THE USE OF GIS TECHNOLOGY AND ROMPOS IN ACQUIRING DATA ON ENVIRONMENTAL PROTECTION PROJECTS

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Abstract. Using the Romanian Position Determination System (ROMPOS), a new option for a new generation of information systems using geo-spatial information opens up. Data provided by the Romanian Position Determination System (ROMPOS) could be used in various applications, such as: positioning and monitoring of static or moving objects, in navigation, measuring surface, irrigation, environmental protection, transport etc. This new approach to the problem introduces the concept of GIS manipulation for a decision-making support which implies a spatial image manipulation in order to facilitate the access of decision-making factors to discovering, accessing and integrating geospatial information in decision-making scenarios knowingly, in numerous fields of work and research. A very useful application is in the risk management of environment and pollution factors, with various substances, of soil, air, water and other factors, but also for a competitive management, for decision-making bodies at local and central levels, in various issues that are encountered in the multitude of environmental projects in our country.

Keywords: ROMPOS, GNSS, GIS, acquisition of data, environmental protection.

INTRODUCTION

The Romanian position determination system (ROMPOS), opens a new option for information systems using geo-spatial information. Data acquired through the Romanian position determination system (ROMPOS) could be used in various applications such as: positioning and monitoring of static or moving objects, naval and air shipping, measured surface, irrigation, environmental protection, transport, project management etc.

The new approach to current problems can introduce the concept of GIS handling for a decision-making support, including a geo-spatial image manipulation to facilitate access of decision makers in purchasing, accessing and integrating geospatial information in scenarios that involve making informed decisions, in many research and activity fields, locally but also at central, European or global level.

A very useful application is for managing the risks involving environmental and pollution factors, with various substances affecting soil, air, water and other factors, but also for a management carried out in competitive terms, for bodies making decisions locally and centrally on the various problems that are encountered in many environmental projects and in project management in our country, but also in Europe and the rest of the world.

Recently, the National Agency for Cadastre and Land (ANCPI) included among its projects to modernize the national geodetic GPS network the Romanian position determination system (ROMPOS). Since, at present, making modern services of position determination is based on using satellite positioning technologies, GNSS (Global

Navigation Satellite System), the National Agency for Cadastre and Land (ANCPI), through the Department of Geodesy and Cartography, bought and installed a set of such devices, forming a network of permanent geodetic measurement stations, also known as permanent GNSS stations (GSP). These permanent stations are equipped with GNSS antennas and receivers, which are able to receive GNSS signals, including in particular NAVSTAR-GPS (U.S.A.) and GLONASS (Russia), and in future it will also include the European positioning system Galileo, the global positioning system of China, COMPAS, etc.

In a first stage, between 2004 and 2008, these stations were used only for entering and maintaining the European reference system (ETRS89) using the GRS-80 ellipsoid, which became official in Romania in 2009, besides the old coordinate system S-42, using the Krasovski ellipsoid, and applications for determining the position in post-processing mode. Based on the National Network of Permanent GNSS Stations (RN-SGP) - Class A), a program to increase the density, which was completed by the installation of around 300 points (class B), and work is underway for a C Class GNSS network, with a density of about 1pct/50km^2.

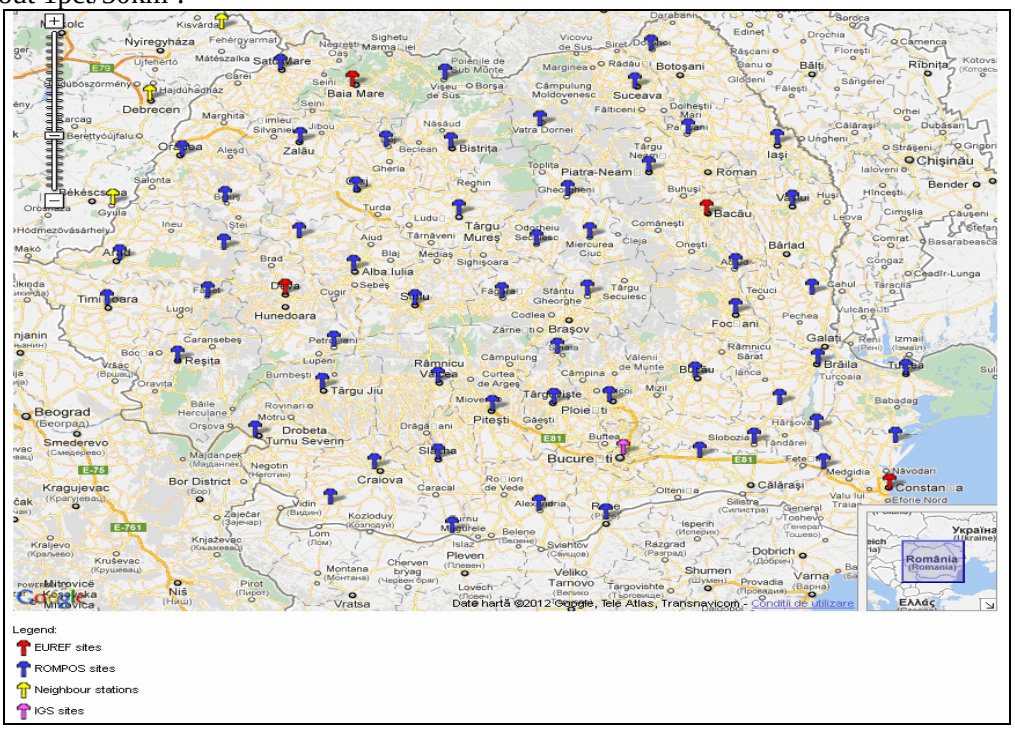

Fig.1. RN-SGP, after September 2008 (According to ANCPI)

During a second phase of development of RN-SGP, after September 2008, the system has gone from providing data for post-processing positioning to real time positioning. Through the integration of post-processing and real-time positioning systems, ANCPI finalized the determination of the Romanian positioning system, called ROMPOS.

MATERIAL AND METHOD

The Romanian position determination systems ROMPOS is based on a national network of Permanent GNSS Stations (GPS + GLONASS), installed by the National Agency of Cadastre and Land Registration. The reference stations work all the time, 24 hours of 24, and provide real time data and also data that was collected at predetermined intervals (1 hour, 24 hours).

♦ The reference stations are interconnected, including for the borders of neighboring countries that have national GPS networks.

♦ The location of reference stations was carefully chosen so as to ensure long term stability for GNSS antennas and for signal reception. The location and the receivers are chosen to provide "visibility" of the horizon, free of obstructions where possible, to avoid possible sources of interference and multipath effects. The use of properly calibrated antennas can reduce multipath effects; new generation antennas, which were acquired by ANCPI in 2008 were calibrated using the best techniques available worldwide (individual absolute calibration for each antenna);

♦ Reference stations use only receivers and antennas with a dual frequency, of geodetic class;

♦ The stations continuously receive data from NAVSTAR-GPS satellites (all stations), and from the Russian GLONASS satellites (over 36 stations). Once Galileo is operational, it will be mandatory for all permanent stations to use data from the satellites of this system and only optional from NAVSTAR-GPS and GLONASS satellites;

♦ Station coordinates are determined with high precision (less than 1 cm), in the reference system ETRS 89 (European System of Terrestrial Reference 1989), by increasing the density of GNSS stations (Bucharest, Bacău, Baia Mare, Constanţa, Deva), integrated in the European Network of Reference (EUREF), (Dragomir P. et al. 2008);

♦ The positions of antennas in reference stations are checked regularly to detect any possible changes due to tectonic movements and other factors;

♦ A quality management system will be implemented in order to help users get expected results in accordance with requirements in terms of accuracy, integrity, and system availability. A minimum level of 99% availability and integrity will be guaranteed. Cases of failures, interruptions and low quality will be identified automatically in real time and treated as soon as possible (Dragomir P. et al. 2005).

♦ National reference stations are compatible with most other GNSS-type systems. The national system will ensure that it is interoperable with the similar European system EUPOS.

The components of the Romanian position determination system ROMPOS.

The Romanian position determination system (ROMPOS) is provided by ANCPI for all users through the National Center for Services ROMPOS.

The National Center for Services ROMPOS was established in the Department of Geodesy and Cartography - Geodesy Service and replaced the RN-SGP Monitoring and Control Center. The RN-SGP Monitoring and Control Center was designed to monitor and control RN-SGP activity for the automatic transfer of recorded data to stations from the central database server. Transferred data consisted of records from NAVSTAR-GPS and GLONASS satellites with different rates (1S, 5S, 30s), and were used to determine positions in post-processing mode, and now with ROMPOS in real time.

This service is badly needed for projects related to project management, sustainable development and environmental protection. Data obtained through this service is useful and can be integrated into a Geographic Information System (GIS), together with data from remote sensing, photogrammetry and the classic data gathered with total stations.

ENVIRONMENTAL PROTECTION AND SUSTAINABLE DEVELOPMENT PROJECTS IN URBAN AREAS

General issues on environmental protection and sustainable development projects in urban areas.

In urban areas, environmental protection and sustainable development projects must be managed properly because resources are limited. These aspects produce a number of issues such as:

• Urban authorities should know what lands are available for development, the legal aspect of occupying a piece of land, and what are the conditions and rights to do so.

• Urban authorities need to know how land is used and managed, must know the location, type and sources of income.

• Urban authorities must know the exact location, use, condition and value of buildings, and also they need to know where and what land is available for expansion in the near future.

• The lack of accurate information on land, buildings, natural resources and the result of increased income in unplanned settlements, poor quality services for citizens, low income for local authorities and poverty to citizens.

The duty of a working group to discuss projects on environmental protection and sustainable development projects, research and formulation of projects and action plans to solve a specific problem. In order to collect, organize and use a lot of information needed to plan and implement environmental problems, a GIS system is an obvious tool to be used in the central and local decision making system(7).

Better environmental and living conditions of people in cities and the immediate objective of any project, is that within the shortest possible time, cities and towns would be able to identify and prioritize problems, and formulate and implement sustainable development policies, in partnership with other parts of the public sector, private sector and the broader community.

Information, in any city, is essential for planning and management. Problems regarding information include the following:

♣ how to determine what data and information is necessary for the purpose at hand,

♣ how to get the data, if any, or how to collect and how to store, so it is easily accessible; how to interpret data and solve underlying problems such as quality, contradictions and incomplete data.

Other problems are: how to determine which information is needed, when and in what form, and how to disseminate what is necessary.

The environmental management, environmental protection and sustainable development information system in urban areas.

The environmental management, environmental protection and sustainable development information system in urban areas (SIMMP) consists of formal measures to capture specific information, as well as fixed procedures to retrieve this information. SIMMP refers to gathering all relevant information for Environmental Planning and

Management Process, environmental protection and sustainable development in urban areas.

SIMMP includes collecting information on various environmental issues that a city or a locality faces in the context of Romania's membership in the EU and supports the sustainable development and environmental protection process, continues to support strategy formulation and action planning, including mapping and conventional data acquisition with total stations, photo-grammetric, and remote sensing, using GNSS technology and, last but not least, it concerns the collection of information necessary to institutionalize that process.

RESULTS AND DISCUSSION

Important suggestions and advice on the implementation of the environmental management, environmental protection and sustainable development information system in urban areas (SIMMPM).

Important suggestions and advice on the implementation of the environmental management, environmental protection and sustainable development information system in urban areas (SIMMPM):

♣ Appointment of a basic GIS consultant. It is clear from the GIS activities that more than a consultant and a contractor are involved in GIS development. Consultants and contractors are needed in financial management, human resources development, training, data acquisition, public opinion, planning, development of projects etc. In order to maintain a systematic and coordination approach, a municipality needs a General Consultant, to bring together and solve all the problems to come.

♣ Prepare a strategy of the Information System developed enough. SIMMPM will be a component of geographical information systems in cities, towns, villages and at decision making level. An information strategy system is necessary in order to lead to the development and implementation of information systems for various types.

♣ The strategy will establish a framework in which to judge investment systems in infrastructure that exist and are proposed, and to establish a framework for setting priorities. It also identifies major systems and resources needed for support and investment in the medium term; the technical and management policies that determine the basic means and rules by which information systems will be developed and managed are identified.

♣ The failure of providers of information technology to respond quickly to changing needs, because there is no medium to long term to see what is needed.

♣ Inability of users to share data due to inconsistent data definition.

♣Difficulty in maintaining and preserving adequate basic skills to plan and introduce new systems.

♣ Development of new business opportunities and policies makes the introduction of new ways of business processes possible, while proving access to new and timely information.

♣ Better management of information resources by sharing data, swapping data standards and data definitions.

♣ Improved allocation of human, financial and technical resources in accordance with business objectives and policies.

♣ Efficient use of limited resources by coordinating the development approach is done in a logical order, using a standardized approach.
♣ Reducing the cost of emergency planning and fewer opportunities that do no hit their target.

CONCLUSIONS

The strategy to implement the environmental management, environmental protection and sustainable development information system in urban areas (SIMMPM) will manage to correct many issues concerning implementation and will create support and request for information from central and local administration.

Internal and external collaboration is very good and necessary. This is possible through a well-organized local and central consultant who coordinates GIS, GNSS, SIMMPM and ROMPOS technologies. There are still many challenges ahead, but the collaboration of all stakeholders and of the public and private partnership should be maintained and should coexist with regard to these environmental projects.
GIS technology together with GNSS ROMPOS-type technology (Romanian Position Determination System), are closely related, and the two complement each other in collecting data on environmental issues from a village, town, county or from across the country.

The environmental management, environmental protection and sustainable development in urban areas information system, (SIMMPM) will manage to rectify and solve many problems related to implementing various environmental projects, sustainable development and will create support for handling all requests of various types of information from local and central management. These resolutions can be expanded locally (for county administration) or nationwide.

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