

**CREATION OF THE DIGITAL DATA BANK
OF 1:1000000 SCALE TOPOGRAPHIC MAP
FOR RUSSIA**

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Abstract

In the Russian Federation digital topographic maps making is carried out within the framework of the Federal Programme approved by the Government. In the course of the Programme realization a digital topographic map of 1:1000000 scale for Russia has been completed by the Federal Service of Geodesy and Cartography of Russia.

1 The Federal Programme "Progressive technologies of surveying and mapping in the Russian Federation"

The Federal Service of Geodesy and Cartography of Russia (Roskartografia) in accordance with the functions charged with by the Russian Federation Government, provides survey and mapping for federal and regional programmes; formation and maintaining of the national cartographic and geodetic data archives of Russia; design of geographical information systems (GIS) of federal and regional levels.

The most urgent problems in the development of geodesy and cartography in Russia are reflected in the Federal Programme for up to 2000, approved by the Government decree of May, 1994 - "Progressive technologies of surveying and mapping in the Russian Federation".

One of the important parts of the programme is that referred to digital mapping where its objectives, targets, prospects, steps and terms of creating a new information industry are defined. Main efforts to accomplish the programme of digital mapping in Russia are aimed at:

- establishment of a unique national digital cartographic data archives, permanently revised, of multi-aspect use;

- development of geographical information systems of various applications as a tool to use cartographic

databases and solve some applied problems of national economy;

- formation and maintenance of cartographic data bases and banks;

- supply of all users concerned, in the first place, governmental bodies, with necessary information.

The task of database formation of digital topographic maps (DTM) is undoubtedly of national importance. It is proved by the results of the questioning of ministries and departments of the Russian Federation. In the course of the questioning scales of needed maps, mapping areas, order of priority, as well as main problems to be solved through digital and electronic maps with using geoinformation systems were observed. It was determined that the top priority goal of the initial stage was to produce digital topographic maps at 1:200 000 and 1:1000000 scales.

To accomplish all the tasks a Russian research and production centre of geoinformation (Rosgeoinform) in Moscow and regional geoinformation centres in Sankt-Peterburg, Ekaterinburg, Novosibirsk, Irkutsk and Khabarovsk were set up in 1992-1993 within the structure of the Federal Service of Geodesy and Cartography. These centres are responsible for digital and electronic map making, formation of geoinformation banks, provision of all the organizations concerned with digital information on land, and for design and use of geoinformation systems.

2 The digital topographic map at 1:1000000 scale

By the end of 1994 the work had started in the later 1992 to produce a digital topographic map at 1:1 000 000 scale for the whole territory of Russia was completed. The main principle followed in the compilation of digital topographic maps for the territory of Russia is to make them fully adequate to conventional maps in content. It means that digital map objects have sufficient amount of attributive data allowing representation of all characteristic features and objects. This work obviously calls for great efforts and production expenditures if to take into consideration that topographic maps produced in Russia traditionally have their high degree of informativness.

Major characteristics of digital topographic maps are as follows:

- content, mathematical base and sheet division are identical to those of source cartographic materials used for digitizing;

- classification and coding system corresponds to that adopted in conventional cartography;
- object quantity number corresponding to the source cartographic material;
- relief representation is by contour lines with conventional contour intervals;
- levels of data access: an elementary object, a compound object, net of objects, a map element, a map sheet, territory, information inquiry about data of any access levels.

The general description of the digital topographic map at 1:1 000 000 scale is given in Table 1. General description of classification and coding systems used for topographic information is given in Table 2.

Table 1
General description of digital topographic map
at 1:1 000 000 scale

	1:1 000 000
Data sources	Overlays
Number of sheets in a series	138
Number of DTMs available	138
Sheet dimensions	4 x 6 degr
Data structure	vector
Average capacity of one DTM sheet	1.5 Mb
Max.capacity of one DTM sheet	3.0 Mb
Average number of objects on a sheet	30000
Layers	8
Relief representation	contours with conventional contour intervals
Technology used	scanning or manual digitizing

In digital topographic mapping the special attention is paid to information quality control. At the centres of geoinformation responsible for map making a strict quality control system is introduced. It comprises a complex of computer-aided means and special control procedures to provide detecting and removing errors of different kinds: deformations in sheet margins, errors in object codes and their characteristics, in plan and height object positions etc.

Table 2

General description of classification and coding systems used for topographic information

	1:1 000 000
Number of layers:	8
- mathematical elements	
- relief	
- hydrology	
- settlements	
- industrial, publical, cultural and agricultural objects	
- road net	
- vegetation and soils	
- boundaries and names	
Number of object codes	169
Number of attributes for one object	0 - 7
Total number of attributes	45
Out of them:	
- qualitative attributes	25
- quantitative attributes	20
Number of meanings that can be taken by one qualitative attribute	from 2 to 160
Total number of possible meanings of qualitative attributes	267

Digital maps published have their practical applications for various ministries and departments: for instance, digital maps of 1:1 000 000 scale are used by the Ministry of extraordinary situations which has concluded with Roskartografia the agreement on designing GIS to warn, localize and liquidate the consequence of disastrous hazards of natural or technogene character; and also by Ministry of environment protection and by others.

3 The international projects

Roskartografia takes part in some international projects for the development of geoinformation systems on the basis of digital topographic maps, in particular, with using DTMs of 1:200 000 and 1:1000 000 scales.

Joint Russian-Finnish project for establishing digital map database and geoinformation system for neighbouring territories of Russia and Finland was signed on the 21st of January, 1993 by the leaders of the Russian Federation Committee of Geodesy and Cartography and of National Land Survey of Finland. On the Russian side the project was agreed with the Ministry of environment protection as regards the formation of thematic layer of ecological data for the neighbouring territory.

States-subjects of Russian Federation, and in particular, the Republic of Karelia, has shown a great interest in the GIS-Sever. Now the question of using GIS-Sever as a basis to develop a regional multipurpose GIS-Karelia is under consideration of the government of the Republic of Karelia.

Taking into account the importance of geoinformation provided for the measures aimed at protection of Baikal lake and steady development of the Baikal region, the Federal Service of Geodesy and Cartography of Russia, the Ministry of Nature of Russia and the U.S. Geological Survey, National Mapping Division, have suggested a joint GIS-Baikal project for 1994-1995.

At present the project GIS-Baikal is considered and approved by the U.S. State Department, which has allotted funds to purchase the equipment required for the project realization. The project was also approved at the meeting of Russian governmental Commission on Baikal.

In addition to the production of digital topographic map of 1:1000 000 scale, the Federal Programme of digital mapping envisages creating digital topographic maps of larger scales, topographic maps and plans, surveying for national cadastres of various kinds, developing and using geoinformation systems of different applications, including international projects, for instance, the joint Russian-Canadian project on the establishment of a digital database of large-scale maps and on GIS for the town of Ryazan.

In general, Roskartografia will have to do much in the development and application of new technologies, in the issue of a whole series of cartographic products in graphical and digital forms.