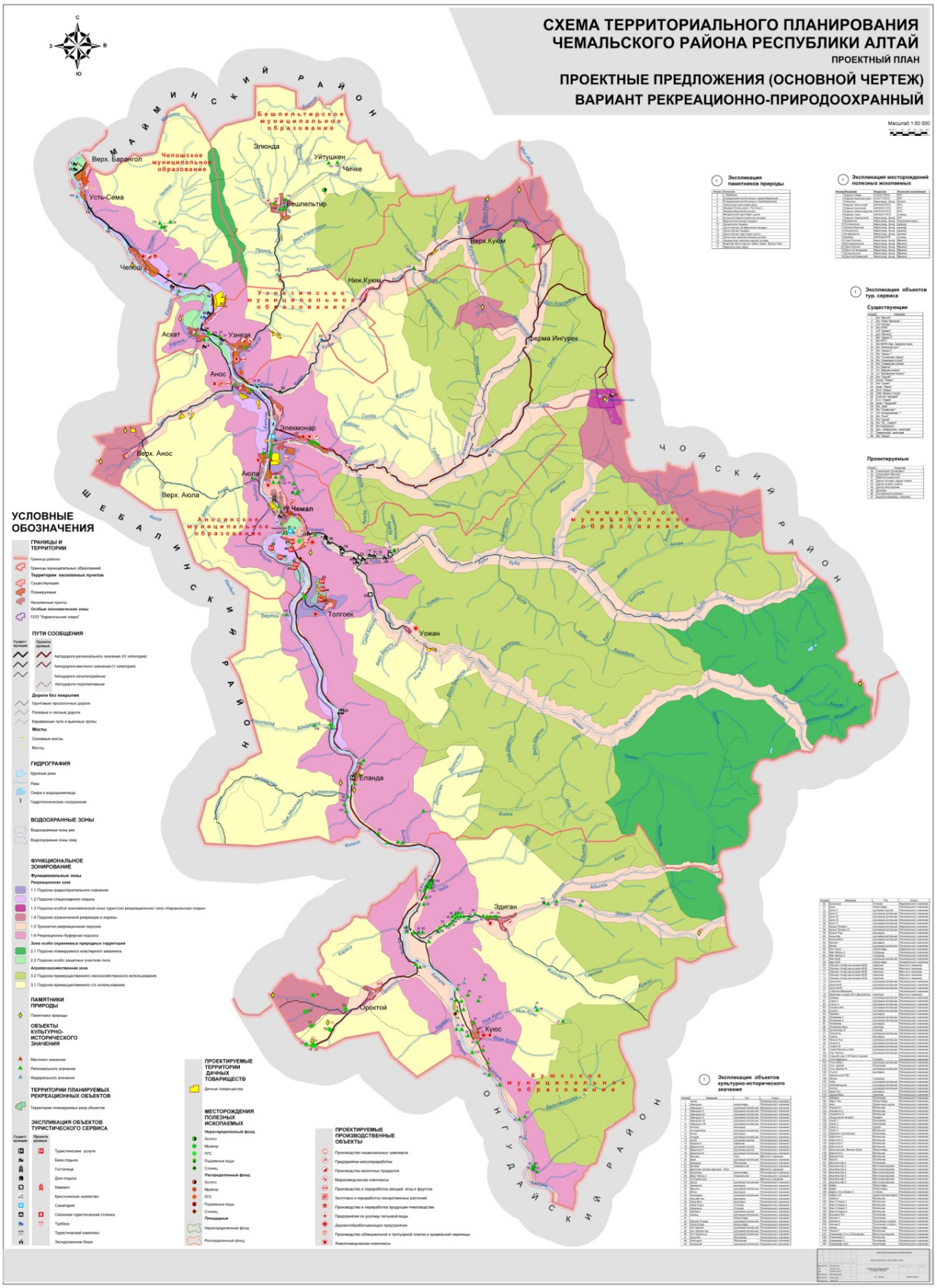

Fig. 1. Schematic map of the proposals on the development of the Chemal district. Recreation and Nature-conservation Version.

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