

## **SOFTWARE PLATFORM FOR SEISMIC RISK ASSESSMENT IN ROMANIA BASED ON THE USE OF GIS TECHNOLOGIES**

### **- ABSTRACT -**

#### **OBJECTIVES**

The project aimed the development of a package of software modules, integrated into a unique platform, designed for the seismic risk management. As a starting point, recent studies concerning seismic risk in Romania were used, performed by the university members of the team, in the framework of Romanian and European projects. The software implementation integrates the use of geographic information systems (GIS) with that of specialized modules, meant for data management and seismic risk analysis. The values of the resulted seismic risk indices are displayed at territorial scale, in order to point out critical zones in case of seismic events.

#### **PARTNERS**

The project was carried out between 2006 and 2008 by a consortium formed by three Romanian organizations:

- *National Institute for Building Research (INCERC) – Project Co-ordinator*
- *Technical University of Civil Engineering (UTCB)*
- *Institute for Computers (ITC S.A.).*

#### **STAGES**

- I. Analysis and structuring of data
- II. Mathematical models and computation algorithms. Database structure. Implementation of platform modules (1)
- III. Module implementation (2). Module assemblage
- IV. Demonstration of functionality by the testing of platform on a pilot zone
- V. Users' manual / presentation of platform. Dissemination of results

#### **WEBSITE**

<http://roseris.incerc2004.ro/>

#### **RESULTS**

- √ **ROSERIS software platform**, with the following *characteristics*:
  - *Improved methodology for seismic risk assessment*
    - § Compatible with Romanian and European regulations in the field
    - § Adapted to the degree of availability of input data and to the state-of-the-art of national research
    - § Using reliable prerequisites, sustained by the regulatory basis, harmonized with European norms, recently enforced in Romania
    - § Based on a transparent algorithm, open to subsequent developments, following the progress of knowledge in the field
    - § Expressing the risk by the damage level of buildings in the study zone, corresponding to a given level of seismic hazard

- *Platform functionality*
  - § Data collection: primary, easy accessible data are used (number of stories, construction year, structure type)
  - § Data can be collected by operators with minimal computer skills, distributed in the territory
  - § For data collection, only the M.A.G.DA module/application is required; the installation of the entire platform is not required
- *Software implementation*
  - § Data storage: simple and robust solutions, based on extensively used software applications, available as well at local level (Microsoft Access Database)
  - § Mapping: use a top geographic information system, extensively applied at national and international scale: ESRI ArcGIS
  - § Functionality of the platform: the modules of the platform can work also independently, such that the steps of data collection and of seismic risk assessment can be de-coupled from the central application
  - § Graphical user interface: intuitive and easy-to-use, even by users which are less familiarized with computer operation; more advanced computer skills (use of GIS) are necessary only for map customization
  - § The platform is an open system, adaptable to potential subsequent development requirements formulated by the users

**Deliverables:**

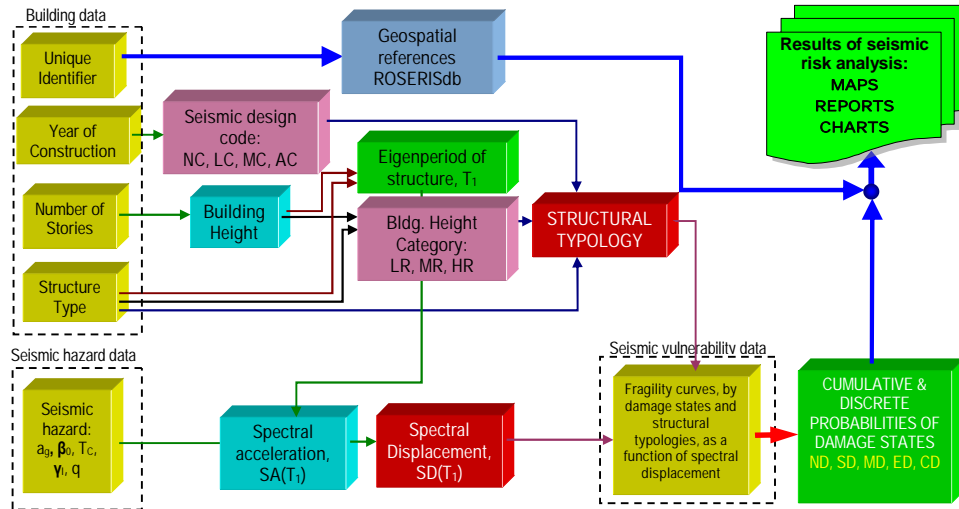
- Geospatial databases, with data concerning building stock and seismic hazard
- Improved methodology for seismic risk evaluation, adapted to software implementation
- Software platform for seismic risk assessment – complex package of integrated software applications

***Benefits***

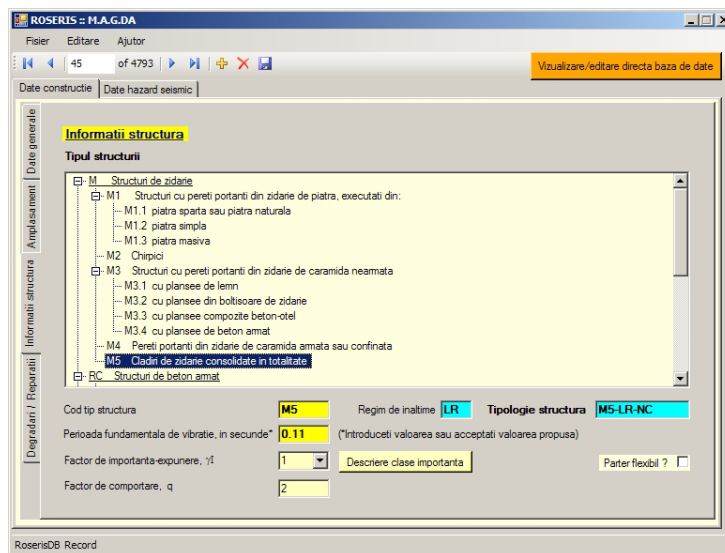
- √ creation of a database structure required for seismic risk analyses, facilitating, along with the developed software applications, the collection of these data at national scale
- √ methodology for seismic risk assessment in Romania, adequate for software implementation
- √ increase of the efficiency and quality of decision process of authorities with attributions in seismic risk management, with applications in:
  - elaboration of strategies for seismic risk mitigation;
  - intervention plans in case of seismic events;
  - plans for seismic rehabilitation of buildings etc.

**FINAL REMARKS**

The development of the ROSERIS platform has meant the creation of a complex and original product, corresponding to the actual needs and priorities in the field of seismic risk reduction and adapted both to the seismic, regulatory and information context in Romania and to the concrete situation of the building stock in this country.



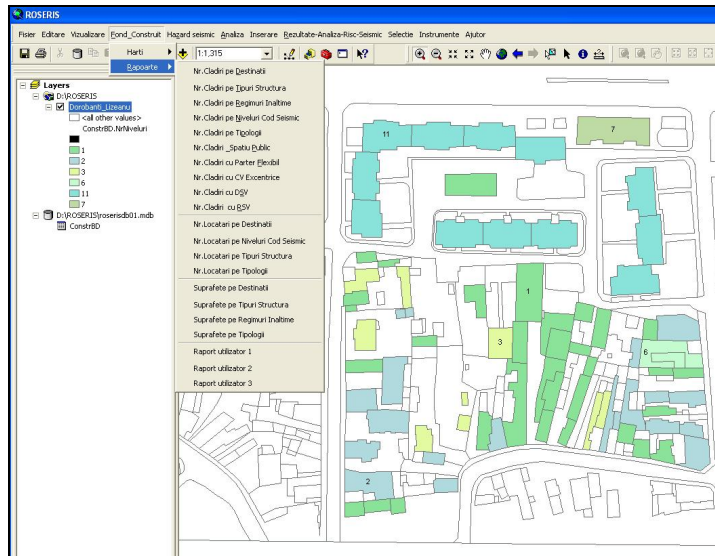
General flowchart of the seismic risk assessment methodology implemented in the ROSERIS platform



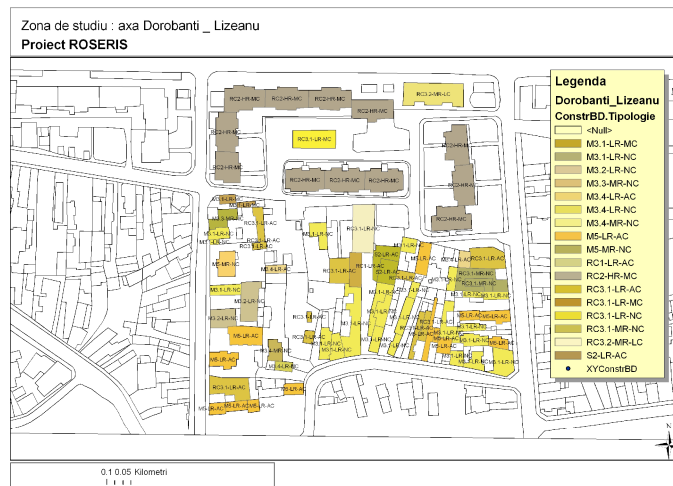
Main screen of the M.A.G.D.A data collection and management application

IDCladire	Destinatie	CodDestinatie	SpPublic	AnConstr	N/Niveluri	Inaltime	NrTronsoane	NrLocatar
40			<input type="checkbox"/>					
41			<input type="checkbox"/>					
42			<input type="checkbox"/>					
43			<input type="checkbox"/>					
44			<input type="checkbox"/>					
45	Case individuale	RES1	<input type="checkbox"/>	1930	1	3	1	4
46			<input type="checkbox"/>					
47			<input type="checkbox"/>					
48			<input type="checkbox"/>					
49			<input type="checkbox"/>					
50			<input type="checkbox"/>					
51			<input type="checkbox"/>					
52			<input type="checkbox"/>					
53			<input type="checkbox"/>					
54			<input type="checkbox"/>					
55			<input type="checkbox"/>					
56			<input type="checkbox"/>					
57	Case individuale	RES1	<input type="checkbox"/>	1940	1	3	1	0
58			<input type="checkbox"/>			3		
59			<input type="checkbox"/>					

Screen for display-editing-calculation of the module/application for seismic risk assessment EVARISX. Fragment of the contents of the ROSERISdb database



Screen of the GIS-ROSERIS application. „Reports” menu



Map for the study (pilot) zone, developed using the ROSERIS platform