



Regional Project "Extremum Disaster Management Technology"

Background

Nowadays one of the most actual global problems is the problem of nature and man-made disasters. Earthquakes are considered to be the most dangerous among natural disasters with severe consequences and numerous losses of human lives. The annual damage caused by earthquakes makes about 100 billion US dollars. Most catastrophic earthquakes of the last years occurred in Turkey on August 17, 1999 (over 15 thousand people were killed and more than 23 thousand were affected), in Greece on September 7, 1999 (over 100 people were killed and more than 600 were wounded) and in Algeria on May 21, 2003 (more than 9000 people affected).

Statistics show that the number of saved people depends considerably on the timeliness of the beginning of rescue operations in areas of destructive earthquakes. Alongside with it, disruption of transport communications, communication service and management systems, does not allow, as a rule, to estimate real situation and to make adequate decisions for carrying out rescue operations, as well as to determine optimal quantity of forces and facilities that are needed for search and rescue activities. In this case the operative and reliable forecast of expected consequences is a guaranty of successful performance of rescue operations, which result in reduction of the number of victims and mitigation of social and economic consequences of earthquakes.

Since 1995 the Federal Center of EMERCOM was actively engaged in development of the automated system (based on GIS-technologies) for operative forecast of consequences of destructive earthquakes.

This work resulted in creation of a global GIS "Extremum" System designated for forecasting of consequences of destructive earthquakes which allows to carry out round-the-clock duty and forecast (estimate) consequences of earthquakes all over the world.

Since August 2000 GIS "Extremum" System is used to the common benefit of the world community. Now, at occurrence of a seismic event, in the shortest period (within 1-2 hours) we compute and predict, the consequences of the earthquake and provide the estimation through E-Mail to 48 addresses in 22 countries of the world, and to CIS-countries. Results of a long-term experimental running of GIS "Extremum" System confirmed high efficiency and accuracy of given forecasts (more than 80%).

During the international seminar "Models for estimation of damage from earthquakes: contribution to the process of decision making at seismic risk management", which was held in Moscow on June, 29 - July, 1, 2000, the Executive Secretariat of the Council of Europe EUR-OPA Major Hazards Agreement has initiated the examining and testing of various systems for estimation of consequences of earthquakes and determination of response actions. According to the results of tests GIS "Extremum" System was recognized as unique original system and was recommended for experimental running to forecast the consequences of earthquakes all over the world.

In 2002 GIS "Extremum" System received Certificate of Distinction of the United Nations Sasakawa Award for outstanding contribution to the solving the problem of protection of population and territories from destructive earthquakes.

Project Proposals

With a view to implement the Resolution on Euro-Mediterranean synergy, adopted by the Ministers of the Council of Europe OPEN PARTIAL AGREEMENT member-states at their 9-th meeting in October, 3-4, 2002 (France), it was offered to launch the regional pilot project on establishment and operation of the international EUR-OPA Extremum Disaster Management Technology (DMEETechnology) for forecasting the consequences of destructive earthquakes on the territory of some Balkan countries, Greece, Turkey, Algeria and Morocco, as well as other countries expressing interest to participate (Caucasus region).

For implementation of this project the international team of experts will be set up who will create and put in to operation regional DMEET system of forecasting the consequences of earthquakes, based on the original «Extremum» version developed by the EMERCOM of Russia.

The generalized technological structure of "EUR-OPA Extremum Disaster Management technology" may include the following blocks: the block of database containing structured files of the digital cartographic and semantic information; the block of mathematical models; the user's interface - the tool of efficient control of all GIS blocks; the block of documenting and preparation of thematic and cartographical production for edition.

Files of digital cartographic information may contain cartographic materials of four levels of plotting: general charts - for region (1:5 000 000 plotting scale; 1:1 000 000 plotting scale); for separate countries of the region (1 :200 000 plotting scale); cities with the images of their structure and blocks of buildings (1 :100 000 plotting scale); objects with the image of separate constructions (1:10 000 and 1 : 2 000 plotting scale).

Files of semantic information will contain data of climatic conditions on the territory of all countries expressing interest to participate (Balkan and Caucasus countries, Turkey, Algeria, Morocco and others); data on location of tectonic ruptures; catalogues of the heaviest earthquakes that occurred in the region from 1900 up to 2003, the data on the types of constructions, the number of inhabitants in settlements with the population over 1000 people; the characteristics of the facilities that represent secondary sources of threat; the data on forces and facilities for emergency response and the personnel experience.

The block of mathematical models will contain procedures which can be divided into five groups: the models of impact; the models describing resistance of objects to the impact; forecast models; optimization and operative models; models for prevention and preparedness planning. Each model permits to solve certain types of tasks both before the event, and after its occurrence.

The user interface changes configuration of the system according to the chosen task, making maps of the appropriate contents and scale accessible, opens the procedures of input of the necessary initial data, makes active mathematical models and program modules.

The initial data for the forecast include such information as parameters of earthquakes: geographical coordinates of epicenter (longitude, latitude), epicenter depth, time of earthquake, and earthquake magnitude. The information is received from Services of urgent reports of Geophysical Service of the Russian Academy of Sciences, the European Mediterranean Seismological Center (EMSC, France) and National Seismological Information Center of the USA (NEIC).

Expected Results

Application of "EUR-OPA *Extremum* Disaster management Technology" will help to respond operatively to the seismic event and within 1-2 hours after the earthquake to provide the related services and organizations with the information about the estimated number of victims, required forces and facilities for arrangement of rescue operations as well as provide strategies and efficient prevention and preparedness planning. On the whole it will allow to reduce the casualties by 50 %.

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