

Development of Geographic Information Systems and their use in National Libraries of Russia

by NATALYA KOTELNIKOVA and LUDMILA KILDYUSHEVSKAYA

INTRODUCTION

By the end of the 20th century cartography has amassed a vast array of information on major aspects of existence, interaction and the functioning of nature and society owing to vigorous automation and computerisation. These are applied for the purpose of creating geographic information systems ([GIS](#)). The main function of geographic information systems is the storage and use of computer (electronic) maps and atlases. Geographic information systems differ from each other in their territorial levels (global, national, regional, municipal and others) and by their subjects (land, cadastre, ecological, sea and other maps). The geographic information system, 'Black Sea' is cited as an example. This is an information-based project compiled with a view to taking decisions on the protection of the resources of the basin of the Black Sea.

The [Black Sea GIS](#) was developed for use by governments, scientists, the general public, NGOs and the media for the following purposes:

- planning for marine environment activities and impacts on a regional scale;
- public awareness through training, education, workshops, lectures and media;
- scientific analysis, modelling, ecological impact assessment, science planning.

The main GIS components are designed to perform the following functions:

- data input;
- data storage and database management;
- data analysis and processing;
- interaction with the user (graphical/map editing); and
- data output and presentation (plotting).

THE BLACK SEA ENVIRONMENTAL PROGRAMME

In June 1993 the GEF Black Sea Environmental Programme ([BSEP](#)) was established with three primary objectives:

- to strengthen and create regional capacities for managing the Black Sea ecosystem;
- to develop and implement an appropriate policy and legal framework for the assessment, control and prevention of pollution and the maintenance of biodiversity; and
- to facilitate the preparation of sound environmental investments.

The BSEP is being implemented through an interactive matrix of national co-ordinators, thematic regional activity centres and focal point institutions targeting: emergency response, routine pollution monitoring, special monitoring, biodiversity protection, coastal zone management, environmental legislation and economic data management and GIS, and fisheries. A Project Co-ordination Unit (PCU), based in Istanbul, conducts the overall programme co-ordination.

In 1994 the PCU established the working party on Data Management and GIS (GISWP) in order to ensure a region-wide compatibility in the generation and management of databases and to promote data exchange. The working party includes at least one expert (contact person) from each of the Black Sea countries, together with additional external expertise where appropriate. The working party pays particular attention to GIS as a means to communicate data to environmental managers, decision-makers and the general public.

It was agreed that all existing maps, which will be collected by the GISWP, should be digitised at Moscow State University (MSU), Department of Cartography and Geoinformatics. The MSU was also responsible for the distribution of special GIS software to the participants in the project as well as for the organisation of relevant training workshops.

The data were digitised in their institute of origin and transferred to MSU. In close association with the PCU and selected experts, the MSU staff was responsible for the accumulation and transformation of all data into a GIS and development of a user interface for the system. The staff was also responsible for development of the modelling system for the creation of the digital models of the GIS layers, development of the DBMS 'Black Sea' thematic query as well as for development of the DBMS 'Black Sea' geometric query.

Data quality assurance is an essential element in the success of the GIS strategy. Data gathered for incorporation into the GIS database is accompanied by full information which will enable evaluation of its quality. This information includes methodologies employed, intercomparison exercises, where relevant and estimated uncertainties.

DEVELOPMENT OF THE BLACK SEA GIS

The development of the GIS involved two major activities:

1. Development of a specialised software package for digitising, editing and storing of cartographic information, for modelling of geofields, for processing of digital models and thematic map creation, for transformation of geographic co-ordinates into planar co-ordinates of the Mercator projection and finally for demonstrating data. This activity was the responsibility of the Department of Cartography and Geoinformatics of the Moscow State University.
2. Collection of basic historical data on the Black Sea, processing and integration of those data into the system as well as collection and processing of new data by the different thematic working parties of the BSEP.

The Black Sea GIS consists of seven thematic blocks representing different aspects of the Black Sea ecosystem; each block contains a set of map layers describing different aspects of the Black Sea ecosystem, for some maps a relational database is available. In order to understand and manage ecological and anthropogenic processes better, it is necessary to understand the physical processes which form the base of the Black Sea ecosystem, composition of the landscape and human distribution, as well as many other important processes which form the unique environment of the Black Sea.

The GIS is made up of the following maps: geography, chemical oceanography, biology and fish resources. By pushing a button the user makes the corresponding subject section of the GIS appear on the screen. Aided by the menu in this section the user chooses the appropriate maps and analyses them separately or jointly, compares them with other maps, computes the final parameters on any spot they choose on the water surface. Data can be obtained touching all layers at once. There is a possibility of building arbitrary layers (calculating temperature gradients or drawing correlation maps).

Thus the users working with the Black Sea GIS on their own are given a new kind of information, which can be created with the use of geoinformation technologies only, and the opportunity of receiving a new sort of library service.

OTHER DEVELOPMENTS

The Rosgeoinform Centre (The Russian Geographic Information) has produced an enquiry system 'The Political Map of the World'. The system allows political maps to be scaled, to produce maps of particular states and regions and to get reference data on each state. The system also has the capability to measure distance directly from the maps.

'Russia 1000 maps' (1997) - produced by INGID. It contains digital maps of Russia at scales between 1:200,000 and 1:1,000,000, maps of Moscow, Saint Petersburg, Pskov, Novgorod and other major cities. It provides the user with a means of searching by subject, editing the maps, overlaying imagery on the maps and automatically drawing routes with regard to traffic information.

Several foreign GIS are also held in the libraries:

ArcAtlas: Our Earth, developed at the Environmental Systems Research Institute ([ESRI](#)) with the assistance of Russian scientists from the [Institute of Geography](#) of the Russian Academy of Sciences. The Atlas contains a sizeable volume of reference information on the nature of the Earth and provides the user with possibility of editing the maps.

An example of a GIS created in the libraries is the work with the General Map of the Russian Empire of 1734; that work has been carried out at the Map Department of the Russian National Library. A special presentation devoted to this event will be held.

There are several factors, which prevent from implementation GIS in the libraries. Those GISs that are of most value are developed mostly by research and industrial organisations. These systems are either rather expensive or are created for a single purpose to meet the specific needs of the organisation. In a number of cases working with GIS requires special rather complicated software and accordingly high-capacity computers and that is scarcely ever available to libraries. The market of informational services in Russia hasn't formed yet; due to this it is difficult to get information on those GISs, which are being created now. One of the ways to improve the situation is the organisation of digital access to a GIS via internet (organisation of corporate access).

WEB SITES REFERRED TO IN THE TEXT

BSEP - Black Sea Environmental Programme. <http://www.blackseaweb.net/general/enviprogram.htm#tabel2>

BSGIS - Black Sea Geographic Information System. <http://www.blackseaweb.net/maps/content.htm>

ESRI - Environmental Systems Research Institute. <http://www.esri.com/>

GIS – Geographic Information Systems. <http://www.gis.com/index.html>

Institute of Geography of the Russian Academy of Sciences. <http://igras.geonet.ru/>