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CARTLAB

Approaches and Solutions for Creating Atlases in Geographic Information Systems

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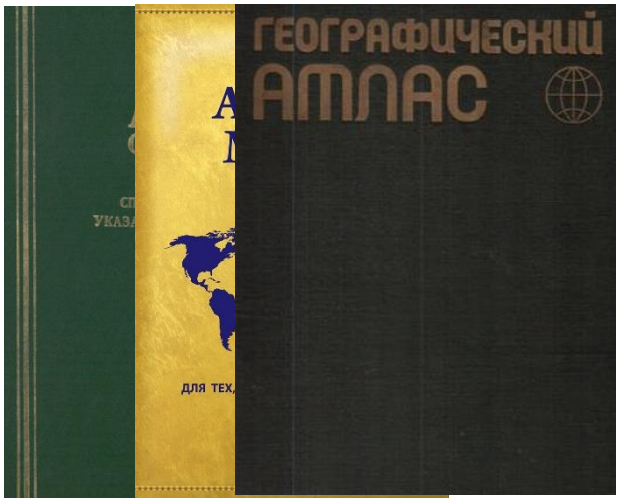
Implementation of Atlas mapping in GIS

1. The perform individual cartographic processes (also used in the preparation of atlases):

- Creating the mathematical basis of maps;
- development of spatial and thematic databases;
- generalization of objects;
- creation of thematic maps;
- creation of typical cartographic foundations and individual thematic maps;
- and others.

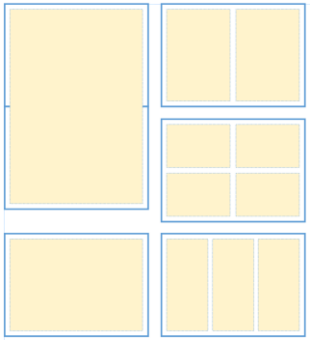
2. Many common GIS have a special functionality that allows one to cut (insert) the map into the pages of an atlas. → The creation of multi-page cartographic works such as city atlases, road atlases, etc.

Various types of Atlases



Type of Atlas		
Complex	General geographic	Thematic
Typical features		
Multiple scale levels of one territory, but of different themes	Many areas of mapping, different in size, but a single theme	Many areas of mapping, different in size and theme
Types of maps		
Overview map Main content Additional maps	Base maps Inset maps	Base maps Inset maps
Determination of scale series		
by the map format taking into account the map layout schemes on its page	by the density of mapped objects	by the density of mapped objects

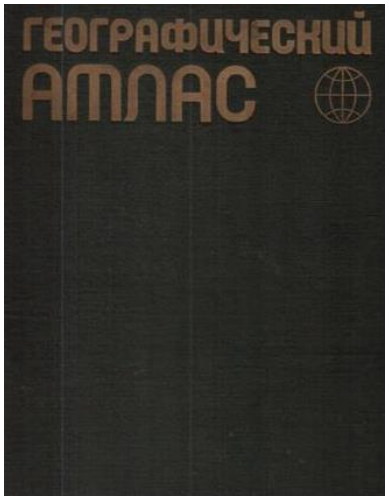
Schemes for determining the scale series of the Atlas

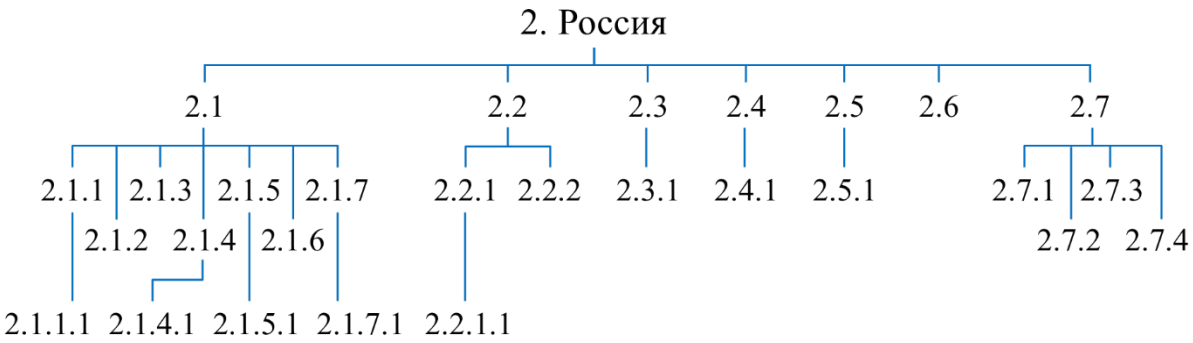


The map layout schemes on atlas' page

Geographic, complex and thematic atlases are characterized by complex structures and diverse relationships between their sections. Therefore, the use of GIS is limited in terms of creating these types of atlases as independent cartographic works with holistic structures and full content!!!

Various types of Atlases





General geographic atlases are of the same type in content, their structure is quite established and it can be attributed to hierarchical ordering, which consists in the possibility of dividing the atlas into its component parts. For example, for the Worldwide Atlas of World 1999, the following sections and subsections can be distinguished: 1. The world as a whole - an introductory section. 2. Russia, continents, oceans - overview maps. 2.1. Regional maps: 2.1.1. Subsections of the 1st order - regional overview maps. 2.1.2. Subsections of the 2nd level - detailed regional maps [36].

Various types of Atlases

The structure of **thematic atlases** is very individual. The ordering of the territory of mapping is organized on the principle of hierarchy of territorial coverage, within each territory (section) there is a set of maps.

Integrated atlases (complex) provide systematized information about the full comprehensive characteristics of the mapped area. In such atlases, the components (sections) of a comprehensive Atlas traditionally form groups of nature maps and socio-economic maps, which in turn are divided into subsections/topics. At the same time," the number of maps in the Atlas and their content depend on the geographical features of the region, its study, the availability of materials, the possibility of their cartographic use ". The main task in developing the structure of the complex Atlas is to determine the necessary sections and the optimal list of maps in each section.

General technological scheme of creating atlases in GIS

Geographic atlas

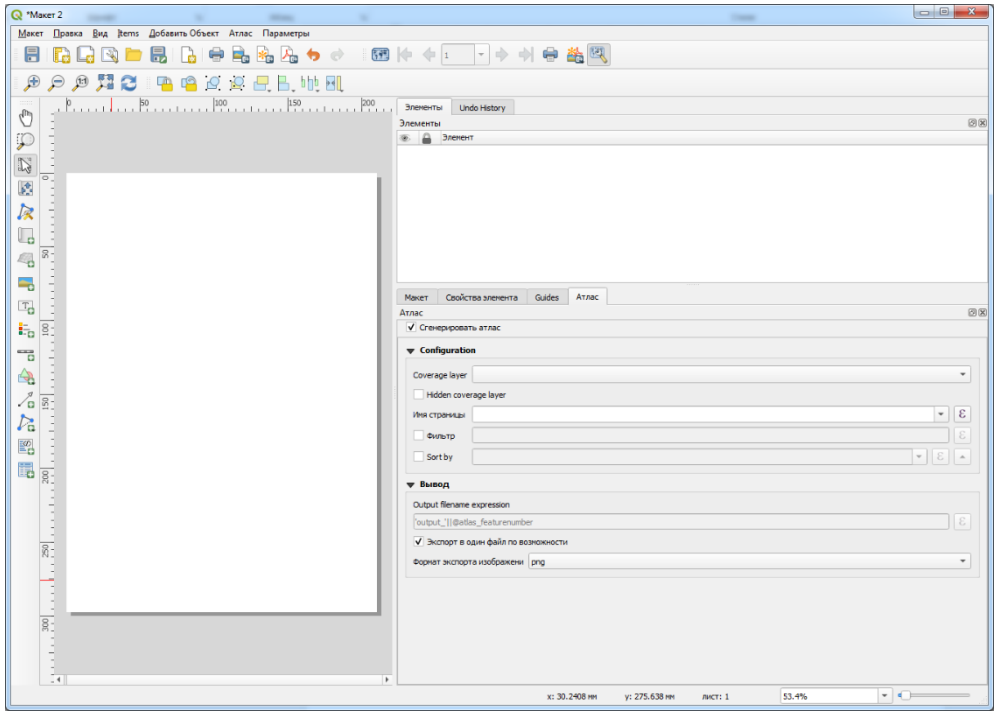
1. Choice of cartographic territory
2. Division of the territory into parts. Map list definition
3. Determining the mathematical bases of maps
4. Creating map layouts
5. Formation of cartographic basis for each map
6. Creating geographic maps

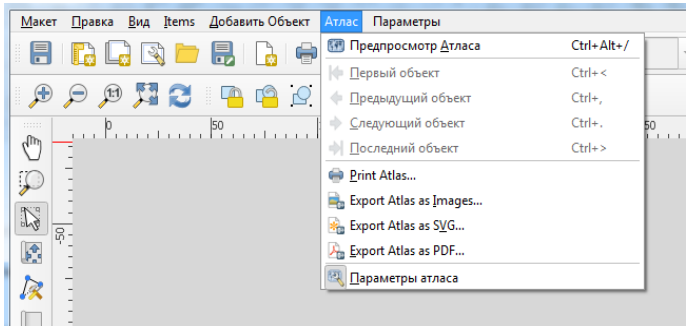
Comlpex regional atlas

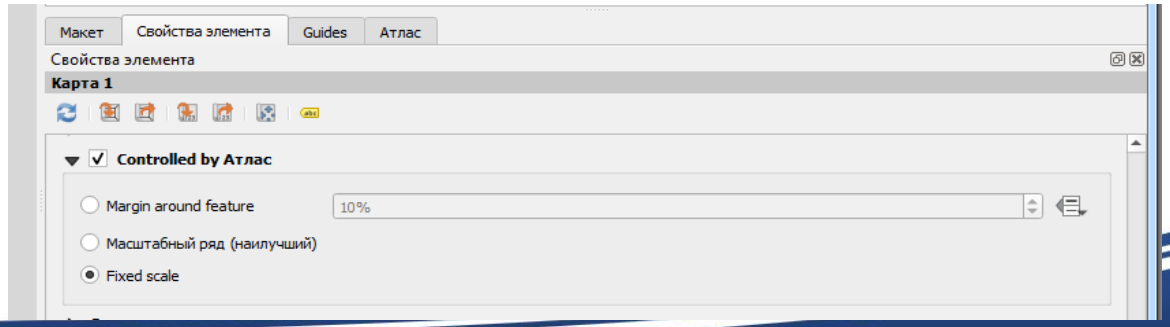
1. Choice of cartographic territory
2. Determining the mathematical bases of maps
3. Creating map layouts
4. Defining sections and subsections of the
5. Defining a list of maps
6. The creation of standard geographical basis
7. Designing thematic content
8. Creating geographic and thematics maps

Creation atlases in QGIS

Window «Layout» (creation Atlas)



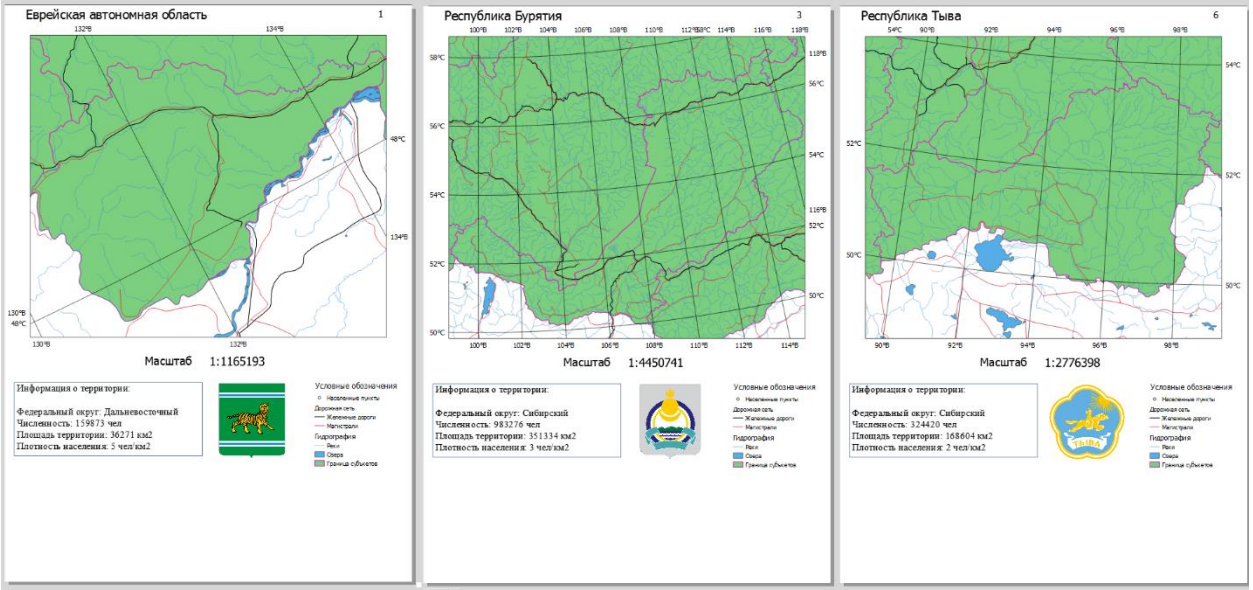




Creation atlases in QGIS

Advantages QGIS for creating Atlas:

- The fast automatic creation maps on each page of atlas with the same content for different territories;
- Creation of a uniform style of atlas pages.



Layouts of pages created by the geographic atlas.

Creation atlases in QGIS

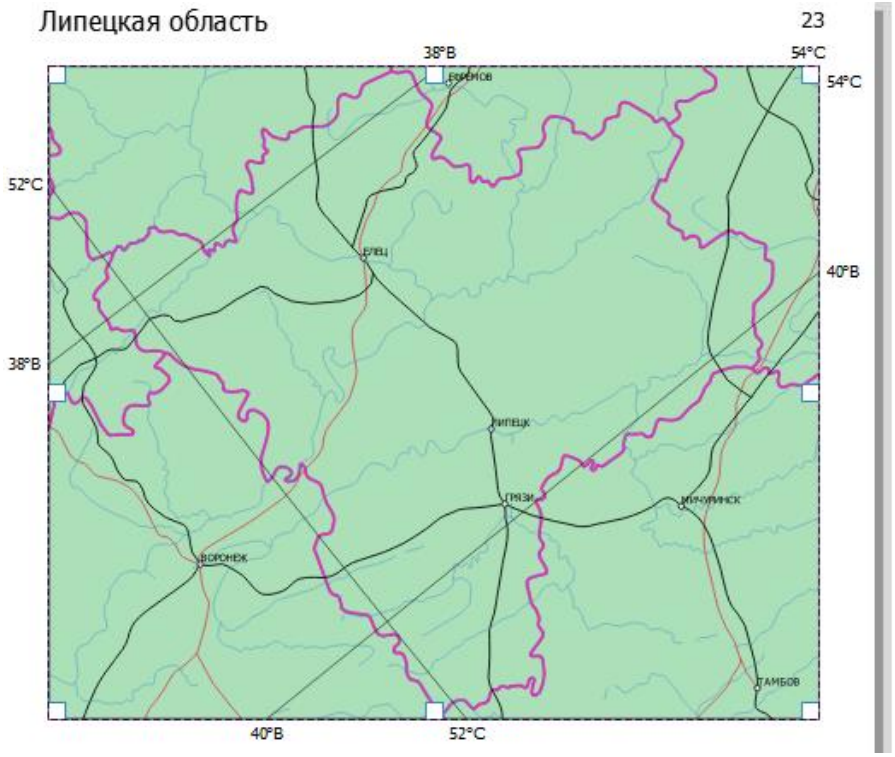
Features of work in the QGIS, making it difficult to create atlases

- The impossibility of miscalculation and the correct rounding of the map scale for different-sized territories;
- Lack of rotation of the territory relative to the axial meridian (when several subjects are on the same coating layer);
- The time-consuming process of creating a floating layout for a complex atlas
- Limited Creation of Map Symbols (not all map symbols are displayed correctly with some cartographic image methods)

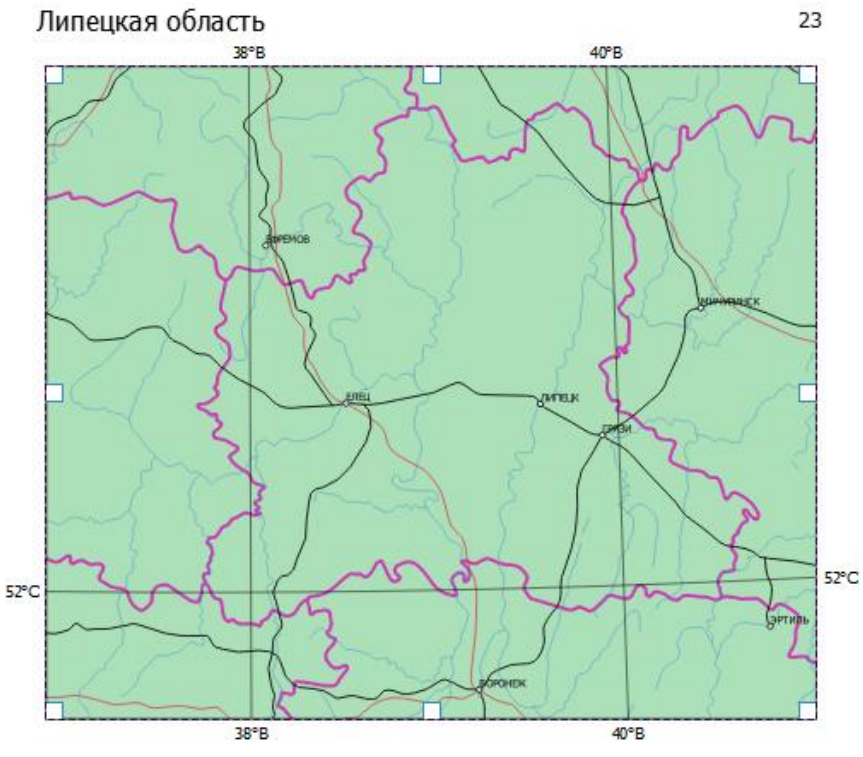
Creation atlases in QGIS

Solutions

1) Solution of the problem of rotation of the territory relative to the axial Meridian



Incorrect location of the territory

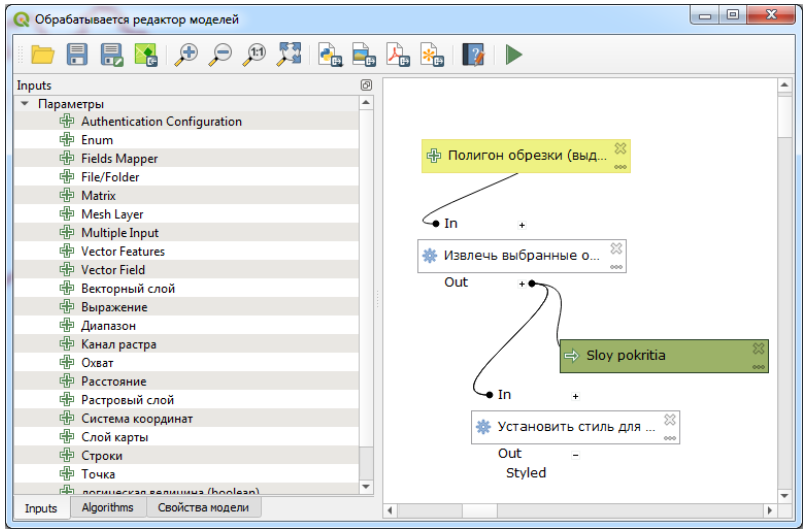


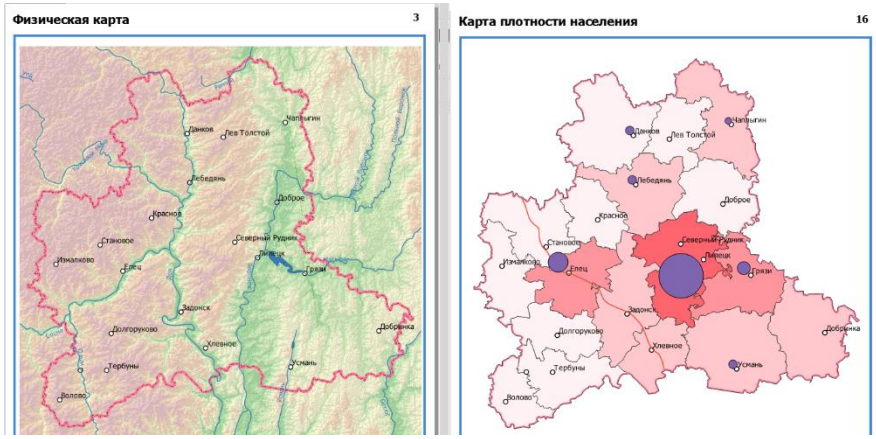
The correct location of the territory

Creation atlases in QGIS

Solutions

2) Creating a floating layout function using a graphical model

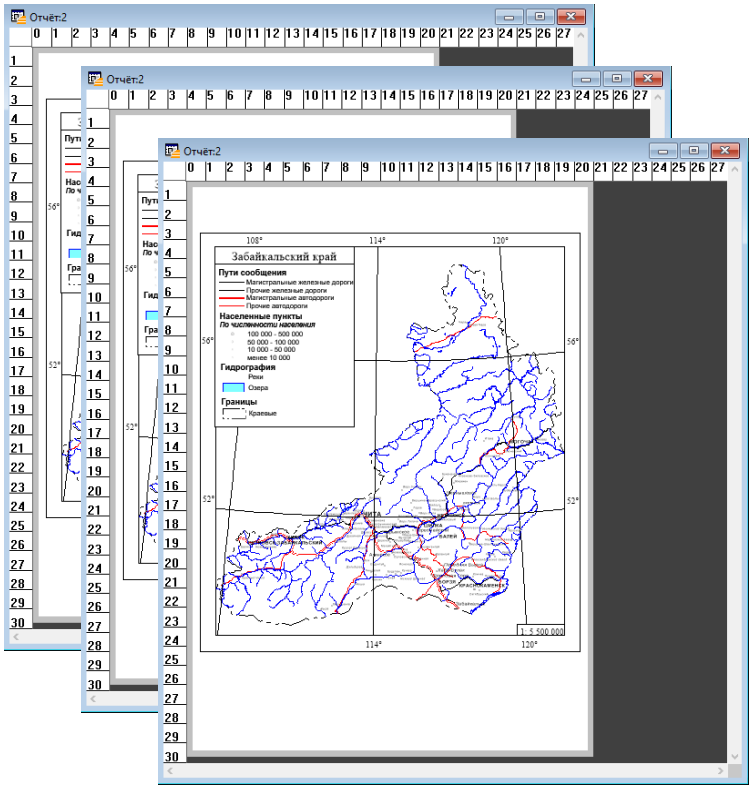




3) The technological scheme of creation of Atlas in QGIS is developed

Creation atlases in GIS MapInfo Pro

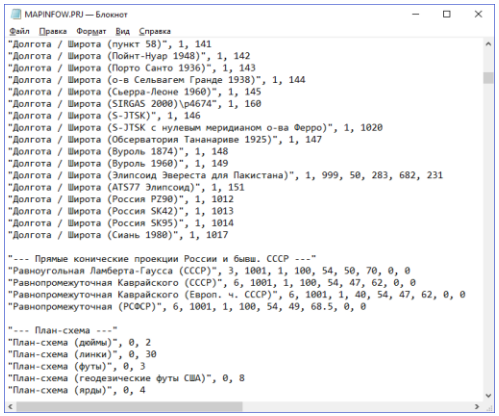
The main advantage of MapInfo Pro GIS for use in Atlas mapping is the ability to create multiple maps and reports within a single working set (project). This allows you to create a multi-page document using maps with different source data, mathematical basis and content, which makes MapInfo Pro suitable for creating General geographic, complex regional and thematic atlases.

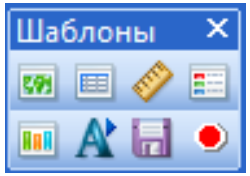


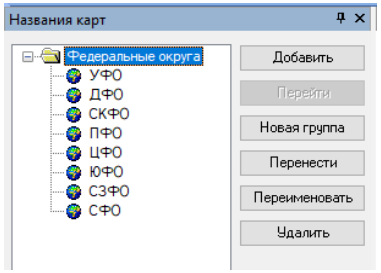
Creation atlases in GIS MapInfo Pro

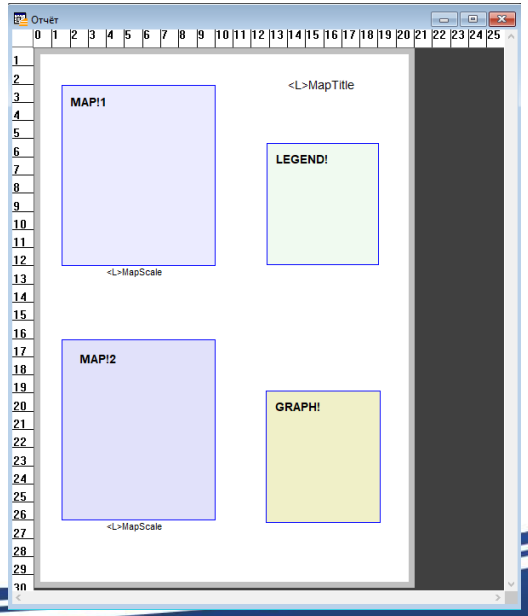
Features of work in the GIS MapInfo Pro, making it difficult to create atlases

- for insert-maps you need to create separate maps;
- if the report window is accidentally closed and the working set cannot be started, the report must be created completely again;
- lack of the ability to duplicate the report window
- map scale and report scale of this map do not match due to window size and frame;
- inability to automatically build a grid with different frequencies in latitude and longitude

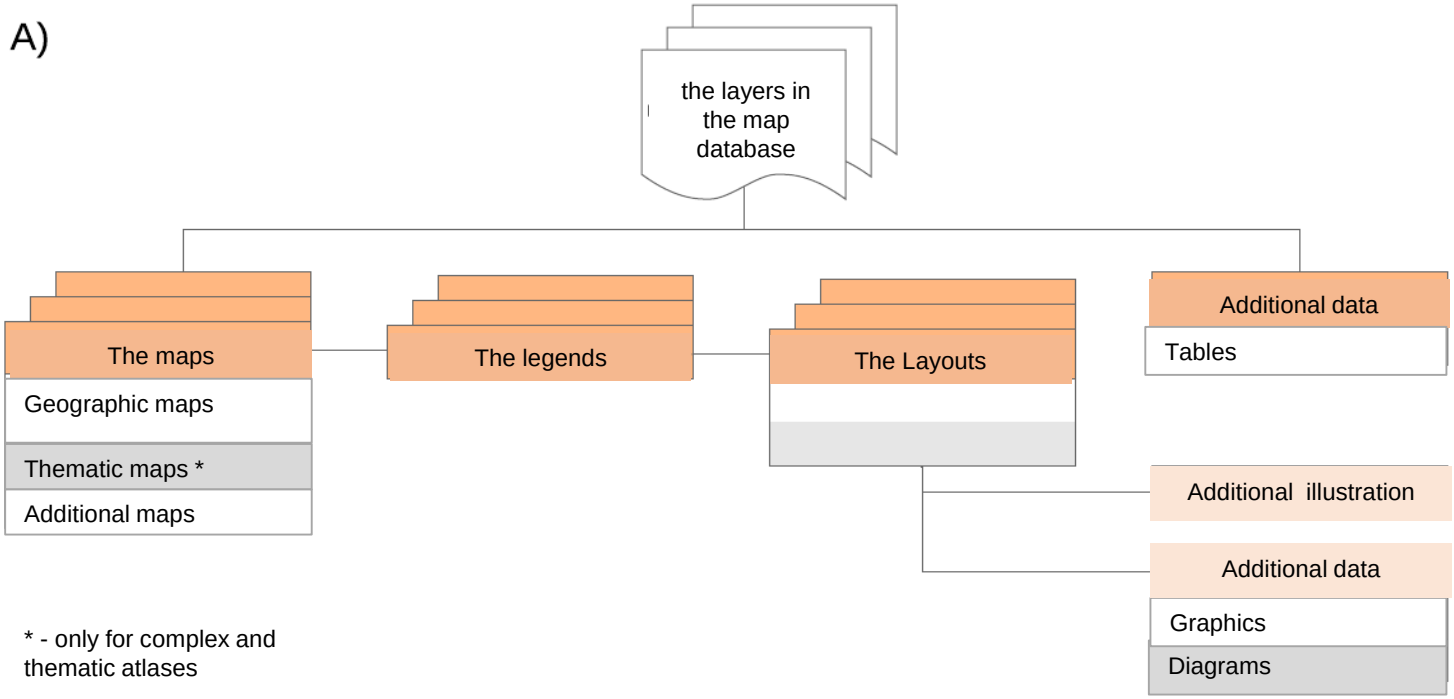








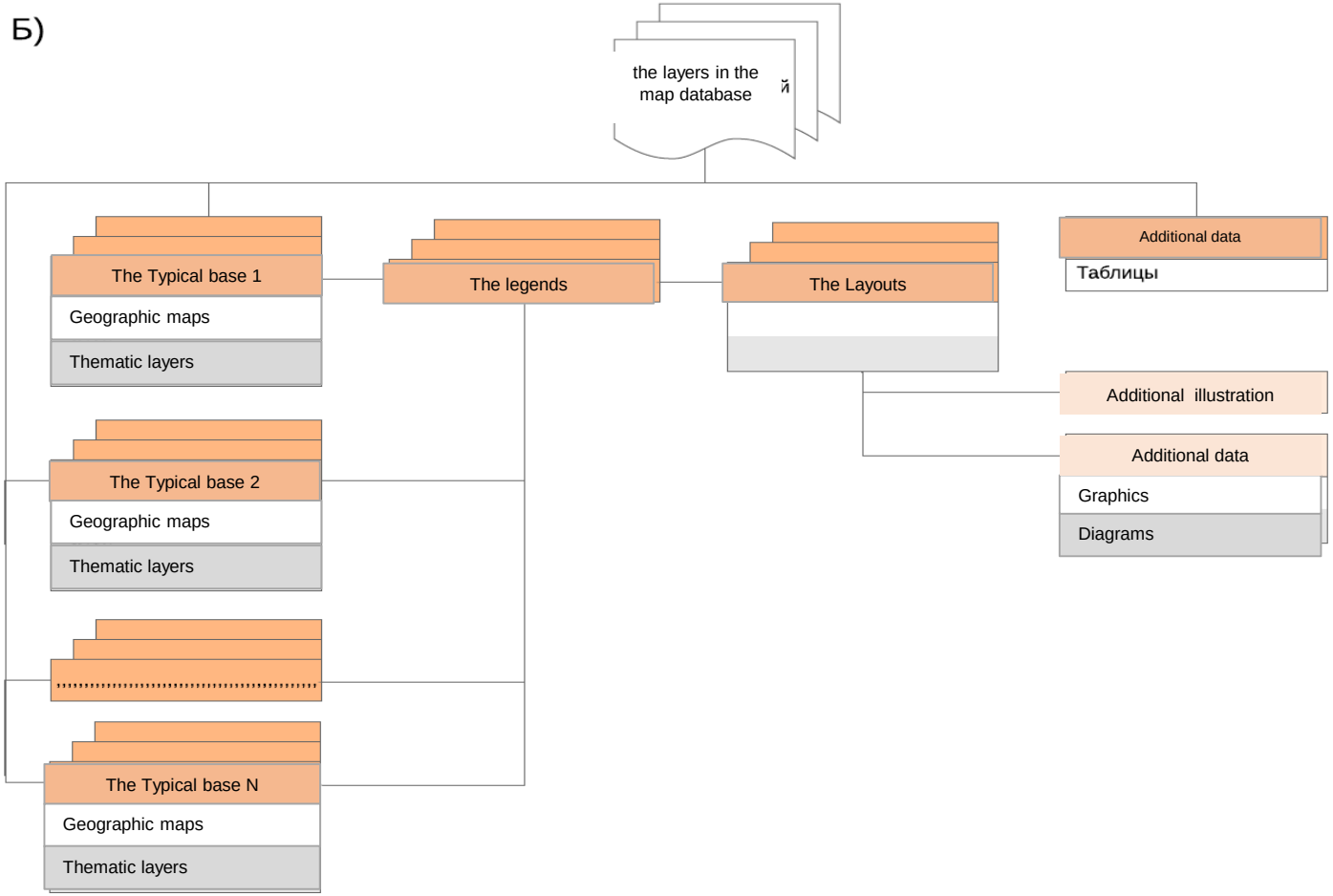
Creation atlases in GIS MapInfo Pro



Organization of the Atlas structure in a GIS MapInfo

- a large number of maps and reports are created in a single working set, making it difficult to navigate internally in the Atlas.

Creation atlases in GIS MapInfo Pro



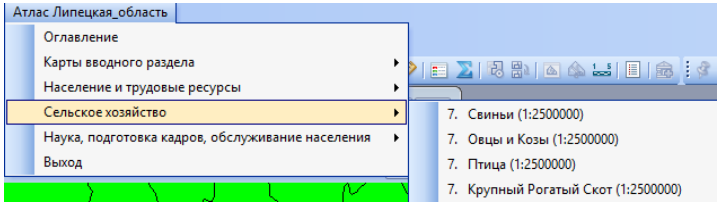
Scheme of organizing a comprehensive regional atlas in MapInfo Pro GIS with the creation of typical foundations

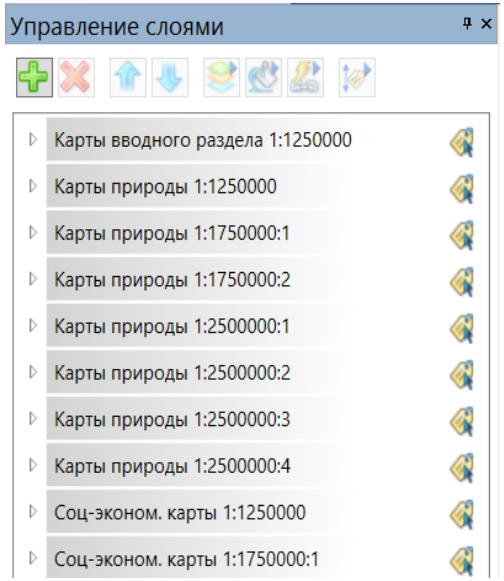
- the structure of the atlas will be represented by the typical geographical bases used in the atlas, which will reduce the number of maps in the program, but it will be necessary to manually turn on and off the thematic layers to display and print different maps made on the same standard basis.

Creation atlases in GIS MapInfo Pro

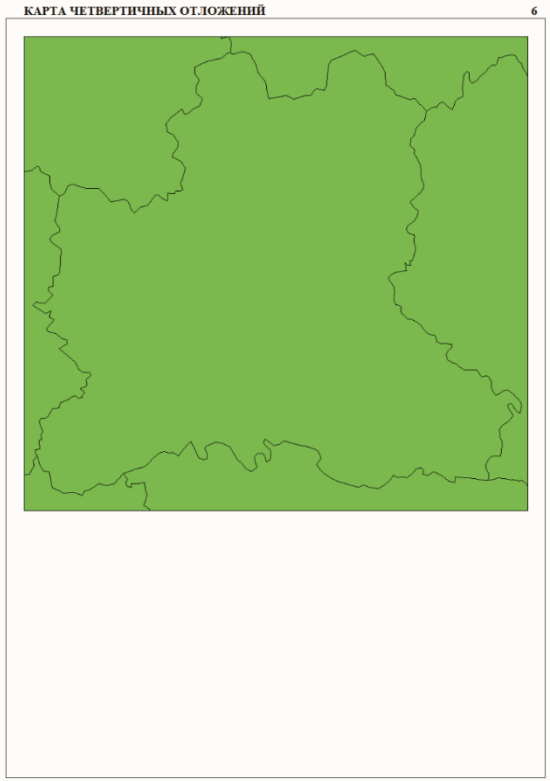
Solutions

1) Software development for determining the structure, creating a menu based on it and the formation of the corresponding windows of maps and reports





Creation atlases in GIS MapInfo Pro



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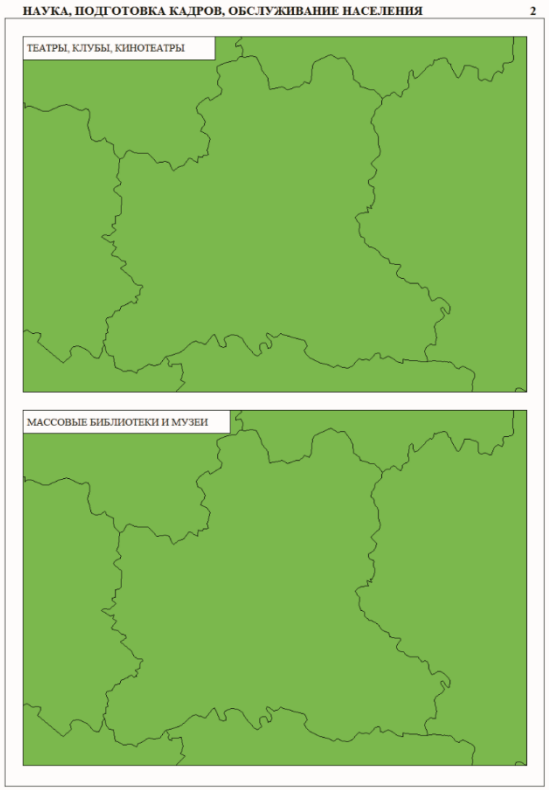
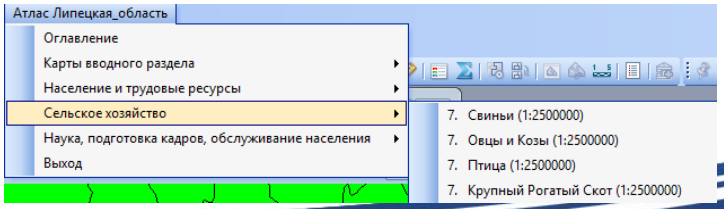


Масштаб 1:1750000

Масштаб 1:2500000



Results and conclusions

1. The formulated approaches and solutions for improving the considered GIS allow automating the basic processes of creating atlases.

2. These proposals are of particular practical importance when creating complex regional atlases that show the situation in the region in many branches of knowledge and are used in decision-making at the regional and municipal levels to ensure sustainable development of territories. This is explained by the presence of a large set of available spatial and statistical data (including those from censuses and data from statistical services) that allow you to create a variety of thematic maps.

3. The development and testing of solution stages first will be carried out on creating complex atlases of certain Russian regions

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Thanks for attention!

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