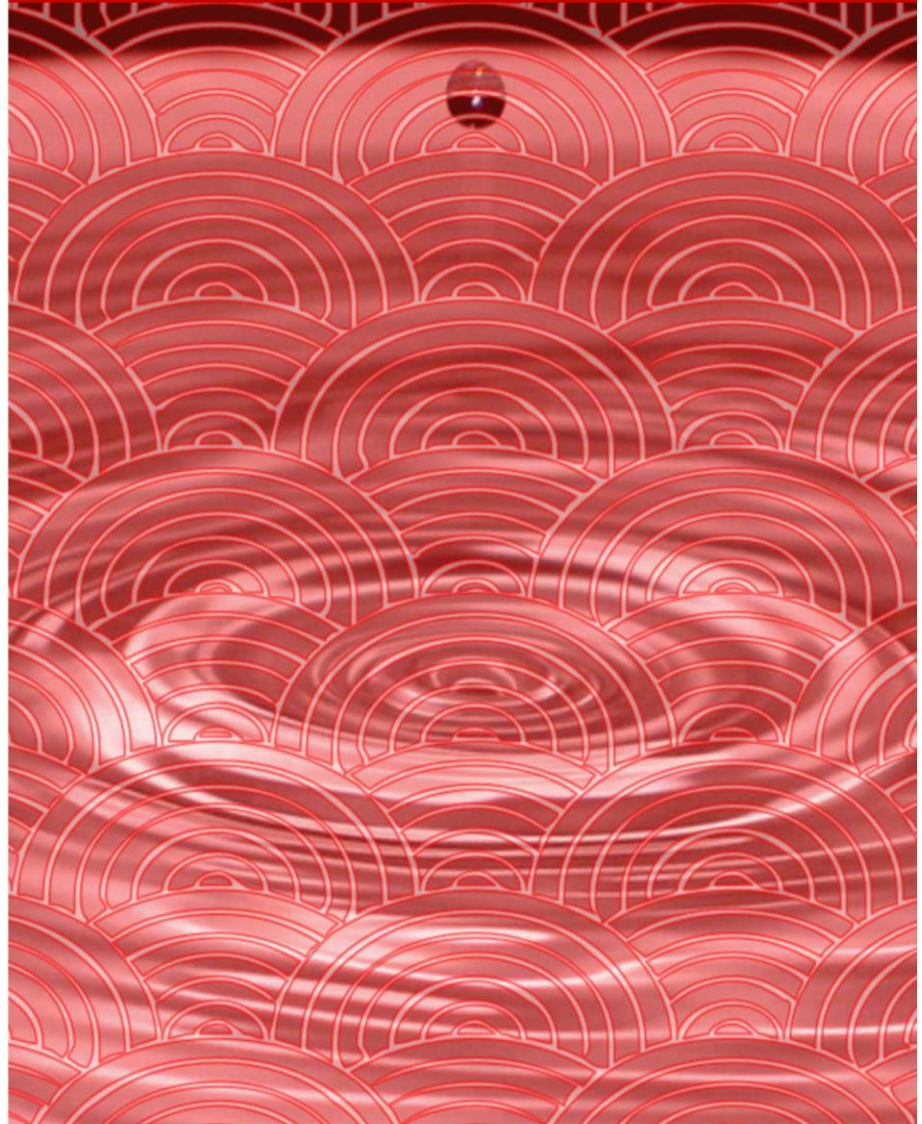




Volume 1, Issue 1, April 2016

GeoPatterns



University of Bucharest

Center for Risk Studies, Spatial Modelling,
Terrestrial and Coastal System Dynamics

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An introduction to CRMD research centre

Prof. Dr. Iuliana Armaş, **Director of CRMD**

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Abstract. The center performs its activity within its Department (Faculty) of Geography, UB. Its aim is to increase the level of knowledge in the field of Environmental Dynamics to solve current complex problems, involving an interdisciplinary approach. This objective is pursued by carrying out activities of fundamental (theoretical) research, but also of applied research. These are accomplished especially by developing skilled methodologies for spatial and temporal analysis of terrestrial and coastal systems, including in terms of natural hazards and risk resilience. An important aspect addresses the development of algorithms and GIS software for identifying and reducing the effects of vulnerability and risk that result from human-environment interaction.

Keywords: CRMD, Environmental Dynamics, terrestrial systems, coastal systems, GIS.

1. OVERVIEW

The center for risk studies, Space Modeling and Dynamics of terrestrial and coastal systems (CRMD – www.geodinamic.ro) was established in 2006 and is accredited by the University of Bucharest (UB) under code 48. The centre currently operates within the Faculty of Geography and brings together specialists from varied but connected fields, as well as Masters Students, PhD candidates and Postdoc researchers. The overall objective is to develop internationally competitive research activities. There is great openness to collaborations with research institutions from home and abroad. Our mission is to develop niche directions based on interdisciplinary applications in order to understand the systemic complexity and oneness of the planetary organism.

The CRMD research centres on geography and paleogeography, particularly on the subdomain of applied geomorphology. This is achieved by integrating Geographic Information Systems (GIS) and teledetection instruments, both optical and radar-based. Another crucial research direction focuses on a spatial approach to disaster coping

strategies and risk perceptions with application of psychometric and qualitative tools. Activity takes place in three departments: risk studies (RS), modelling, and coastal dynamics. Within these departments research touches on the following main directions:

- Vulnerability and Resilience Studies;
- Disaster Management;
- Disaster Risk Reduction (DRR) Studies;
- GIS and InSAR applications for spatial and temporal risk modelling of natural and social environments;
- Morphodynamic Research;
- Risk Perception and Adaptation Studies;
- Diachronic analysis based on ancient and historical maps; Geoarcheology.

Research at the centre is not just theoretical but also applied. The latter focuses on developing efficient and effective spatial and temporal methodologies to analyse territorial systems, including from a community perspective on risk and risk adaptation. One key dimension is the development of algorithms and simulations that allow for identification and reduction of

vulnerability and risk, as they emerge from the human-environment interaction.

At CRMD, we fully embrace the future. Other activities include professional and scholastic training through the inclusion in our research collectives of graduate students, master students, PhD candidates, and postdocs. The aim here is to find talent in connectable research domains and bring together interdisciplinary teams. These activities allow for the education of applied scientific research specialists and continuous training of staff in research and teaching, in line with socio-economic demands.

2. STAFF

Our human resource is transdisciplinary, covering a wide spectrum of scientific knowledge, from geosciences to psychology. At the moment there are eleven permanent members of staff as well as a number of associate members from institutions, in the country or abroad, which work with us for the duration of different research contracts.

The Centre leader, Prof. Armaş has more than twenty years of research and teaching experience in the field of geomorphology, landslides and seismic hazard, vulnerability and risk assessment, risk perception. Her research has been published in 14 books and over 100 papers (15 ISI indexed research papers), reports, and monographs. She is a member in the editorial board of four Romanian research journals, five school-books and peer reviewer for Romanian and international ISI-indexed journals, being invited as an expert for several EU-projects, like the the Caphaz-net FP7 project, dealing with the question “How can we enhance the capacities of European societies to cope with natural hazards?”ⁱ

The experts have developed a vast collaboration within the UB team during previous projects, which had remarkable results publicized in international magazines with widespread reputation.

We mention a few from abroad and apologise to the many more which have collaborated with us throughout the years: Ph.D. Eng. D. Marius Necsoiu (USA), Ph.D. Eng. Liviu Giosan (USA) or Ph.D. Math. Diana Mendes (Portugal).

Dr. Liviu Giosan, Geoscientist, Associate Scientist w/ Tenure at the Department of Geology

and Geophysics, Woods Hole Oceanographic Institution, is the honorary President of the CRMD. He is a well-known geologist with broad experience and expertise in Paleooceanography/Paleoclimatology: Sources, transport, transformations, and climatic significance of clastic sediments in marine, fluvial, and other aquatic environments; in Morphodynamics and Sedimentation: Rivers, deltas and supply-dominated coasts, and in human-climate-landscape interactions, i.e. in the role of natural phenomena on development and collapse of civilizations based on reconstructions from marine/continental deposits.

Dr. Eng. Marius Necsoiu is an expert within the Southwest Research Institute® (SwRI®), San Antonio, Texas, with broad experience and expertise in remote sensing systems, photogrammetry, global positioning systems, and geospatial technologiesⁱⁱ. He is a certified mapping scientist in remote sensing by the American Society for Photogrammetry and Remote Sensing and project management professional by the Project Management Institute with previous work experience at NASA Goddard Space Flight Center and Jet Propulsion Laboratory. At UB, he had an essential contribution in setting up CRMD’s remote sensing infrastructure and few novel geospatial-related projects. He has almost 20 years’ experience in working with a variety of optical and radar airborne and satellite data. Dr. Necsoiu is the main author of the multispectral data displacement analysis (MDDA), a successful optical-based method that provides very accurate results for detecting and monitoring active morphological processes. He has authored or co-authored more than 50 technical papers and reports (see chapter 5 for selected papers) and serves as technical proposal reviewer including NASA, National Science Foundation (NSF), Department of Defense (DoD), and the European Commission.

Dr. Mendes is a mathematician and applied scientist with broad experience in nonlinear dynamics (stochastic and deterministic), time series analysis, computational economics, control and synchronization. She is a principal researcher at BRU-IUL (Business Research Unit – University Institute of Lisbon, Portugal) and has authored or co-authored more than 40 technical papers and reports.

3. YOUNG RESEARCHERS

The young researchers team operates within the risk studies and the modelling departments. Our PhD candidates and Postdocs cover a wide area of expertise with research on: spatial multi criteria decision analysis (Diana Popovici at ITC, Enschede, Holland), satellite radar interferometry (Mihaela Gheorghe, 7th International School on Radar/SAR, Bonn, Germany, ESA Polarimetry Course, Frascati, Italy, ESA's 6th Advanced Training Course on Land Remote Sensing, Bucharest, Romania), participative research, community development, international waters management (Cristina Posner, MSc Royall Holloway, University of London, UK), ethnography, participative maps PGIS, and political ecology (Cristina Posner, Francis I. Rainer Institute of Anthropology, Bucharest, Romania), disaster risk management and natural hazard impact assessment (Maria Bostenaru, Karlsruhe Institute of Technology, Germany), disaster management (Radu Ionescu, MSc Coventry University, UK).

The Coastal Research Group is a small but enthusiastic group of young researchers (Alfred Vespremeanu-Stroe, Ştefan Constantinescu, Luminița Preoteasa, Florin Tătui, Florin Zăinescu), dealing with a wide range of coastal topics: coastal landscape evolution (deltaic lobes, barrier spits and islands), coastal geomorphology (beach morphodynamics, foredune development, nearshore sandbars behaviour), coastal climate (storm evolution and impact, climate variability), nearshore hydrodynamics, river mouth behaviour. The group conducts research projects on the Romanian Black Sea coast, particularly on the Danube Delta. The researchers are connected with other coastal communities from Romania (GEOECOMAR; NIMRD „Grigore Antipa”; Danube Delta NIRD) and abroad (Ulster University, Aix-Marseille University, Utrecht University, University of Copenhagen, Woods Hole Oceanographic Institution), aiming to get a well-grounded understanding of the coastal processes and associated coastal behaviour at multiple spatial and temporal scales through various programs of coastal monitoring, data analyses, interpretation and publishing of scientific reports or review papers. They developed collaborative works with similar

international research teams and with local authorities in support of optimal management of coastal resources and activities.

4. RESULTS

The *Centre for Risk Studies* has repeatedly won national competitions for research funds, having a large experience in interdisciplinary research (geology, sedimentology, coring and dating techniques, pedology, hydrology, GIS and remote sensing, etc.).

Scientific research has so far focused on issues of risk and natural hazards (landslides, floods and earthquakes), morphodynamics (of river beds and slopes, meadows, and coasts) and risk perception studies, in locations as wide ranged as the Carpathian and Subcarpathian south facing regions, the Lower Danube Valley, the Danube Delta, and the city of Bucharest. A number of 22 grants were won between 2002 and 2015 and financed research such as the above. Past grants were of CNCSIC, CEEX, PNIIPC, and STAR type, with currents proposals under evaluation under Horizon 2020 and Danube Transnational Programmeⁱⁱⁱ.

Research has led to the publication between 2002 and 2015 of over 50 articles in high impact ISI Web of Science journals such as: *Nature*, *Scientific Reports*, *Geomorphology*, *Quaternary Science Reviews*, *Quaternary International*, *Earth Surface Processes and Landforms*, *Natural Hazards*, *Journal of Coastal Research*, *Palaeogeography*, *Palaeoclimatology*, *Palaeoecology*, *Continental Shelf Research*, *Marine Geology*, *Nat. Hazards Earth Syst. Sci.*, and others. Besides journal articles, while the centre has been active, there have been published over 30 books with publishers recognised by CNCSIS and one edited book with Springer publishing, to which we add seven other chapters in different volumes published by Springer.

The main novel scientific results achieved in our research centre comprise:

– *A more effective process of interpretation of complex dynamics based on a holistic approach achieved by a multidisciplinary team of scientists and engineers.* This concept of multidisciplinary integration is an increasingly spread aspiration of

current scientific research in our centre, being motivated by the multi-faceted objective reality.

– ***The application of satellite-based radar interferometry to capture aspects of vulnerability in landscape evolution within the context of the nonlinear dynamical systems (NDS) theory.*** Currently, there are no known NDS-related studies applied to geomorphic systems, which use precise spatial ground displacements measurements to support its evidence. Although geomorphic systems are generally nonlinear, the concept of deterministic chaos has remained in geosciences, specifically in geomorphology, at a theoretical level, by lacking technological support of high precision, repeated and large scale ground displacements measurements. Satellite interferometry based on high resolution radar images, are promising techniques to provide this type of support. The centre has ongoing revolutionary research on directive use of sets of single polarized synthetic aperture radar (SAR) satellite data and a multi-temporal radar interferometry (InSAR).

– ***Better interferometric-based ground displacement products in Bucharest urban area, using single polarimetric data,*** as well as higher-level products development for ESA Third Party Missions (e.g. TerraSAR-X) within the Earthnet Programme, including validation campaigns, development, installation and maintenance of validation equipment (i.e. ground-based instrumentation for match-ups with satellite data), and supporting activities for validation (databases of in-situ measurements for match-ups).

– ***Increased quality of the InSAR-based displacement products by using ground-based validation of radar ground-displacement products (GNSS-based geodetic measurements).***

– ***Results based on multi-temporal InSAR methodologies*** (initially applied to ERS, ENVISAT satellite data and later refined using TerraSAR-X/TanDEM-X satellite data for Bucharest urban area) and conventional geological and geomorphological methods captured (a) the space-time evolution of the city and (b) the vulnerability of natural support. The space vulnerability is estimated as a concordance/non-concordance association between specific local evolution patterns. The understanding of these phenomena have long term theoretical and

practical results in the context of climate change, offering the support to successful risk mitigation actions in urban areas at national, European and international level.

– ***Capturing the evolution patterns of the riverbed-slope morphodynamic systems,*** at different spatial-temporal scales, by correlating terrestrial- with satellite-based monitoring of Subcarpathian and Carpathian regions of Prahova Valley and 1D hydraulic model to identify potential erosion/accretion areas and river response to human disturbance.

– ***Large-scale coastal behaviour*** studies increased national and international knowledge related to present evolution of world's deltas; in-depth analysis of Danube delta evolution; marine fields and barrier islands evolution; development and abandonment of different deltaic lobes in relation with Danube sediment discharge and coastal hydrodynamics and sediment transport modulated by climate variability.

– ***Geoarchaeology and Coastal landscape reconstruction*** implies new understanding about the way humans interacted with the coastal landscape from ancient times till present and how different changes in coastal behaviour and in the evolution of deltaic lobes influenced the development and decay of ancient cities like Histria and Argamum.

– ***Coastal morphodynamics:*** sediment transfer from nearshore to backshore and vice-versa is essential for future development of beaches. Our results are related to beach-dune interactions, sediment transport from nearshore sandbars to beach, foredune and sandbars behaviour on microtidal beaches, mouth bar evolution, shoreface morphodynamics and coastline evolution at different time scales under the pressure of river floods and hydrodynamic conditions.

– Analysis of ***storm impact on the Romanian Black Sea coast*** offers new insight into storminess evolution in the last century in relation with various modes of climate variability and the response of beaches to different climate forcing. The analysis of coastal hazards and coastal zone vulnerability is crucial for future integrated coastal zone management.

– ***Historic cartography and diachronic analysis, GIS and RS*** applied to urban, mountain, Danube Valley and coastal environments offer new data

related to Carpathian and Subcarpathian landscape evolution, the urban development of Bucharest, Lower Danube valley changes, Danube delta evolution, Romanian cliff coast variability etc.

– ***Socio-economic vulnerability index-based approaches*** using multi-criteria methods for aggregating complex indicators.

– ***Psychometric studies on the way communities relate to various risk phenomena***; a novel theme in Romanian geographical research, which started in 1997 by looking, initially, at Bucharest, and then expanding to the Subcarpathian region, as well as the Danube Valley and Delta. Since 2013 this line of research has gained depth, via qualitative approaches, ethnographies based on semi-structured interviews, participative GIS, and participative research.

5. FACILITIES

The equipment that facilitates research within CRMD can be found in UB, at 1 N. Bălcescu Blvd., 4th floor, or in Sf. Gheorghe in the Danube Delta. There is access to computational infrastructure and research (including auxiliary) equipment. In 2007, the centre, through grant CEEX-AMTRANS no. X2C20/2006, acquired class C Merry Fisher boat, with an Evinrude 90CP engine, as well a Kymco MXU 300 ATV. With the same grant we bought level sensor Level Troll 700, a GPS Garmin GPSMAP 76CSx, PCs and various softwares. CEEX-MENER grant no. 738/2006 allowed for the purchase of an Ecosonda Garmin GPSMAP 298C Sounder. Projects past 2010 ensured we could buy statistical, spatial, and teledetection (optical and radar) softwares as required. High-resolution multi-temporal InSAR techniques, specifically the persistent scatterers (PS) techniques, have been applied to TerraSAR satellite data over Bucharest, acquired in frame of two successful DLR proposals (i.e., LAN1444 and LAND0421) and one ESA AO CAT-1 proposal (i.e., Project 12793), PI's M. Necsoiu and I. Armas. The 4th ALOS Research Announcement for ALOS-2 – Japonia: Marius Necsoiu (PI) and Armas I: Monitoring Slope-channel Adjustment in a Tectonically Active Area (Carpathian and Subcarpathian Prahova

Valley, Romania) No. 1495, facilitated resources in landslide research.

Other research facilities were offered on account of cooperation with partner institutions home: UPB, ASE, INCDFP, UTCB, National Institute of Statistics, and others; as well as abroad: *Geosciences and Engineering Division, Southwest Research Institute®* (SwRI®), San Antonio, Texas, Woods Hole Oceanographic Institution, Boston, SUA, *ISCITE-IUL, Department of Quantitative Methods, Lisbon, Portugal*. The Coastal Research Group developed collaborative works with similar international research teams (in the frame of the Joint Integrated Cooperation Programme Romania-France, ERA.Net RUS Plus Initiative or Cross-Border Cooperation Programme Romania-Bulgaria).

6. STRATEGY

The centre's outlook relies on a continuous development of its material base, paralleled with investments in human resources. Within the centre, there is impetus for training and development of applied sciences specialists, continuous training of teaching, research, and practitioner, staff, in the fields of GIS and RS, disaster management, natural and technogenic hazards, and risk. These are to be achieved by integrating more master and PhD students in our future projects; development of research infrastructure; extension of study areas. One of many activities to help us achieve these objectives is quite clearly the GeoPatterns Journal of which this text is a part. GeoPatterns is under direct supervision of CRMD and as such reflects the values and research impetus described throughout. What is more, GeoPatterns is envisaged as a platform for both young and established researchers to find their shared interests, collaborate, and produce useful, high quality, rigorous, publishable, research. There is livelihood for an ongoing drive to develop niche research at the boundary, the contact point, where the different social, cultural, and geospatial sciences meet and interact.

ⁱ www.caphaz-net.org

ⁱⁱ www.geomatics.swri.org

ⁱⁱⁱ www.interreg-danube.eu

A summary of CRMD research on Bucharest

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Abstract. Due to its environmental issues, Bucharest has always been a constant attraction for our research Centre works. Three major collaborative projects funded from the state budget focused on the urban vulnerabilities at Bucharest city level: HERA, REVEAL and GEOSPACE. The paper summarizes the innovating topics and the main outcomes of this research.

Keywords: *urban vulnerability, multi-criteria analysis, InSAR, GNSS, diachronic cartography, nonlinear dynamics*

Due to its environmental issues, Bucharest has always been a constant attraction for our research Centre works, research being funded from the state budget.

Early research topics mainly focused on the environmental vulnerabilities in sector 3, especially in the historic center area where a series of psychometric analysis on risk perception were generated. The findings, published in Risk Analysis and Natural Hazards journals, showed that the population's perception of environmental risks declines if its living standard falls.

The first major project on Bucharest area was HERA (Multi-hazard and seismic vulnerability in the context of the city of Bucharest, <http://www.hera.ase.ro/>). HERA Project summed up for the first time the collaboration of various researchers representing Earth sciences (seismologists, geologists and geographers), social sciences (psychologists), engineering (civil engineers), and computer scientists.

The participation was shared among three universities (University of Bucharest – UB, Technical University of Civil Engineering of Bucharest – TUCEB and The Bucharest Academy of Economic Studies – ASE) and a major research center (National Institute for Earth Physics – NIEF).

The project was perceived as original by means of its design and implementation of an interdisciplinary spatial multi-criteria methodology. The method represented an integrated evaluation of the vulnerability of the urban space through inferential analysis implemented in the GIS environment.

Unfortunately, the project funds were cut by half in 2008 (although the project website was requested to mention the initial amounts). Consequently, only the historical Centre in Lipscani area could still be mapped properly.

The UB team and its TUCEB partner generated precise and accurate mapping reports on the terrain, including the state of the buildings, their functionality, structure and the building materials. The reports included data analyses according to the buildings functionality and their inhabitants at various timings of the day. The teams also conducted perception quantitative interviews which offered a clear picture of the historical center state in 2009.

The application made by the IT team of The Bucharest Academy of Economic Studies consisted of a usable tool in ArcGIS for query data and analysis of the state of buildings. This tool was based on more than 350 buildings reports representing the field inventory of all buildings in the historical Lipscani area (Figure 1).

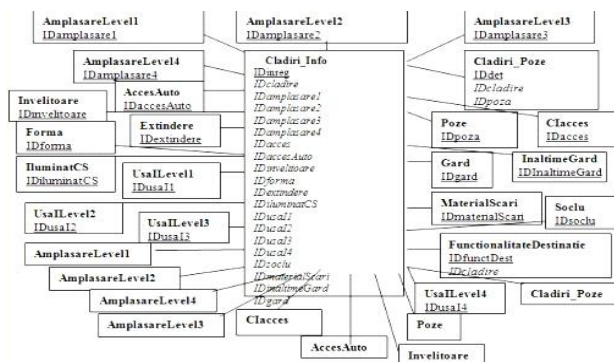


Figure 1. Database scheme for buildings consisting of spatial and non-spatial elements

Besides editing and visualization of buildings-related spacial and non-spacial information, the tool created was endowed with multiple filtering features (Figure 2):

- a complex building filter allowing ranking by predefined characteristics such as age, state, function, height or historical heritage listings;
- a building filter based on the number of floors;
- editing/visualization of the information on buildings;
- a building filter according to their functionality purposes.

The application generates reports on the buildings situation that are easily saved or printed for later perusal. In order to collect all relevant information, the data obtained herein were further listed according to the main features of the building. Upon inquiry of the data base, the tool then generated a synthetic report called 'Info Building'.

For an as easy as possible analysis, the data visualization could be performed both in 2D (ArcMap) or 3D (ArcScene). The two representations are simultaneously displayed and permanently correlated. The modification or selection of an element in one of the two visualizations is immediately reflected in the other one. The 2D and 3D visualizations of the buildings in the studied area facilitated a more accurate analysis.

Principal Component Analysis and Discriminant Analysis were implemented in an integrated tool of statistical analysis and results visualization (Figure 3).

In 2011 and 2013 the CMRD research team succeeded in two more scientific research projects whose focus was again laid on Bucharest

vulnerability quantification and intended to understand the complex interactions between natural and social elements.

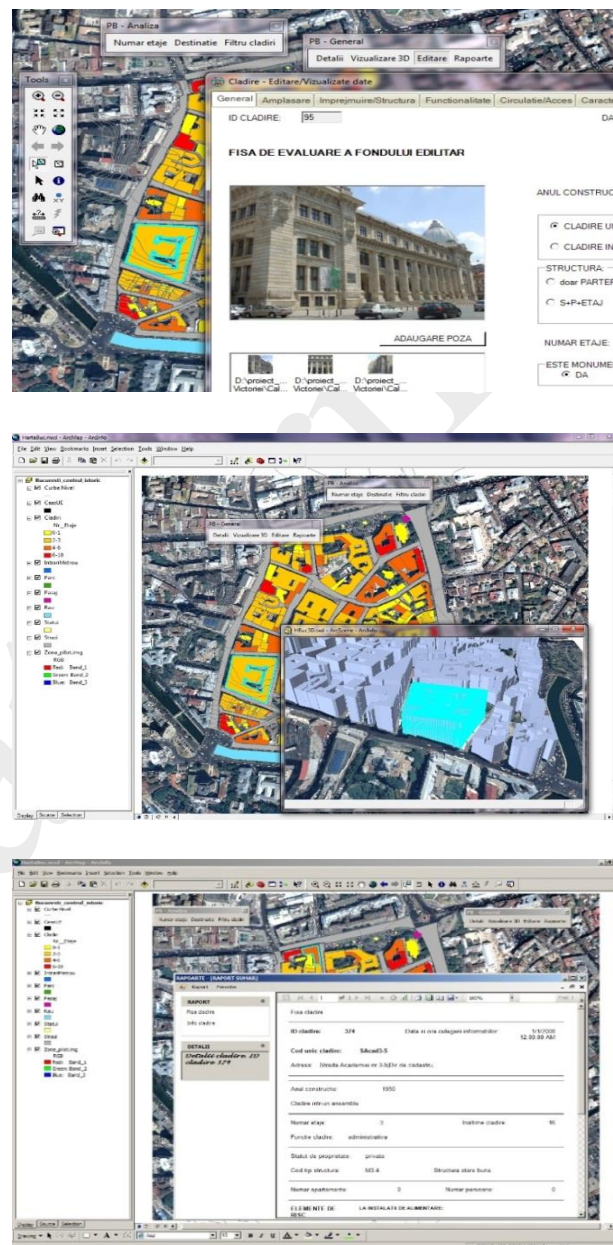


Figure 2. Filtering, visualization and reports



Figure 3. Example of statistical methods for analysis

1. REVEAL Project (Spatial and temporal patterns of urban vulnerability in Bucharest <http://www.geodinamic.ro/reveal>) was budgeted by the Executive Unit for Financing the Higher Education and University Researches. Spanned between 2011-2016, it targeted the evaluation of *environmental vulnerabilities in a time-space framework*. The objective of identifying urban vulnerabilities due to natural and anthropogenic factors in the seismic risk context of Bucharest was achieved via diachronic cartography and satellite interferometry (InSAR) techniques, correlated with geomorphological mapping and multi-criteria statistical approaches based on 1992, 2002 and 2012 census data. Results captured the space-time history of the city evolution and the vulnerability of its natural support, in relation to the physical and the socio-economic vulnerabilities.

The research new results are summed up according to the following innovating topics:

- Mapping of vulnerability of the built substance in accordance with seismic directivity. Based on a unique approach and on relevant hazard scenarios, the seismic loss estimation at Bucharest building level was shaped for the first time with analytical methods. The methodology applied relied on 48 vulnerability curves for buildings, on the Improved Displacement Coefficient Analytical Method included in the SELENA software for computing damage probabilities and on multiple seismic hazard scenarios. The 2011 and 2002 census data were standardized according to the framework of the near-real time System for Estimating the Seismic Damage in Romania (SeisDaRo). Results show the suburbs and the old city centre buildings bear the highest percentage of damages; the buildings profile aforementioned is characterized by a higher number of low-storied buildings.
- The geomorphologic vulnerability was for the first time assessed by using Differential Synthetic Aperture Radar interferometry, or DInSAR, LiDAR, and results derived from classical methodologies (i.e. diachronic

cartography on detailed historical maps from 1852 until present), orthophotomaps (2006, 2008, 2010), and field research.

- The socio-demographic and economic vulnerability analysis based on a multi-criteria approach provided an image of powerful and deep social transformations rooted in the 1990s. We addressed social vulnerability as a context-dependent issue as developed by Cutter *et al.* (2003). We continued the analysis of social vulnerability in Bucharest as developed by Armaş and Gavriş in 2013, creating the social vulnerability index for Bucharest, based on the 1992, 2002 and 2011 census data.
- Quantitative population and building loss assessments due to an earthquake hazard. The population loss estimation for three selected earthquake scenarios resulted by multiplying: a) the complex social vulnerability index b) with the estimated ratio of severely damageable buildings, c) and with the population numbers in each census unit. The maps represented the quantified maximum affected population values, per unit, in percentages. We provided useful estimated figures for a possible number of severely injured, in connection with the current levels of local medical preparedness. To estimate building vulnerability we used the Improved Displacement Coefficient analytical method in the SELENA software. The building loss estimation for three selected earthquake scenarios resulted by multiplying: a) building vulnerability, b) with the number of buildings in each census unit.

2. Conducted between 2013 and 2015, the **GEOSPACE** research project (Identifying linearity /non-linearity in landscape evolution by integrating satellite-based radar interferometry and ground-based monitoring data. Study area: Bucharest, <http://www.geodinamic.ro/geospace>) was funded by the Programme for Research-Development-Innovation for Space Technology and Advanced Research.

We applied satellite-based radar interferometry to capture aspects of vulnerability in the urban landscape within the context of the nonlinear dynamical systems (NDS) theory. To identify the underlying dynamics of

the empirical data, linear/non-linear time series analysis (dynamics) were used in spatial analysis, and deterministic/stochastic – linear/nonlinear trends in landscape evolution. The results lead to better interferometric-based ground displacement products in Bucharest and a more effective process of interpretation of complex dynamics based on a holistic approach achieved by a multidisciplinary team of scientists and engineers. The project teamed up two universities (UB and TUCEB) and Optoelectronica 2001 S.A – a research institute. University of Bucharest was represented by the Faculty of Geography and TUCEB by the Faculty of Geodesy, the most important Romanian institution in the geodesy higher education field.

Multitemporal InSAR methodologies (initially applied to ERS, ENVISAT satellite data and later refined using TerraSAR-X satellite data), change analysis products using optical satellite data (i.e., Landsat imagery), and conventional geological and geomorphological methods captured the space-time evolution of the city. The most popular multi-temporal differential interferometry (DInSAR) techniques, like PS (Persistent Scatterers) and SBAS (Small BAseline Subset) techniques were used for monitoring surface deformations in different types of areas. The radar displacement products were for the first time in Romania validated using Global Navigation Satellite Systems (GNSS), leveling geodetic measurements, as well as by conventional geological and geomorphological methods.

The research novel results were compiled according to the following innovative topics:

- Higher-level products development for ESA Third Party Missions (e.g. TerraSAR-X) within the Earthnet Programme, including validation campaigns, development, installation and maintenance of validation equipment (i.e. ground-

based instrumentation for match-ups with satellite data), and supporting activities for validation (databases of in-situ measurements for match-ups).

- Robust and accurate monitoring and prediction of environmental state and changes based on long-term EO observations (complemented by in-situ data) addressing the new scientific challenges for ESA's Living Planet Programme in the framework of the Earth Observation Envelope Programme (EOEP). The project improved the understanding and quantification of the natural processes and human activities and their interactions, in order to better assess the relationship between urbanization and the natural evolution trends and hazards.
- ***This project was the first international assessment of chaos theory to geomorphological systems by applying two different approaches to identify the underlying dynamics of the complex empirical data achieved by diachronic geospatial analysis using historical maps, and historical satellite images data analysis: (linear/non-linear) time series analysis (dynamics) and spatial analysis, to identify deterministic / stochastic – linear / nonlinear trends in landscape evolution.***

The innovative outcome was that ground displacement trends are characterized by long term memory, which on the long term are forming interesting attractors.

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Coastal Research Group in the frame of CRMD – overview of research activities

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Abstract. The Coastal Research Group in the frame of CRMD Research Centre undertakes various research activities in Danube Delta, on the Romanian Black Sea Coast and along the Danube river valley related to coastal morphodynamics, coastal hazards, geoarchaeology, large-scale evolution of coastal environment, GIS and remote sensing analyses applied in coastal geomorphology and coastal system integrated management. The general aim of our group is to get a well-grounded understanding of the coastal processes and associated coastal behaviour at multiple spatial and temporal scales.

Keywords: *Danube Delta, Romanian Black Sea coast, SCMF, marine and coastal environment.*

The Coastal Research Group in the frame of CRMD Research Centre undertakes various research activities in Danube Delta, on the Romanian Black Sea Coast and along the Danube river valley. Many of these activities use as research facility the Sf. Gheorghe Marine and Fluvial Research Station (SCMF) of the Faculty of Geography, University of Bucharest. It was created as an initiative of our group members and operates since 2002 at Sf. Gheorghe, Tulcea County (in Danube Delta, at the mouth of St. Gheorghe branch), providing local support for developing research and educative activities in marine and coastal sciences.

We provide researchers and students the logistic support for undertaking observations, measurements and field experiments on natural processes, modelling factors and associated landforms or on coping ways of human communities to local environmental conditions while providing the opportunity of exploring the entire coastal system, including current and past form (geomorphology, geology), controlling factors of coastal processes (wind, waves, currents – oceanography), biodiversity (biogeography, ecology, palaeontology) or landscape (management, spatial planning, anthropology).

Our research activities cover therefore a wide range of areas and topics aimed at gaining a better understanding of marine and coastal environment functionality and its changes at various spatial and temporal scales for configuring the optimal conditions for living in such a sensitive environment. Thus, the research activities include:

- **Coastal morphodynamics:** The dynamics of beaches, dunes, sandbars and cliff coasts is tracked by seasonal monitoring and sediment budget calculations taking into account the parameters of environmental factors such as wind, waves, currents and flooding in modelling the coastal forms. The correlated behaviour of the beach-dune system, the water line and the longshore sandbars is monitored on the Sf. Gheorghe beach, located in the Danube Delta, updrift of the mouth of the southernmost Danube branch that flows into the Black Sea, at seven landmarks distributed along the beach (11 km long). The development of these landforms in the temperate, micro tidal climate of the Danube Delta accounts for the small and medium morphometric characteristics, rendering them sensitive to the finest variations of control

factors (e. g. wind, waves, local sea level and precipitations). The particularity of spatial and temporal development of beach-dunes system on Sf. Gheorghe shore is represented by the gradual growth of morphometric characteristics along shoreline under the influence of unidirectional, southward directed longshore currents. This is the physical framework in which two beach sectors with different morphodynamic behaviour succeed in accordance with the longshore currents: an erosive sector followed by another in dynamic equilibrium close to the river mouth. Measurements of seasonal beach dynamics are also made on the Southern Romanian Black Sea shore at Midia, North Eforie, Pescărușul Gulf, and Vama Veche. Bathymetric measurements, which cover upper (represented by submerged sandbars movement area) and lower shoreface until 20 m depth, are undertaken annually on the Danube Delta coast between Sulina and Periteașca. Due to its major influence on the deltaic shore dynamics, given by its position within the alongshore sediment transport system, a special attention is granted to high precision monitoring of Sf. Gheorghe mouth bar, regularly during the summer, but also after major hydro – meteorological events (e.g. floods, drought, storms).

- **Coastal hazards:** Measurement data offer a new perspective on the climate and the impact of coastal storms, as well as on the importance of these events on littoral cell's dynamics and coastal areas vulnerability.
- **Geoarchaeology:** Geoarchaeological studies comprise the reconstruction of the evolution of natural and cultural landscapes, offering the opportunity to study the landscape transformation dominated by the combined action of natural and anthropic factors on different time scales, as well as the evaluation of socio-environmental resilience in coastal area. Geoarchaeological studies in Danube Delta are conducted in site areas of Histria, Orgame, Enisala, Halmyris, and Caraorman.
- **Large-scale evolution of coastal environment:** The reconstruction of deltaic system evolution requires detailed investigations regarding deltaic

lobes, hydrological network, beach ridge plains and barrier islands development. Studies dealing with large-scale landscape evolution are grounded on detailed stratigraphic, sedimentological, geochemical, palynological and paleontological analyses. The chronological framework is determined by absolute ages obtained through Optically Stimulated Luminescence (OSL) and radiocarbon dating methods. In the case of recent sediments (deposited during the last 150 years), sedimentation rates are determined by isotopic measurements of P_{210} and C_{137} .

- **GIS and remote sensing analyses applied in coastal geomorphology:** Geographical Information Systems and remote sensing allow quantification and analyses of spatial data, offering valuable information regarding the dynamics of coastal areas, sea water characteristics, land use changes etc.
- **Coastal system integrated management:** A holistic understanding of coastal system behaviour is fundamental for providing and applying valid management policies based on the concept of sustainable development.

These research activities are part of numerous research projects funded by national or international research agencies (UEFISCDI, CNCSIS, CEEX-AMTRANS, PAI- Brâncuși, ERA-Net, and ESA) or individual companies (Halcrow). Our research group comprises experienced researchers, young scientists, post-docs, PhD, Master and Bachelor students. Students who work on bachelor, master's or doctoral theses learn methods and techniques for exploring the marine and coastal systems, thus gaining various knowledge and skills necessary to address specific coastal environment problems, as well as global ones related to climate change, sea level rise, renewable energy development and a sustainable environment.

Our group is connected with other coastal communities from Romania and abroad, aiming to get a well-grounded understanding of the coastal processes and associated coastal behaviour at multiple spatial and temporal scales through various programs of coastal monitoring, data analyses, interpretation and valorification as scientific reports or review papers. We developed collaborative

works with local authorities in support of optimal management of coastal resources and activities.

The research results were published as scientific articles in well-known international journals (*Nature, Geomorphology, Earth Surface Processes and Landforms, Marine Geology, Geology, Continental Shelf Research, Quaternary Science Reviews, Quaternary International, Scientific Reports, Anthropocene, Natural Hazards, Journal of Coastal Research*), books or book chapters (edited at *Springer, Lexington Books*) addressed to

specialized or general public, being also presented in numerous scientific events in our country or abroad (*International Coastal Symposium, International Conference on Geomorphology, European Geosciences Union General Assembly, Medcoast*), or as specialized courses (*Oceanography, Geography of the Black Sea, Coastal reconstruction and dynamics*) at the Faculty of Geography, University of Bucharest (bachelor or master studies).

Inns and churches in Bucharest's Old Town – Patterns of the past

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Abstract. The purpose of this study was to identify and analyze inns and churches of the historical Bucharest, based on diachronic cartography on historical maps from 1789 up to the present. The importance and the spatial development of the inns and churches throughout history were identified using modern GIS techniques for spatial representation. A major goal was to identify connections between churches and inns. Routes and checkpoints of the passersby and inhabitants were established. Results showed that there were strong connections between churches and inns, represented as patterns of the past.

Keywords: *Bucharest's Old Town, inns, churches, checkpoints, routes, pattern*

1. INTRODUCTION

One of the well-known areas of Bucharest, The Old Town represents the birth place of the capital city of Romania. Being only a village, 600 years ago, it developed into a citadel – Arx Bukaresth, market and later became the capital of Wallachia (Gheorghe, 2014). The capital is first attested in 1459 during the reign of Vlad Țepeș and the first focal point was located in the southern part of The Old Town, overlapping The Old Princedom Court (Mucenic, 2004). However, The Old Princedom Court does not refer to its old age, but the explanation of this title is related to Alexandru Ipsilanti, who changes his residence to the New Princedom Court on Spirei Hill, abandoning the old one (Giurescu, 1966). Even so, The Old Town continues its prosperous existence, becoming the main attraction in Bucharest area. This was only possible due to the inns and churches that populated throughout history the central part of the city and played an interdependence role one for another.

There are only a few studies published in the last century regarding The Old Town (Florescu, 1935; Potra, 1985). Many inns, churches and other historical sites are no longer identified and it is

difficult to spot them without having the necessary equipment and access to valuable documents.

However, there are a couple of authors in the last decade that made progress locating them based on archives and maps: Gherasim (2007) – analyzing how Bucharest was reflected in cartographic documents, Zamani (2007) – centered on trades and leisure activities in the Old Bucharest and Mortu (2011) – well known for his studies regarding specific commercial architecture buildings. Before the 2000s, three great authors have to be mentioned: Florescu (1935) – focused on churches, manorial courts and inns based on Purcel's (1789) and Ernst' Plan (1791), Giurescu (1966) – focused on the whole history of the city and Potra (1985) with his monumental work – *Istoricul hanurilor bucureștene*, focused on the evolution of all the inns that existed in Bucharest.

The research aimed to use and process all the available data and references, by using GIS, in order to identify, analyze, complete the list, and visualize the inns and churches of Bucharest's Old Town. The study was based on the idea that there were strong connections between the inns and churches in the Old Town, considering the fact that they played a major role for the population.

2. METHODOLOGY

The methodology of consisted in four major parts, based on notable references (Chelcea, 2003 and Armaş, 2006). The four methodological steps were as follows:

1. Setting the objectives;
2. Delimitating the study area;
3. Collecting the research data;
4. Elaborating the paper.

2.1. Setting the objectives

The objectives were split up into four main categories, according to their importance. The priority of the first objectives was higher than that of the secondary ones. These are listed below as follows:

- I. Identifying and locating all the inns and churches that overlapped The Old Town at a specific point during history by using the diachronic analysis method based on historic cartographic material and archive documents.
- II. Elaborating a diachronic analysis of the churches and inns of The Bucharest's Old Town, starting with the oldest known cartographic representation of the Old Town¹.
- III. Identifying connections between the churches and the inns located in the area.
- IV. Photographing the actual points of interests after replicas or old reproductions from the same angle and rendering them as collages.

The objectives were fulfilled in a cascade manner, in chronological order. The basic characteristic of these ones was the fact that they formed complex links between their components.

2.2. Delimitating the study area

The study area covers a surface of 54 ha. The area borders Victoriei Avenue on the west side, Regina Elisabeta Boulevard on the north side, I. C. Brătianu Boulevard to the east, Halelor Street and Independenței Splai to the south as shown in Figure 1.

These boundaries were attributed by taking into consideration different factors such as changes of

the street network and significance of the area. Although, for instance, Lipscani Street lies not only to the west of Victoriei Avenue, which is the western limit of the area, but also to the east of I. C. Brătianu Boulevard, the eastern limit, the first segment of the street appeared on the actual territory of The Old Town. The five major arteries represent, at the moment, a well-established and precise limit.

Contrariwise, the conventional boundaries of the current Old Town were different in the past. Formerly the street network had different names and most of the roads followed a different trail. A decisive role was played by The Dâmbovița River whose riverbed was channeled only at the end of the nineteenth century. The river affected the way the street network, the churches and the inns were built. As a result, the Old Town had different boundaries to the east and to the west before the regularisation of the river. On this regard there were included in the study even churches and inns located on the left side of the actual Victoriei Avenue, in the southwestern part of the area², and also on the right side of the actual I. C. Brătianu Boulevard such as Sfântul Gheorghe and Bărăției Square.

This kind of distribution was due to the multitude of inns and places of worship located around the western core of the Old Town. This operated like an organized, structured, and interdependent system. Not including some elements situated in the proximity to the area would have led to breakage of the balance between these ones. Colței Inn, for instance, located previously nearby Sf. Ilie/Bulgară Church, which had the previous name of Colței Inn Church, could not exist without Colței Church. It was located near Colțea Hospital, on the right side of the I.C.Brătianu Boulevard, out of the study area. In the past the Colței Church administered the Colței Inn. Excluding the first one from the study would have unbalanced the organism - the church and the organ – the ecclesial inn. Another example is represented by the former inn and the Sfântul Spiridon Vechi Church, on the actual field of Națiunile Unite Square, southwest of the Old Town, and back then, located on the left bank of the Dâmbovița River.

¹ The oldest known cartographic representation is Fr. Purcel's

² In this part the river formed a meander that was rectified after the first regularisation of the river (1881-1886).

Being situated close to the Ișlicarilor Lane (nowadays Franceză Street), the access from the inn and the church to The Old Town was within reach, conferring them a special role. Excluding these components from the area of study would have represented interrupting the link between the Lipsani core and its proximal components like Sf. Spiridon Church and Inn.

Therefore, before the regularisation of the Dâmbovița River until the nineteenth century, the southern boundary of the area of study was represented by the river itself, the access to the right riverbank being possible through light pedestrian trellis bridges. Through the regularisation process the river was channeled and its bed was changed, so the area regained its final southern boundaries - Halelor Street and Independenței Splai, the last one designed to follow the actual flow of the river.

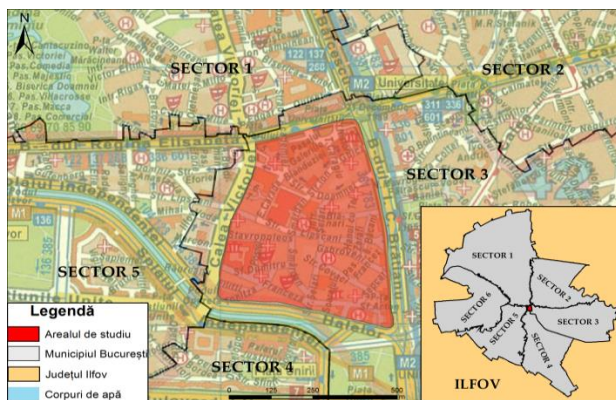


Figure 1. The study area and its actual boundaries
(Source: ANCP's Portal, Bucharest's City Plan 2008)

2.3. Collecting the research data

After identifying the actual boundaries of the study area, the research data was collected. The required data was collected during several field surveys and based on archival research (Armaș, 2006).

a.) Field data collection

By applying the cartographic method, all the the landmarks were mapped on the sketch map, including the researcher's comments. The mentioned landmarks³ were photographed by applying the photographic method.

³In this case the inns and the churches

b.) Archival research

First of all, there were identified the required works that had to be investigated in order to create a temporary reference list. Different works have been used such as from the field of geography, history, literature or Romanian grammar like "The Explanatory Dictionary of the Romanian Language" (DEX, 2009). The complete reference list is available at the end of the paper.

Another source of information was represented by the old topographical plans of Bucharest, the newer topographical maps and aerial photographs. The above mentioned cartographic sources were scanned and stored on the computer. In the next step the content was edited and analyzed.

Finally, the online references represented another source of information. As a result there were examined and used digital libraries as "The Digital Library of Bucharest", blogs of interest and discussion forums.

2.4. Elaborating the paper

The paper followed two main directions: the Diachronic Analysis and the analysis of Attractors.

The first direction was meant to analyze and interpret the study area in terms of its history and evolution. We applied the method of historical maps analysis (Armaș, 2006).

Once scanned and transferred to the computer, the raster files of the historical maps were imported in the ArcMap 10.1, module of the Geographic Information System software ArcGis 10.1, based on the Bucharest City Plan, published in 2008 by Editura AGC Busman. The imported maps were georeferenced using the Image to Image method and the stereographic projection 1970.

On each of the georeferenced map, on the basis of the original legend, there were identified all the points of interest, beginning with churches, inns and ending with the Dâmbovița River (defining element of the environment) and the actual boundaries of The Old Town.

For each georeferenced map we created three different shapefile (.shp) types – polyline, line and point. Churches were digitized through a point shapefile (in form of a black church with a white

cross inside), the street network, The Dâmbovița River and the boundaries through line shapefiles (the street network symbolized by yellowish orange and the boundaries, by dashed line) and the inns through a polyline shapefile (light brown color). By using the ArcMap's Buffer function, the river's line shapefile has been converted into a light blue polyline shapefile for a better representation. On each of the following maps the inns were assigned letters and the places of worship numbers. Depending on the importance of some streets, those were attributed labels. As a result, each map contained in the background at least five shapefiles.

In case of some specific maps we added supplementary shapefiles, like in the case of the 1789 map. In this case, we emphasized the importance of trellis bridges back then, i.e. connection routes between the Old Town and the neighboring areas, by adding another shapefile.

Six maps which cover a period of 219 years (1789-2008) were scanned and underwent the diachronic analysis: Officer F.Purcel's Bucharest City Plan – 1789, Baron R.A.Borroczy's Plan - 1852, the Plan Issued by the Geographic Institute of the Army – 1900, Masterplan of the Municipality of Bucharest - 1921, Topographical Plan of Bucharest - 1984, Bucharest City Plan published by Editura AGC Busman – 2008. The diachronic analysis was related to the historical events of the past and consisting of six phases: 1789, 1852, 1900, 1921, 1984 and 2008.

The second direction – entitled “Attractors” referred to the two factors that dominated the history of Bucharest and especially of the Bucharest's Old Town: the ecclesiastic factor and the commercial factor.

All the references were evaluated and the required information concerning churches and inns quantified and summarized. Regarding the churches and the inns, information such as founders, originality elements, relevant events and years, for instance year of demolition, were extracted. Based on the inductive and deductive methods linked to the shooting method during the field research, similarities and differences between the attractors were found. Using Photoscape 3.7 soft, the old and actual photos of the attractors were merged, resulting in meaningful collages. The actual photos

were taken after old ones, trying to capture the same focal point and shooting angle.

3. RESULTS

28 inns were identified and grouped by their functionality into four categories (Figure 2):

- Lordly inns (3): Șerban Vodă, Constantin Vodă, Sfântul Gheorghe.
- Monastic inns (7): Colțea, Golgota, Grecilor, Sfântul Ioan cel Mare, Sfântul Spiridon, Stavropoleos, Zlătari.
- Manorial inns (7): Câmpineanu-Serafim-Villacrosse, Damaris, Filipescu, Greceanului-Dedu, Iacovachi, Roșu, Ion Românul (Eliad).
- Commercial inns (11): Bazaca, Băltărețu, Gabroveni, Ghermani, Manuc, Papazoglu, Hanul cu Tei, Hagi Tudorache, Verde, Castrișoaiei, Simion.

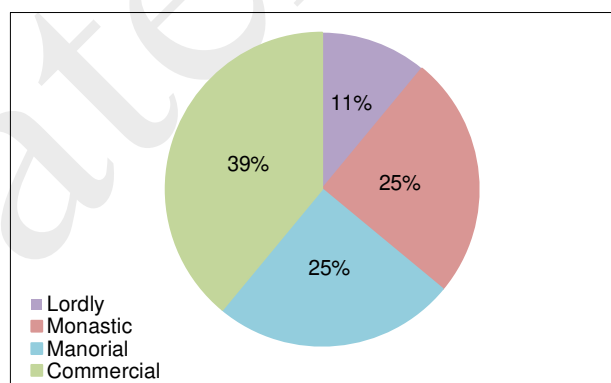


Figure 2. Inns in Bucharest's Old Town (1789-2015)

Figure 2 shows that more than one in three inns were commercial, one out of two monastic or manorial and rough 10% lordly.

After analyzing all the six maps that underwent the diachronic analysis, only 16 inns out of 28 could be represented. The remaining 12 inns were not marked on any of the six maps. References regarding them were found only in old works of Romanian authors such as Crutzescu, Florescu, Iorga, Giurescu and Potra. The evolution of the map-based identified inns is shown in Figure 3. Two of them survived until the present day: Manuc's Inn (Hanul lui Manuc) and The Linden Tree Inn (Hanul cu Tei).

Even though they do not fulfill their old functions anymore, Manuc's Inn (Figure 4)

comprises a restaurant and a hotel and The Linden Tree Inn, an art gallery and two pubs (Figure 5).

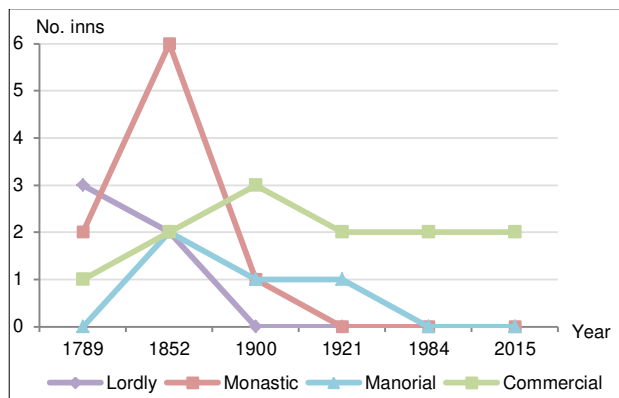


Figure 3. Identified inns on the maps that underwent the diachronic analysis

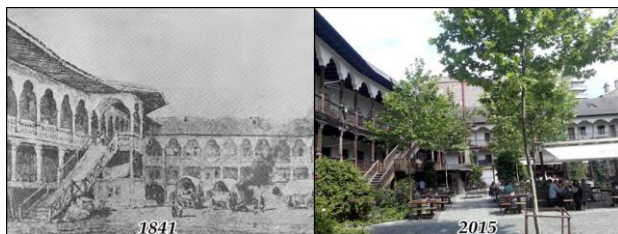


Figure 4. Manuc's Inn (M. Bouquet, 1841) and today (V-N. Nechita, 2015) consisting of basement, ground floor and two upper floors; oriental style architecture



Figure 5. The Linden Tree Inn (Poitevin-Scheletti, 1927) and 2015 (V-N. Nechita, 2015) unique for its passageway form; it shelters today The Linden Street, a short path between Lipsani and Blănari Street

According to Figure 3, the maximum number of inns was reached in 1852 – 12. Half of them were monastic and along with the manorial ones – two, this types reached their peak that year. The highest number of lordly inns was quantified 1789 – two and the highest of commercial ones, 1900 – three. Only two inns were represented in 1984 and 2015 (see Figure 3), therefore two distinct periods can be identified: 1789-1852 and 1852-2015. During the first period, the number of inns increased gradually and starting with 1852, it decreased drastically, because of natural events such as The Great Fire of

Bucharest (1847) or the sociocultural evolution of the city. As for the churches, 19 were identified in the Old Town during the covered period.

Contrary to the inns, all 19 churches were identified on one of the six maps at least once.

The evolution of the map-based identified churches is shown in Figure 6. Only eight churches out of eighteen persist until the present day. The highest number of identified churches was 15, in 1852 and the lowest, eight, beginning with 1984 until now. Two major periods can be identified: 1789-1921 and 1921-2015. The number of sanctuaries identified on the maps during the first period was greater than ten. After 1921, the number of these ones decreased, reaching values less than nine as shown below.

Five churches were found on each of the six researched maps as shown in Figure 7. During history all of them were located in the actual study area and well dispersed throughout it: Sf. Nicolae-Șelari in the northeast, Doamnei in the northwest, Zlătari and Sf. Dumitru to the southwest and Curtea Veche in the southeastern part.

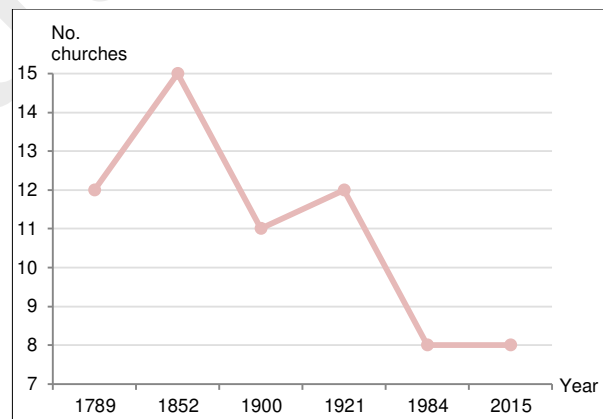


Figure 6. Identified churches on the maps that underwent the diachronic analysis

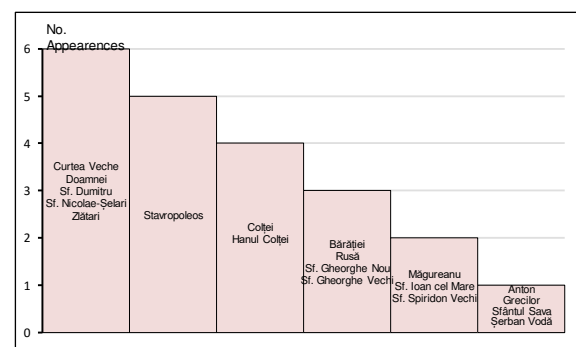


Figure 7. Number of appearances of the churches on the researched maps

4. DISCUSSION

Interpreting the previous results, different suppositions can be made. Both the inns and the churches evolved throughout history in close relations, serving as attractors for Bucharest inhabitants, travelers and merchants. However, the inns had a higher priority than the churches, being main cores for the further development of the city, especially the monastic inns that were built later in the proximity of the monasteries and the churches.

The spatial representation showed that more than half of the monastic inns were located in the proximity of the Lipscani Street, two of them bordering it to the south. Following the natural path of urban evolution, the churches preceding the inns were built close to The Inner Fair in order to mark *checkpoints* for the passers until reaching the main core of The Old Town. These checkpoints developed into imposing inns, attracting a numerous population. We can assume that the people were following the next path: Podul Mogoșoaiei (actual Calea Victoriei) – Lipscani Alley (actual Lipscani Street) – Podul spre Hanul Șerban Vodă (actual Smârdan street) – Ișlicari Alley (actual Franceză Street) – Târgul de Afară Alley (parts of actual Calea Moșilor, for accesing Eastern Europe) or Podul Șerban Vodă (actual Unirii Passageway and Dimitrie Cantemir Boulevard, for accesing Constantinople) or Colței Alley (actual I. C. Brătianu Boulevard as a wayback route). Certain is the fact that, even if the inhabitants, travelers or merchants crossed the Old Town starting from another point on the map, they had to follow at a certain time a major part of the route above mentioned. This was possible due to the greater accesibility of the road network in the area, to the famous churches and inns that contained stores with a high variety of products.

In addition to this, the lordly inns followed a major part of the same path. Two of them – Șerban Vodă and Sfântul Gheorghe Nou were located on the Lipscani Alley – the third one, Constantin Vodă being located to the southwest, close to Șerban Vodă inn. Representing only 11% of the total number of inns that served the population of the study area at a certain time, they had the longest

lifespan. Occupying large areas, consisting of an extensive courtyard and built after the Arabic *fondacos* (*store house* in Arabic, *inn* in Italian), they represented main attractions for travelers, merchants or simple citizens, having a total lifespan of more than one century. Many merchants decided to sell their products in one of their rooms, because of the large number of available rooms for rent. Back then it was more affordable to sell products in one of the lordly inns' available rooms, rather than having your own commercial inn.

Almost 40% of the researched inns were commercial, meaning they were built and exploited only by merchants. The only representative commercial inns were the ones that survived until today, Manuc's Inn (Hanul lui Manuc) and The Linden Tree Inn (Hanul cu Tei), even if they do not fulfill the old functions anymore. Being built later, in the first part of the nineteenth century and having a stable polygonal shape, both the inns withstood calamities like earthquakes, fires or floods. The other commercial inns occupied small areas and were destroyed mostly during the Great Fire of 1847 or during the later earthquakes. The remaining 25% of inns were manorial inns, founded by boyars and occupying small areas. Built later, after the apparition of the lordly and monastic inns, but having a reduced area of influence, they were either destroyed or abandoned. The most famous manorial inn was the Papazoglu Inn located in the area of the Sfântul Gheorghe Nou Church, destroyed by The Great Fire and abandoned.

On the other hand, most of the churches survived and that was possible due to their spiritual role. As the inns lost their importance and were demolished or replaced by hotels, all the churches underwent a restoration process. During the researched period only six churches out of the 19 disappeared, considering the fact that only two out of the 28 inns survived. Five churches were demolished following the modernization process: Sfântul Sava, Șerban Vodă, Grecilor, Sfântul Ioan cel Mare and Măgureanu and only one, Sfântul Anton, burned to the ground in 1847 following The Great Fire. The highest number of churches identified on the maps analyzed using the diachronic analysis was recorded in 1852. An explanation for that could be the fact

that in 1852 was released one of the most detailed Bucharest's Plan.

In comparison to the first researched map of 1789, more churches were omitted, due to lack of information. As time went by, churches were demolished after 1852 one by one and their number continued to decrease. Only one church was built during this period – the Rusă Church – built between 1905-1909. Along with the modernization of the Romanian society, the rulers in charge for the city's development rather restored older churches instead of building new ones. One important aspect that has to be mentioned is that, as shown in Figure 8, only five churches were identified on all researched maps that overlapped the actual area of the Old Town. Considering that each church had an circular area of attraction with a radius of 200 meters, more than 95% of Bucharest's Old Town overlaps one of the circles, except a small area in the northeast. Anywhere an inhabitant, a traveler or a merchant was located, excepting a small surface in the northeast, he was *attracted* by one of the churches.

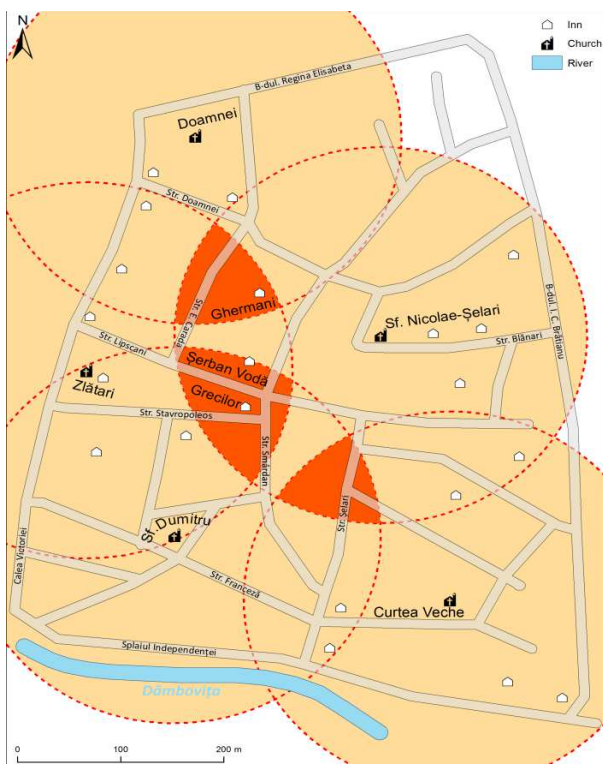


Figure 8. The five most important churches with their area of attraction and the inns that overlapped The Old Town

Moreover, there were identified three areas where three circles of attraction were overlapping.

The first one was located around E. Carada street, the second one at the crossroads of Lipscani, Stavropoleos and Smârdan streets and the last one in the northern part of Smârdan streets. Interesting is that two thirds of this urban texture, the northern and the central one, comprised inns: Ghermani, Șerban Vodă and Grecilor, meaning that the area of influence of those inns increased as they offered the inhabitants, the travelers or the merchants various ways through to one of the main churches and later to the main streets. The three high density areas of attraction, especially the northern and the central ones can be considered locations of great historical significance, having a particular role in setting patterns of the past.

5. CONCLUSION

The research showed that there was a strong connection between the churches and the inns located in Bucharest's Old Town. They played an important role for the travelers, merchants or inhabitants from the city centre. The assumption that they were following specific routes, attracted by checkpoints – inns and churches could be validated. However, the lack of information because many valuable documents have been lost, represented weak points in the research.

The study shows that using modern spatial representation techniques as GIS can improve and lead to better understanding of the history and the spatial development of a city. The methodology and the results of the study provide basic information for further research of The Old Town.

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Decision analyses – a brief introduction

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Abstract. The decision analyses have been developed in the second half of the 20th century to help managers better deal with the decision making problems they had to face. Evolving from very technical and simple managerial tools, they became today a very wide domain, comprising knowledge, methods and techniques from Mathematics, Statistics, Computer Science, Management and lately GIS. The most important aspect of the decision analyses is the decision making process. Even though, earlier in their development, the goal (the decision) was emphasized, after 1970's the accent was put on *how* a decision should be made. This led to a dynamic development of methods and instruments that could assist the decision makers through the decision making process, so the decision support systems, and later the spatial decision support systems appeared.

Keywords: *decision problem, decision making process, decision support systems, spatial decision support systems*

1. INTRODUCTION

The decision analyses emerged during early twentieth century as a necessity for assisting decision-making in management and economics and are developing rapidly since the mid-twentieth century. They have applications in all areas where there are several factors involved – from economics and management to environmental protection, public administration and territorial planning.

Although they are not yet globally widespread, their practical importance makes them increasingly used and there are ongoing concerns for their improvement and diversification of their applicability.

The aim of the present paper is to briefly introduce these analyses, to present, in general lines, their development and to emphasize their importance and their utility.

In decision analyses, the most used concepts are: *decision-problem* (or just *problem*), *decision-maker*, *decision making process* and *stakeholders*. A *decision-problem* – is a situation in which there is a perceived difference between the current state and a

desired state of an individual or group of individuals and in which there are several alternatives and the individual/group of individuals does not know from the beginning the solution for the problem (Sharifi, 2004a). The *decision-makers* are the people entitled to make a decision. They are usually managers, but also, due to the fact that the decision analyses tend to be applied in public administration, the decision-maker can also be the Mayor of a municipality or other upper level local/regional administrator. In general, any person that has to deal with a great number of needs (of the company or of the municipality) and a lack of resources (financial, human, technical etc.) will become a decision-maker facing a decision problem. The *decision making process* is the sequence of actions and/or events starting from the identification of the decision problem and ending with choosing one alternative, that becomes a solution to the decision problem. The decision making process is a very complex one, so several models have been developed. Some of them are briefly presented in the next section. The *stakeholders* are the individuals and/or group of individuals that are

either affected by a decision or that have a specific interest in a decision problem. In most of the cases stakeholders find themselves in both situations at the same time and are represented by private investors, NGOs, local communities and different social groups. The stakeholders are the ones who influence the objectives in a decision making process.

2. THE DECISIONAL PROCESS AND DECISIONAL ANALYSES

The decision-making process almost always belonged to senior managers, who held a high control over all processes in a company. In other words, the manager had the authority to make decisions at his discretion. Starting in the '70s, this tradition changes and the so-called rational management emerges, the decision is no longer made by manager in an arbitrary way, based on his/her experience and intuition, on the contrary the managerial process integrates elements of mathematics, statistics and the probability theory (Bennet and Bennet, 2008).

The decision analyses began to gain increasingly greater importance with the increase of the amount of data and the development of managerial sciences. Although they essentially are more connected with the management process, however, with the development of GIS technologies, decisions began to be based on objective, transparent and, where appropriate spatial criteria.

In the case of this type of analysis, attention is not focused on the final decision, but on the decision-making process, on the involvement of all stakeholders, on the streamline of the decision-making process, costs reduction, increasing benefits, taking into account resource limitation. In other words, decision analyses consider how the decision should be made and not what decision must be made (Simon, 1979).

The main challenge in decision analyses is the problem structuring (Bosman, 1987) and understanding its characteristics, whether it is a matter of economic or technical problem (Romero and Rehman, 2003). When decisions involve a single solution, the decisional challenge is to

implement that solution so the problem is a technical one. But when there are multiple solutions to the same problem, it becomes an economic problem.

Meanwhile, there are two main views on decision making, synthesized as early as 1960's, by Herbert Simon, in his book entitled *The New Science of Management Decisions*. On the one hand, the objective rationality approach is stated - in which is supposed that all aspects and components of a decision problem are known, all the necessary resources to make a decision are in place and, implicitly, all the alternatives can be laid out and the best solutions can be found. This approach is the ideal situation in a decisional process. In reality, however, these cases with such an approach on a decisional problem are extremely rare. So another approach is distinguished, a degree more practical, namely the rational procedural approach (bounded rationality). This gives up on the idea of absolute and focuses on the idea of satisfaction because in practice there is no absolute structuring of a problem, many resources necessary for decision analyses are missing and all decision makers cannot be concomitantly and absolutely satisfied. Furthermore, ideal solution cannot be found, instead satisfactory solution can be developed. This latter approach is the most common in practice.

The bounded rationality approach regarding decision making began to be used and grounded since the early twentieth century. The first fields in which this concept was considered were economics and law. In economics and the related sciences, and in general in any field of activity that involves money, it was and is necessary to make the best decisions possible and as objective as possible, so that the final decision cannot be challenged or subsequently be considered ineffective after implementation. In the field of law and legislative issues also it was and is necessary to make transparent and impartial decisions. So the type of needs led to the theorization of the decision making process. Among the first who grounded the decision making process is Dewey, who, in his work entitled *Logical method and law* (1914) stated that people do not pay enough attention on the actions they undertake, but act based on instinct and routine. This is not always negative, sometime it happens to

be a correct intuition. Often though, people reflect on their decisions beyond the immediate effect, thus they rationalize, argument and motivate an action, a fact, etc.

Therefore there are two types of decisions, some based on intuition and others based on reason. In the latter case, most times has been proven that the best decisions were made under given circumstances. In his work Dewey (1914) greatly emphasise on logic and common sense, seen as an objective way of looking at things and compares the legal situations and, implicitly, those who work in this field with farmers, scientists and mathematicians who use procedures, formula and reasoning to make the best decisions and militate for the adoption of this way of thinking in the field of law, and especially in juridical processes. He ends his paper asserting that the introduction of flexible and experimental logic in the legislative field represents not only a social necessity, but an intellectual one (Dewey, 1914).

The founder of decisional analyses is Herbert Simon, Professor of management at Carnegie Institute of Technology. He wrote numerous papers through which he emphasised the necessity of reasoning and implementation of procedures in decision making in the sphere of economy and in economic organisation and propose different models.

One of his first papers is *Theories of decision-making in economics and behavioural science*, written in 1959. The author starts his paper with a classification of the economy based on the involved actors in macro-economy (when industry and the entire economy are considered) and micro-economy (when individual economic actors are considered), taking into account the economic behaviour in descriptive economy (only describes economic behaviour) and normative macro/micro-economy (which guides the economic decisions towards public policies or the consumer. The latter subsequently became the field of management, being separated from economy and evolving as a separate science. Debating economic theories and problems, especially the theory of consumerism, the management approaches also the issues of decisions and/or satisfying actions. This notion is central in the procedural reasoning approach introduced by Simon. He takes the idea from psychological

theory, according to which, the motivation for action is determined by objectives/needs, and actions ends at the moment when the objective/need is achieved/satisfied. In addition, the conditions to satisfy the objective/need are not, by all means, something well defined, but rather they include a certain aspiration level, which is solely adjusted by the experience of individual. Extrapolating this theory, he states that the economic entities do not necessarily have as a goal to maximize profit, but rather to maintain a certain level/rate of profit, to hold a certain market share or to have a certain level of sales. So they will try to satisfy the profit as economic need and not the maximization of profit.

Another novelty of this paper is his vision that the entire decisional process that takes place in the human mind can be implemented through an information technology process, thus a computer can elaborate and follow a decisional process. The advantages of such a programme would be a high number of criteria to be taken into account in making a decision, the increased capacity to generate numerous alternative, high capacity to evaluate the impact of each alternative on the environment to which it belongs. (Simon, 1959)

In another paper from 1979 *Rational decision making in business organizations*, he develops the notion of procedural reasoning, emphasising the fact that in the economic and social spheres, the idea of absolute does not fit in. There is not solution that is absolutely good, there is not situation absolutely known, there is no absolute aspiration level, but all are relative depending on the aspiration level of each individual or economic entity (Simon, 1979).

The bounded rationality approach has several basic principles: (Sharifi *et al.*, 2004a)

- Establish the scope and define the problem;
- Establish an aspiration level or matching criteria;
- Use of heuristic research to simplify the problem and extrapolate a single better alternative;
- If no feasible solution is found, then the aspiration level is lowered and the process is repeated;
- After identifying a feasible solution, this needs to be evaluated to establish its rank of acceptability;

- If this is considered unacceptable, the process of seeking solutions is rerun;
- If this is considered acceptable, then this has to be implemented;
- At the final, the level at which the solution corresponds to the needs for future uses needs to be assessed.

3. MODELS OF THE DECISIONAL PROCESS

There is a multitude of models representing the decisional process, the most important being those of Dewey, Simon, Mintzberg and Turban.

Conform to the model of Dewey (1914), the decision making process means answering to the following three questions: (i) What is the problem? (ii) What alternatives are there? (iii) What is the best alternative? This is one of the oldest and simplest model.

The model of Simon (1960) stipulates that there are three stages in the decision process: (i) The intelligence phase (identification of the decision problem); (ii) The design phase (presuppose invention, development, test and analyse possible way of action – new or already developed, resulting in finding some feasible alternatives) (iii) The choice (selection of a certain way of action, resulting in selecting one alternative to become the solution). In the decision making process, when the alternatives are not feasible, the intelligence phase is rerun, if the feasible alternatives are not satisfactory, the process can be resumed either from the design phase or the phase of intelligence. The difference between the two models is that the Simon's model is not seeking to find all alternatives, but only a few, and before choosing one of the alternatives, their feasibility is tested. The model of Simon is based on the sequential analysis of alternative solutions, namely a single solution is studied once, uses the heuristic method of finding alternatives and considers that the final solutions are those that satisfy the proposed (planned) aspiration level, meaning that a problem is solved when there is a satisfactory result. Another model of decision making process is that of Mintzberg (1976). He developed his model based on the practical situations found in some companies and hospitals,

when he reached the conclusion that the organisations follow different ways and many times the model followed by them is not a linear one. The principal phases in this model are: (i) identify the problem, (ii) develop the alternatives and, (iii) select a solution. Sometimes, after a problem was identified, it requires a more in depth diagnosis, but other times the organisation goes straight to seeking and filtering a feasible solution or to elaboration of new solutions according to its own requirements.

After the list of feasible alternatives was made follows the validation of the alternatives and the negotiation between the involved decision makers. All these steps could lead to the need to resume the design phase or identify solutions to find a better compromise. Sometimes, after the decision was taken, some organizations must formally confirm the decision (Sharifi *et al.*, 2004a).

The model of Sharifi (2004a) is an adjustment of Simon's model with those three phases, only that they are better defined and in more detail, given the fact that Simon's model although original as idea, it became insufficient in the context of technology development and the amount and complexity of information. Therefore, in the intelligence phase we refine steps such as defining the system, searching and scanning environmental data collection mechanisms and understanding the behaviour and system evaluation system behaviour and identify the problem and setting targets and identifying indicators. The next phase, of design, includes the formulation of models, validation, generation of alternative and predicting and quantifying the consequences. In the last phase, for selection, steps are followed to establish the criteria for selection of alternatives, evaluation of alternatives identified in the previous phase, selecting an alternative, performing a sensitivity analysis to see how robust the analysis and final decision is.

4. DECISION SUPPORT SYSTEMS

In terms of operational instruments used in decision analysis, there are two types of decision support systems. Firstly, there are the decision support systems (DSS), with a strong managerial side, enabling decision making and ensuring

transparency of the decision regarding problems of economic and technical type (Fig. 1) and SDSS – spatial decision support systems. In the second case, the decision support systems are combined with GIS tools, enabling detection of rational, objective and transparent solutions to spatial problems (Fig. 2). Spatial decision support systems are most frequently used in the field of urban planning. In this area there are numerous constraints, from those natural (relief, climate, water etc.), to the economic ones (funding, logistics) and the managerial ones (cost efficiency, efficient use of resources, etc.).

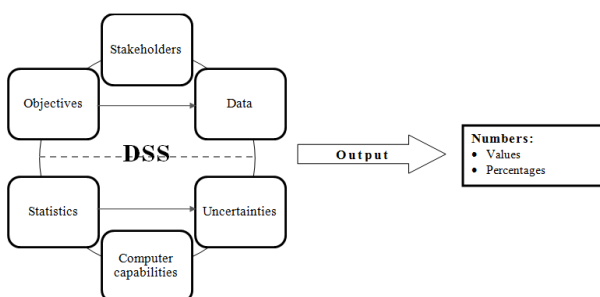


Figure 1. Decision Support Systems – components and output

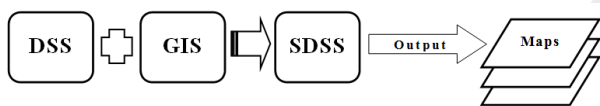


Figure 2. Spatial Decision Support Systems and their output

The decision support systems originated in the 1960's, when there were made timid attempts of computer use in managerial decision making. In the 1970's, their use started gaining momentum, computer applications for the managerial support of institutions and companies were developed (customer portfolio management, production support, support for finance, advertising etc.). Beginning with the 1980's, this type of computer systems start diversifying, after a period of approximately 20 years, when the models implemented by these systems were exclusively financial. Thus, in mid 1980's the DSS group is developed with applications in urban planning, and in mid 1990's the web-based DSS emerges (Power, 2004, 2007).

The decision support systems are a type of management support that helps analysts, managers

and planners in making decisions. DSS are particularly useful for semi-structured and unstructured problems, which permit an interactive dialogue between system and user. Their main goal is to use the processing power of the computer, but in a user friendly manner, helping the user to explore the problem, better understand it by accessing data and suitable decision models. They are designed for generating and evaluating alternatives to better understand the problem, to increase the negotiating capacity between different objectives and provide decision support.

A scope of DSS is that of assisting certain decision makers, either individually or in group, and not the entire organisation. This allows each individual / group to customize the model according to their needs and requirements and use it in an interactive way. The interaction between actors makes DSS a useful tool in terms of utility and speed of responses. They occur in real time, thus saving time. In addition, high processing power of modern computers enables a dynamic and varied output. Another principle of functioning is to use brainstorming between those involved, so the solutions are satisfactory for all stakeholders.

The spatial decision support systems have been developed to find solutions for decisional problems involving spatial data (SDSS – Spatial Decision Support Systems). They integrate DSS and GIS (Geographical Information Systems) and include analytical techniques and thematic analyses offering the user the necessary framework for the application of decisional processes, which involve the analysis of geographical information. In addition, SDSS is based on georeferenced data, as GIS is based on spatial data (Crossland *et al.*, 1995). SDSS is able to operate with complex spatial problems, offering a common framework for the integration of managerial data bases, for graphic displays, for table reports and for the expert knowledge of decision makers (Densham, 1991).

SDSS are used in two situations: (i) in spatial location problems – where is most suitable to place something (based on the objective set) and (ii) in spatial allocation problems – what is the most suitable usage of a certain place (parcel, building etc.).

SDSS	GIS
<ul style="list-style-type: none"> • Flexible – assists individual approaches in the decisional process. • It is specifically designed for decision making. • It is designed for semi- and unstructured problem solving. • Flexible in the sense of combining analytic models and databases. • Gives feasible alternatives • It is iterative, integrative and participative • Can also include non-spatial data in analyses 	<ul style="list-style-type: none"> • Supports only cartographic displays. • It has a limited capacity for analysis of geographic information. • It is too rigid for modelling (requires specific data formats, resolution limitations) • Presents deficiencies in analytical modelling techniques • Faces difficulties in designing semi- and unstructured problems

Table 1. Differences between SDSS and GIS
(Densham, 1991)

The applications of SDSS are very numerous, ranging from urban planning (e.g. Eldrandaly *et al.*, 2003; Sharifi *et al.*, 2006; Zucca *et al.*, 2008), infrastructure and routing (e.g. Coutinho-Rodrigues *et al.*, 2011; Jankowski and Richard, 1994; Ray, 2007) to agriculture (e.g. Nath *et al.*, 2000), water management (e.g. Makropoulos *et al.*, 2003; Rahman *et al.*, 2012; Sharifi, 2003), to environmental issues (e.g. Herwijnen, 1999) – wind farm site selection (e.g. Gorsevski *et al.*, 2013), solid waste planning (e.g. MacDonald, 1996; Sharifi, 2004b; Wang *et al.*, 2009), to coastal management (Jans *et al.*, 2000; Ruijgrok *et al.*, 1999; Uljee, I. And Engelen, G., 2000 cited in Uran and Jansen, 2003), tourism (e.g. Dye and Shaw, 2007; Feick and Hall, 2000) and risk management (Gheorghe and Armaş, 2015).

5. CONCLUSIONS

In their short existence, of about 50 years, the decision analyses proved their utility by helping the decision makers to make better and more substantiated decisions. Evolving from simple, technical solutions implemented to help the managers, they became today very complex systems, capable to deal in real time with various

needs of different stakeholders and taking into account numerous factors that affect the decision.

Of course, their development is tightly connected with the development of the technology (computers, software, instruments to collect the data needed), of the methodology and with the problems identified by the practitioners, as they applied the new techniques and they were able to identify the limitations of this type of analyses and/or the limitations of the software developed.

As many (spatial) decision support systems appear and many methods are being improved and developed, a more urge to better knowledge is being perceived. The decision problems are much more complex now compared with the ones from 1960s or 1970s, the decision maker has to face a much larger number of stakeholders, and also the public pressure is more powerful. The manager (of either private or public entities) is not regarded as an absolute centre of power, but a person who is selected by the stakeholders and represents them and their needs, so he can and will be made responsible for every decision he makes and that is affecting the people who invested in him/her. Hence, the accent shifted from the decision that has to be made to the decision making process that became much more transparent.

As any type of new analyses, these ones have also their limitations. One of them is that the decision maker needs to have comprehensive and intuitive software to use, because he/she lacks technical knowledge regarding decision analyses. Also, the stakeholders have to be thoroughly identified and they have to be able to prioritize their needs, to set their satisfaction levels and to establish what they are willing to give up to in order to maintain what they really need. And probably the most important limitation is that, regardless the “help” provided by the (spatial) support systems, the decision maker alone has to make the final decision by choosing one of the designed alternatives.

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GeoPatterns

The Analysis of Local Communities Flood Adaptation Strategies using Traditional and Participative Research Methods. Case Study: The Danube Valley between Giurgiu and Gostinu' – PhD Thesis Summary

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Abstract. The aim of the research is to combine traditional approaches to the study of adaptation to floods based on academic research with trans-disciplinary approaches. The research followed specific objectives: (a) To identify current and past ways of interactions between the inhabitants of the Danube floodplain and their local environment and the factors that contributed towards adjustment, adaptation or mal-adaptation; (b) To estimate the impact of structural methods of protection against floods and the bureaucracy associated with implementing them; (c) To apply a detailed case study in the village of Gostinu in Giurgiu county, using diachronic analysis, ethnographic methods and PGIS to identify factors that influence adaptation to flooding; (d) To identify the characteristics of local communities and the vision of community members, regarding floods and explore reactions to plans to renature the Danube floodplain; (e) To analyse flood protection policies and strategies at local, regional, national and international level and estimate their impact.

Keywords: *participative research, ethnographic research, structural methods, diachronic analysis*

1. INTRODUCTION

The article presents a summary of the PhD thesis written by Cristina Nenciu Posner and coordinated by Prof. Dr. Iuliana Armas from the Faculty of Geography, University of Bucharest. The thesis was publicly presented on 7th of December 2015 being favourably approved by the PhD Committee. Research for this paper was made under the framework of 'Taming the Post-socialist nature: floods, local strategies and national policies along the Lower Danube' (PN-II-ID-PCE-2012-4-0587), a project funded by UEFISCDI and implemented by Francisc I. Rainer Institute of Anthropology in partnership with the CRMD (www.politicaecology.ro).

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sciences, Environment and Earth Science' co-financed by the European Social Found within the 'Sectorial Operational Program Human Resources Development 2007–2013'.

2. STUDY AREAS

The research focuses on three interconnected areas of study in terms of the context of adaptation and the temporal and spatial scales (Figure 1), which differ depending on the research methods used.

The diachronic analysis considers a wider area – the Danube Valley between Giurgiu and Oltenița (Figure 2), selected primarily because hydro-geomorphologically this is a naturally distinct unit and secondly due to its socio-economic evolution as determined by specific historical and geographical characteristics. These characteristics have

influenced the move of Wallachia's capital from Targoviste to Bucharest, transformed Giurgiu into a port for Bucharest and created distinct connections between Giurgiu and the settlements located in the northern area, on the Burnaz High Plain: Daia,

Baneasa, Pietrele, Greaca, Căscioarele and Chirnogi due to their relation with the Kaza of Giurgiu, a former Ottoman administrative unit with judicial role, which comprised the study area for approximately 400 years.

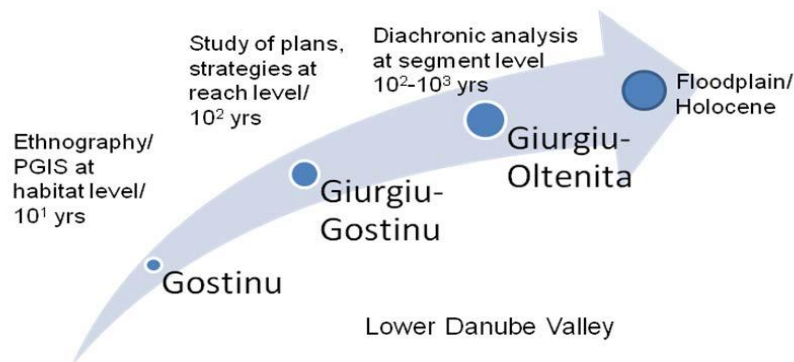


Figure 1. Spatial and temporal interconnection between the three nested study areas



Figure 2. Diachronic analysis study area – Danube Valley between Giurgiu and Oltenița

The analysis of the adaptation plans and strategies was applied to the area between Giurgiu and Gostinu, including three administrative units located in the Danube valley, which have the highest exposure to flooding in the Giurgiu county: the Municipality of Giurgiu and the Villages of Oinacu and Gostinu.

The PGIS participative mapping and the ethnographic method, which involve a situational and contextual approach at micro-scale have been used in Gostinu Village.

3. SPECIFIC OBJECTIVES

Specific objectives are:

- To identify current and past ways of interaction between the inhabitants of the Danube floodplain and their local environment and the

factors that contributed towards adjustment, adaptation or mal-adaptation;

- To estimate the impact of structural methods of protection against floods and infiltrations and the bureaucracy associated with these structural works in the Danube floodplain area between Giurgiu and Gostinu;
- To apply a detailed case study in the village of Gostinu in Giurgiu county, using diachronic analysis, ethnographic methods and Participatory Geographical Information Systems (PGIS) to identify factors that influence adaptation to flooding and infiltrations;
- To identify the characteristics of local communities and the vision of community members, regarding floods and infiltrations and explore reactions to plans to renature the Danube floodplain;
- To analyse flood protection policies and strategies at local, regional, national and international level and estimate their impact in the study area.

The research combines traditional approaches to the study of adaptation to floods based on academic research with trans-disciplinary approaches. It is using ethnography as a qualitative method that gives insights into the situational adjustment or adaptation (determined by local conditions) and PGIS, which is based on 'contextual' non-academic knowledge identified by the analyzed group and based on its collective memory.

4. SUMMARY

The PhD thesis is structured into eight chapters; the first two chapters are theoretical, while the 3rd, 4th, 5th, 6th and 7th chapters present and analyse academic and non-academic data and knowledge about the study areas, collected during the doctoral study. The last chapter is focused on conclusions.

The first chapter argues that geographers have a long tradition of generating new directions of study in the natural sciences, and geography is still considered a liaising science, which is expected to provide answers concerning nature and its natural hazards. In this regard, this chapter presents the analytical model entitled 'Hierarchical Patch Dynamic' (Wu & Loucks, 1995) applicable to riverine ecosystems, such as the Danube and developed to address the complexity specific to hazards and the lack of integration of research between the natural sciences and that of the social sciences.

The theories of the Danube Valley formation are in dispute to date and there is no study on the evolution of the entire lower valley on either the Romanian or Bulgarian sides. To address this issue the paper presents both Romanian and Bulgarian geomorphologic maps (Nikolov, 2015) of the Danube Valley segment between Giurgiu/Russe and Oltenita/Tutrakan and a map of the Holocene paleolake (Nowacki & Wunderlich, 2012) that once existed between Giurgiu and Calarasi, on the Romanian and Bulgarian banks of the river. The former Pietrele and Greaca lakes located in the study area and drained in the '60s, were remnants of this paleolake.

The information presented in this chapter advances the hypothesis that the Giurgiu - Oltenita segment of Danube Valley evolved under intense human pressure for an extended period of time and has certain morphodynamic tendencies dictated by a past that is not well known, however it is of considerable importance for the successful identification of possible ways to adapt to flooding by increasing the use of the Danube's ecosystem services.

The second chapter presents the conceptual framework, complex and comprehensive methods and indicators on risk, vulnerability and adaptation,

which were developed at a national and international level under the assumption that the 'risk society' is considered a characteristic of contemporary post-industrial societies (Beck, 1989, 1992).

A new development in this chapter is to introduce data from archives and papers written on vulnerability and adaptation during the totalitarian period, when on the one hand adaptation was imposed through five-year plans and on the other hand vulnerability was not then accepted as a concept or term in Romanian scientific circles.

Chapter 3 looks at structural methods, which reveal associations between the contexts in which water management structural works were developed, meaning that there were 'hydropolitics' (Wittfogel, 1957) at play in antiquity that have since been replicated by modern western societies in Europe and North America ('The Hydraulic West'). In socialist Romania, the 'hydropolitics' were used as a leverage to coerce the landed peasantry to accept collectivisation and as a tool to control the majority of the rural population.

Studying the evolution of structural works, such as the system of levees, canals, irrigation and drainage stations built in the floodplain, it is becoming increasingly clear that the most significant problems created are longitudinal and transversal river disconnection, high maintenance costs and their overall inefficiency. They have evolved simultaneously with drastic land use changes such as deforestation, advancement of inhabited areas, intensive and extensive agriculture, only structural methods have been designed without taking into account possible changes and reactions of the river and its floodplains.

At the Giurgiu - Oltenita river segment level, the study shows that the levees are not as well-built as authorities claim, further compounded by the lack of consideration for local river dynamics, the embedment of the river course and the drawing up of the levees without taking into account the shape of the Danube river bends, all of which can cause major losses in the area. The occurrence of a possible breach at the maximum erosion point, km 475 of the Danube, could drastically affect Gostinu Village, where houses are no longer being built on man-made mounds of earth as in previous times, the

so called traditional 'talpa' houses. Furthermore, many new dwellings have an average height of 16 m, which leaves them exposed to floods.

Chapter 4 includes the results of the diachronic analysis, which combined information provided by maps and cartographic documents, statistics, bibliographical sources with information from archives (Giurgiu County, local and regional institutions) and highlighted how untamed nature with its geographical characteristics and the political, social, cultural and environmental conditions have led to a Danubian local context of vulnerability and adaptation to floods.

Moreover, the chapter illustrates how the local inhabitants first tamed nature, then forcibly turned it to serve the needs as dictated by a range of imposed controls (fiscal, legislative, etc.) at the level of the Kaza (Ottoman Empire) and principality (Wallachia). Based on the data collected and the analyzed cartographic documents, certain thresholds with obvious impacts on the lives of residents were identified. These thresholds then determined changes and major adjustments to the newly created historic-geographical conditions, each of which time period is further defined by the pressure of leverages that the power / state institutions / bureaucracy imposed on the local communities, which over the long-term led to adaptation or maladaptation.

In the study area, there seems to be a maladaptation regarding current agricultural practices, which are no longer compatible with the present situation because land ownership has changed. During the communist regime, land belonged solely to the state, and the intensive farming practiced on the immature floodplain soil was maintained by an energy inefficient system of drainage and irrigation, which functioned with very high 'environmental costs'. At present, most landowners hold less than 5 hectares of land and are unable to meet the actual cost of drainage or irrigation.

In contrast, the transport sector has been one of the main decisive factors that has brought positive change and allowed populations to adapt. This was because the Giurgiu citadel was at the crossroad between Wallachia, the Austro-Hungarian Empire and the Ottoman territories that were situated along the Danube and the citadel was used as a harbour

for Bucharest up until the opening of the Giurgiu-Bucharest railway, in 1850. The Giurgiu harbour, the river transport and its associated activities have played and continue to play a major pro-adaptive role throughout the area of study.

The main power agents/institutional actors, which forced local communities to adjust to their requirements, expanding the agricultural land to the detriment of the natural floodplains, lakes, forests and other flooded areas, rapidly becoming owners in their own right of all unflooded agricultural land, then forcing the most vulnerable to work the newly acquired land. These power agents were a) The Ottoman Empire through the Danubian territories they ruled, which were called Raia and Kaza; b) The nobility (boyars) and the churches/monasteries from Wallachia; c) The state institutions from the pre-communist modern period; and d) The Communist Party during the totalitarian period. Bibliographic sources and data from archives show how these agents/actors have gradually seized land originally own and worked as common land (Stahl, 1969), by pastoral forest communities, 'bivolari' (trackers who used carts pulled by oxen), custom/border guards, fishermen, shepherds practicing 'trashumanta' and the nomadic Roma people (Petcut et al, 2003). These processes of change took place simultaneously with those highlighted by rural land use maps and data obtained by methods using Geographic Information Systems (GIS), allowing measurements of land-use reform over a period of time.

The way in which local residents constructed their houses in the study area and the food provided by the ecosystem services are evidence of a sustainable pro-adaptive behaviour, which formerly characterised the local communities. The three types of houses described in this chapter – the subterranean type (bordei), the 'maza' type and the 'talpa' type made of 'paiantă' (a type of cob house), which in 2014 represented 74% of the material used to build houses in Gostinu Village (as indicated by a quantitative questionnaire) are examples for other Danubian communities to follow, in order to reintroduce the employment of sustainable materials and methods. The construction of such houses would then encourage ecosystem services regeneration and recreate the specific landscape described by many authors mentioned in this chapter.

During the socialist period, local communities were forced to abruptly abandon a way of life that had been characterized by diverse ways of adaptation, in a closely coupled human-environment, at the centre of which was the individual in search of opportunities that nature provided for its benefit in a flexible way of life to a completely different way of life. This new way of life was based on agriculture practiced in CAPs (cooperative farms), IASs (state agriculture enterprises) and agricultural research stations such as ICITID Baneasa (former United Nations-FAO in the '60s) or based on employment in the industry sector requiring commute to the nearby urban areas such as Giurgiu and Bucharest. This type of development transformed the Gostinu and Oiancu villages from rural areas, which were relatively independent from institutions into peri-urban areas dependent on a large number of institutions and bureaucracy.

Chapter 5 comprises the ethnographic analysis, which shows that the period of communism, dominated by intensive agriculture and maintained by physically powerful structural works, which disconnected the natural floodplain from its river flow, did not however destroy the interconnection of Gostinu area villagers with the Danube. The local population maintain a perceived strong connection to the river, which appears as a recurring theme in the ethnographic interviews. The purpose of this chapter was to present the preliminary results of the ethnographic research in the Gostinu village.

The ethnographic method employed for this paper is that defined by the Anglo-Saxon school of thought, based on a combination of qualitative methods that involve studying without a priori hypotheses and predetermination of what will be seen on the ground and exploring and testing assumptions that emerge as a result of work on the ground. Ethnographic analysis was conducted up to the point of saturation regarding the 'modalities of adaptations' theme and used a sample of 56 informants, identified using a snowball sample method and a semi-structured interview.

The ethnography highlights that the Gostinu community members are characterized primarily by a shared collective memory, a 'repository' of knowledge in the memory of the community about the natural floodplain environment before the

construction of the un-submergible levees after 1963, the year of the last major 'zapor' (a flood due to ice obstacles in the river-course). Other relevant elements emerging as recurring themes in the collective memory are: the local custom of repairing or building houses as group work ('claca'), fishing practices, working on nearby construction sites, the construction and maintenance of levees, the drainage and irrigation system, the intensive farming which begun with the establishment of the cooperative farm (CAP), the collapse of the irrigation and drainage system in the '90s, the influx of poorer inhabitants from the Moldova region, the phenomenon of soil patchiness allied to the variety of soil types, infiltration, excessive humidity, 'the principle of communicating vessels' and interconnectivity with nature – 'El Danubius' is personified and is seen as an 'agent' (Giddens, 1984). As people are 'agents' acting on nature, nature has her agency as 'El Danubius'. To the contrary, the river is not perceived by the local population as an object / phenomenon for control by humans (Steinberg, 2000).

The semi-structured interviews showed that institutionalization created the dramatic transformation of the Gostinu village area into a 'hybrid' (Escobar, 1999) environment, but also caused the transformation of the villagers from predominantly fisherman to farmers. The evolution of Gostinu village was determined by the existence of an over-riding dominant political and institutional framework (pre-socialist, socialist, post-socialist and transition), which has evolved in a way not seen as distinctly in any other part of the floodplain.

The local ethnology is rich in symbols that reinforce the hypothesis of interconnectivity between man and its environment and the existence of rituals aimed at protecting and strengthening the community, protecting the most vulnerable (children under 12) by symbols that are found as recurring themes especially in patterns/techniques used for everyday clothes, functional household objects, quilts, carpets, reed woven objects and wooden carvings decorating the 'talpa' traditional house.

Locals inhabitants have values that show a pro-adaptive behaviour and local knowledge, folklore and symbols have guided their life as a whole for the period up to 1989.

Contemporary ethnographic research on human-environment relations regarding flooding in the Lower Danube is noticeably scarce. This chapter aims to explore the 'hybridization' (Escobar 1999) of the floodplain by exploring the human-nature-technology connections and to what extent the local floodplain inhabitants have adapted, adjusted or even regressed as a result of the excessive use of technology.

In conclusion the chapter on ethnography shows the numerous advantages in using mixed qualitative-quantitative methods and geography-anthropology interdisciplinary approaches, which complement each other to produce a fuller image of the dynamic evolution of an area, dynamism due to natural, cultural, institutional, social and economic transformations.

The purpose of the 6th chapter was to present the PGIS research field (Participative Geographical Information Systems), a domain linking GIS with the critical geography thinking and based on the implementation of participatory research methods. PGIS mapping was augmented with data obtained through ethnographic interviews, field research and participant observation.

Research has shown that using trans-disciplinary methods has considerable potential to bring very valuable information in one place and only information relevant to the communities studied, which collaborated in the research process. The PGIS has been used to: 1) Re-create the flood of 1963, 2) Identify the areas of water infiltration and the documentation of the 'communicating vessels principle'; and 3) Use geo-tagged photos with embedded GPS information to record the characteristics or changes in the ROSPA0090 - Ostrovul Long Gostinu - part of the Nature 2000 Network with help from local residents.

The role of PGIS was to increase the capacity of locals to visualize and understand spatial information about their community, which might help them find appropriate ways of adapting to infiltration affecting 30% of the arable land of the village. The PGIS process has brought together different generations, experts and non-experts to facilitate an exchange of information and learning about former adaptations, about past mistakes that should be avoided in the future and in this way create a collective spatial data-base and enrich the collective memory of Gostinu's inhabitants.

Chapter 7 gives evidence that flood risk has been effectively managed in the past, even though this was not achieved by using integrated and coordinated methods in an institutionalized manner as in the present period. Numerous archive documents prove the existence of adaptation strategies for flood risk management and show that as the Danube floodplain develops, the destruction caused by floods increases. Pre-communist communities accepted floods as part of the cycle of nature, just as they perceived their entire existence was dependent on such natural phenomena.

Adaptation strategies were present in three basic forms: (a) implementation of structural methods using the technology available at the time, taking into account the financial feasibility of such protection measures, given that absolute protection cannot be obtained due to prohibitive costs; (B) living with floods; and (c) options for withdrawal or relocation from areas more exposed to less exposed to flood areas, aimed at correcting a incorrect type of adaptation for the floodplain and its future development.

All three types of strategies have been used at one time or another in the Danube floodplain. Among the first measures of structural protection were those built by the Ottomans in the XV-XVIII centuries in the cities of Vidin and the first dyke for the protection of Giurgiu town, built in the nineteenth century.

The plans and strategies for adaptation referred to in this study have been presented chronologically and analyzed based on the context of time, starting with 1830, the beginning of the modern age in the area under study and ending with the most recent plans or strategies for flood protection developed as a result of the implementation of the Flood Directive no. 2007/60 / EC transposed at national level by the 'National Strategy for flood risk management for the medium to long term 2010-2035'. Once becoming a member of the European Union Romanian authorities have been under pressure to designate areas for water retention such as ponds, swamps and lakes and to renature parts of the Danube Green Corridor. For these reasons civil society, international organizations such as WWF, local NGOs (e.g. Living Danube) and some government authorities would appreciate the implementation of non-structural measures for flood

mitigation rather than excessive reliance on structural measures and a greater accountability on the part of the private sector for losses due to flooding.

The 7th chapter highlights that most Romanians consider as unjust the transfer from state to individual responsibility for losses due to flooding because: (1) The phenomenon of flooding has increased due to the implementation of structural protection systems in all countries of the Danube basin; (2) The habitats of the corridor no longer produce ecosystem services (fish, shells, reeds, clay, sand and other materials needed for building the traditional 'talpa' houses, etc.) and (3) The aging of rural Danube population in the study area and the fact that Giurgiu county is among the counties with the highest poverty index (Sandu, 2011).

5. CONCLUSIONS

The capacity of adaptation and the adaptability have a multitude of meanings and take place in an independent manner, directly or indirectly as a result of policies / strategies or plans. The paper attempts to argue the hypothesis that emerges as a result of the research methods used - a rural area such as Gostinu has a high potential capacity to adapt in a way in which people achieve a decent standard of life while 'living with floods'. Rural areas such as Gostinu may be considered social systems interacting and relying on an ecologic substratum, whose survival depends, among others on its interrelations with the indigenous natural resource system. The environment and its natural resources depend on the actions of the local population. Consequently, the Gostinu rural area may be considered a socio-ecological system and the areas such as Gostinu that still benefit from the services provided by the Danube ecosystem are centrally vital to the regeneration of these services.

In the conclusion chapter (Chapter 8) are presented the general factors that encourage specific adaptive interconnected life systems, which are coupled to the environment: 1) the habit of living with changes and uncertain situations; (2) the promotion of diverse ways of adaptation and resilience; (3) the importance of collective memory and combining different types of knowledge; (4) creating opportunities for self-reliance,

self-organisation and taking responsibility in reconnecting with nature through a way of life based on regenerating ecosystem services, which in the past kept the local Gostinu villagers deeply interconnected with their environment.

The thesis highlights the existence of a Danubian contextual framework regarding vulnerability and adaptation. Reconstitution and understanding social communities based on data recorded chronologically can be viewed from several angles, but this study has chosen to focus on identifying dynamic elements, such as the activities of studied communities influenced by both natural and human factors with access to knowledge or power, political pressures, the influence of bureaucracy, the evolution of vulnerable groups and communities over time, with the major factors that have led to adjustment and adaptation at national, regional and local levels. The hypotheses that emerge are valid for the Danubian context of the communities under study, without a major potential for generalization.

The paper finally concludes that the issue of adaptation is highly sensitive due to the methods of adaptation being heterogeneous and that there is always an initial resistance against them and confusion because 'communities hesitate between adaptation dictated by the past and what is prefigured in the future' (Heller, 2000, p 9). Also because the institutions, which are created to assist people in adapting do not bring adaptation independently, adaptation is formed in an inconsistent way being influenced by connections created at contextual level, under the influence of socio-economic conditions and local cultural conditions favouring certain adaptive behaviours and attitudes.

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Famine, the last act?

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Abstract. Dessalegn Rahmato contends that “Famine is the closing scene of a drama whose most important and decisive acts have been played out behind closed doors.” This paper will critically analyse this statement and evaluate its implications for humanitarian response and intervention. The work is structured as follows. First it will look at different interpretations of famine. Next it looks at systems theory as a base for a framework that it will employ in the analyses. This framework is made up of three types of “doors”: the governmental doors, the private doors and the NGO’s doors. The paper will look behind these doors and see if the decisions taken there have indeed led to famine being the closing scene of a drama.

Keywords: *famine, transparency, state, private, NGOs*

1. INTRODUCTION

Authors define famine in various ways. For some (Svedberg, 1995) it is the extreme form of general endemic hunger. Traditionally, hunger, or under nourishment was the ratio between food intake and food requirements. Although useful, this ratio is debatable because the level of food requirements varies with age, sex, physical activity and climate. Famine does not have one unique set of characteristics. This lack of uniqueness is linked with the concept of entitlement which is “the set of alternative commodity bundles which a person can command” (Dreze *et al.*, 1995). Specific situations with a specific constellation of economic, political, cultural, and social relations determine this set of “alternative bundles” which in turn determine the likelihood famine. Sen’s notion of entitlement seems quite similar to what other authors call resilience (Wisner *et al.* 2004; Cardona 2004). The fact that, in his view, the opposite of entitlement is “vulnerable groups” might further stress this argument. This variability of entitlement or resilience owing to complex economic, political, cultural, and social relations makes famine contextual and specific.

Keen (1994) also discusses this view (Dreze *et al.*, 1995) according to which famine is the result of economic, political, cultural, and social relations. The author reveals the different interpretations of famine over the years. They range from the event interpretation; “a terrible event that descends on particular societies from time to time and yields a number of unfortunate victims” (Keen, 1994), to famine as a complex economic and political process.

Keen’s (1994) contribution is that by holding this view of famine as a process he can also show that there are beneficiaries of famine. Focusing on the victims will only offer us a part of the picture. Famine is a process in which a section of the community gains and another losses. We later come revisit this idea. Another key point to be made about famine is the apparent paradox between how much food the world produces (i.e. enough to meet everyone’s food nutritional needs) (Shaw, 2001) and the fact that there are countries such as the Democratic Republic of Congo (DRC) where about 70 percent of the population is undernourished (GHI, 2011).

Here we find two of the points mentioned above that will further guide this analysis: (1) famine as the result of a constellation of economic, political, cultural, and social relations, and (2) famine as a process in which some stand to gain.

2. WHOSE DOORS?

One way of grouping the various actors that impact famine, in one way or another, is via the sector approach which categorizes the actors as being part of the public sector, the private sector, or the third sector (generally the NGOs). The boundaries between the sectors are sometimes quite blurry (Defourny, 2001) but even with this limitation they can still prove useful in this analysis for they will offer a wide image of who makes decisions that lead to hunger.

These sectors are not independent. The crucial aspect here is to understand how complex systems work. The central idea in complex systems theory is that everything is inter-connected with everything and that even minor variations in one of the subsystems can reverberate across the various linkages to other subsystems thereby making the entire system alter its state, sometimes in drastic, highly visible ways (Hillhorst, 2004). Therefore the governments', the companies' and the NGOs' decisions (even though they will be analyzed separately) are all inter-connected.

3. PUBLIC SECTOR, NOT SO PUBLIC

"Humanitarian crises do not exist! There are only political crises that have humanitarian consequences" (Vidal, 2001).

The impact of governmental or state decisions on the well-being of the populace is something that is constantly debated (Bricmont, 2006). This paper will now try to see if it can identify instances where the state has taken decisions behind closed doors that led to famine. The "closed doors" concept essentially means that the decisions were not taken after a transparent process of deliberation but were taken by a powerful few, usually in secret, and later imposed on the populace (Reltien, 2001).

States use hunger as a weapon. They do it internally, at the expense of their own population (Rubin, 2001), and they do it externally at the expense of other countries populations (Bricmont, 2006). There are a number of reasons why states would allow or even aid the process of famine unfold within their jurisdiction:

One is to save face, to show to the world that the state can manage and that it does not need help. When this is the case the state tries to conceal the famine through various means such as preventing the movements of populations and keeping them in a situation of internal displacement. "Famine denied is famine concealed" (Vidal, 2001). For examples of this kind of state logic one can look at North Korea (Reltien, 2001), DRC (Vidal, 2001), or Abkhazia (Sanchez-Montero, 2001).

Another is to disenfranchise certain ethnic/political/social groups that are perceived as enemies. An example of this is the Serbian authorities' control of essential food and non-food items within Kosovo in the late '90s (Mason and Ogden, 2001).

One other reason why states allow famine to occur in their territories is a combination of ineffective policies. By far the worst example of this is the Great Chinese Famine of 1958-1961. Mao's desire to rapidly industrialize China through the Great Leap policies helped create this crisis but also caused delays in response owing to politically motivated exaggerations of local harvest size. The resulting famine killed between 15 and 30 million people depending on the source and quality of the statistics (Xizhe and Zhigang, 2000).

Denying famine to save face, disenfranchising certain groups or implementing ineffective policies are just some of the reasons (interconnected most of the times) why states allow or even encourage famine within their boundaries. For humanitarian interventions these governmental motivations pose a number of challenges. One of these challenges has to do with the fact that humanitarian intervention is ideally based on the principles of humanity, impartiality and independence (James, 2008). When the North Korean government accepts aid that it believes to be humanitarian (i.e. not subject of conditions which are interpreted as political) it puts a major constraint on humanitarian aid because it channels it through the state apparatus thereby making it lose its independence (Reltien, 2001).

States encourage famine in other states. Whenever power is exercised over others there needs to be a justifying ideology. "That justification almost always comes down to the same formula:

when a exercises power over B, he does so for B's own good." (Bricmont, 2006) Interventionist policies are labelled as humanitarian interventions. There are two divergent views regarding these so called humanitarian interventions. The first relies on a Kantian argument essentially arguing that it is a strict moral duty to intervene when fundamental human right are violated. In other words if one is recognised as a person, that demands that we respect this person as an autonomous source of value. This is a duty of justice (protecting the victims and coercing the wrongdoer) and not to be confused with a duty of charity. Failing to fulfill this duty (i.e. neutrality) is therefore morally culpable (Bagnoli, 2006). If one holds this view he or she can assert that military intervention by a country in another country is humanitarian intervention because some person's human rights were being violated in the latter.

However, if one looks at former (and current) interventions the human rights argument used to substantiate them seems to lose some of its strength. In 1979 Nicaragua, the Sandinistas came to power and abolished the death penalty, built two thousand schools, introduced free education and health services, reduced infant mortality by a third and eradicated Polio. This was a Marxist-Leninist subversion for the US who after relentless economic pressure and 30.000 dead finally brought democracy to the country (Bricmont, 2006). This "humanitarian imperialism" has started wars that have killed millions in Korea, Indochina, Central America, and Iraq. To the death toll one should also add the victims of the superpowers protégés: Pinochet, Suharto, Mobutu; the Brazilian, Argentinean, Guatemalan military regimes; and, the rebel groups in Angola and Mozambique (Bricmont, 2006).

More recently an epidemiological study (Roberts, 2006) found that about 100.000 excess deaths have happened since the 2003 invasion of Iraq. The purposes of an army are to defend its country or to attack others. Neither of these aims is altruistic. An army's equipment, training and, above all, mindset are designed for these aims (Coleman, 2011). Yet "international political agendas are cloaked in humanitarian vocabulary" (Reltien, 2001).

Another way that states can intervene and create hunger within another state is through the use of embargoes. Embargoes are the prohibition of imports and exports from and to another country. Article 41 of the United Nations Charter recognises them as an international sanction. The flaw is in the very essence of an embargo: it uses economic constraints that cause human suffering for political objectives. This hardly ever works because the regimes chosen for destabilisation are usually strong ones that weren't responsive to popular opinion even before the embargo started. The disrupted economy that it creates is dominated by criminals and the black market which also destabilizes civil society so the popular revolt that was hoped for becomes less likely. So if embargoes do not bring about political change and cause massive human suffering why use them? The usefulness of these sanctions seems to lie not in what they can achieve abroad but what can they achieve at home. It is the message that matters. Embargoes are therefore a symbolic condemnation used for domestic political ends (Coti and Wipff, 2001).

It seems then that states encourage famine in other states under the auspices of humanitarian intervention. This poses a number of issues for the second wave of humanitarian intervention, that of the NGOs. The scenarios are infinitely complex but for the purpose of this paper only the implications of military intervention and embargoes addressed earlier will be discussed in relation to NGO humanitarian intervention.

Military intervention impacts the NGOs in two distinct ways. The first is that it forces the NGOs to make a choice regarding how much they are willing to cooperate with the armed forces. Here organisations can be placed on a continuum, from organisations that actively collaborate with the occupying forces to ones that value neutrality but may consider accepting limited assistance to the ones that consider even limited interactions as a threat to their neutrality (James, 2008). The second impact is that military intervention creates a very dangerous work environment for the humanitarian worker because of the perceived association between him and the attacker.

Embargoes put pressure on NGOs intervention from both sides. First because they have to apply for

permission to the sanctions committees (which are overwhelmed with applications) and they can only get a limited number of supplies that are essential for the population's survival. Secondly, and perhaps more important, is that the regime in the embargoed country is likely to be granted monopoly over the distribution of the food items. This further empowers them and represses their opponents who now have to spend their energies in trying to survive (Coti and Wipff, 2001). An example of using food supply for political reasons on a massive scale is the Ukrainian Holodomor of 1929-1933 which killed a minimum of 2.2 million persons (Mesle *et al.*, 2005).

This paper has so far looked at how decisions taken by the state lead to famine. The desire to save face or to disenfranchise certain ethnic/political/social groups, bad policies or any combination of these factors (and many others that owing to word count constraints are not discussed) can create famine within the country. Military intervention justified with humanitarian arguments and branded as such, as well as embargoes, are another group of governmental decisions that create famine, this time, in another country. Again, any combination of factors/decisions is possible; the important issue is that the hungry did not have a saying in any of these instances.

4. MAXIMISING PROFITS

The paper will now look at the second sector (the businesses or the for-profit organisations) and how decisions made behind this sectors' closed doors have led to famine and suffering. It will also examine how this impacts humanitarian intervention. Unlike political decisions that have numerous inter-connected reasons behind them the decisions made by for-profit organisations have a central, built-in motivation: money. So instead of discussing the motives (as was partially done above) the paper will now focus on the ways in which for-profits can benefit from famine.

The first way of profiting is by using violence induced famine to drive out large populations from a certain area in order to gain control of that land. Land can be valuable in itself (arable land), because of mineral deposits (Sierra Leone) (Lefort, 2001) or

oil deposits (South Sudan) (Keen, 1994) or any other resources. Support for the creation of famine on the part of large corporations looking to secure their rights of exploitation has been widely alleged. An inferential argument could be made by looking at Angola. When Jonas Savimbi, leader of the rebel movement for 27 years died (public opinion regarded this as the end of the conflict there) the stock markets reacted negatively. After the ceasefire there was "a significant decrease in the returns of diamond mining companies operating in Angola" (Guidolin and La Ferrara, 2005). In other words the markets correctly knew that peace would reduce profits.

Farmers in powerful countries also benefit from famine in another country. The farmers put pressure on their government. The government uses its power within the World Trade Organisation, the International Monetary Fund or the World Bank and penalises farming subsidies in another country. Food is then imported from the powerful country in the form of tax-exempt food aid (Sanchez-Montero, 2001).

Creating, or simply declaring a famine gives the powerful few in that country access to the distribution of food aid that they know will come (IFRCRC, 2003). In 1998, Gennady Kulik, then Russian vice-prime minister of agriculture, negotiated food aid with the European Commission and the US. Soon after the preliminary agreement with the US, Kulik announced that one of his known associates' firm will act as intermediary thereby receiving a 3 percent commission (Littell, 2001).

Famine facilitates slave trade and ownership. The link is not causal but supportive. Two scenarios are common, the first more than the second. The first is where famine brings desperation and makes the affected take on supposedly paid jobs far away from their village. They depart with people they have never seen before and do not know where they are going. Once they get there, they are informed that if they try to leave they will be killed or tortured. They are now slaves (Bales, 2010). The second scenario is one in which famine pushes populations; it displaces them, making them more vulnerable in the face of captors. In the late 80s in Sudan almost every household fleeing the south had had one family member captured (Keen, 1994).

There are about 27 million slaves in the world today. The price of a human being has averaged 40,000 adjusted dollars in the last 4000 years. Today the average price around the world is 90 dollars. The 27 million generate about 40 billion dollars every year in to the global economy (Bales, 2010). The people making this money have no interest in alleviating famine as this supplies them with cheap human beings.

Another way, in which famine can make a profit for some, is by allowing these to “force the market” (Keen, 1994). What this means is that if a population has some material assets (e.g. livestock), it is forced to sell these at incredibly low prices compared to pre-famine prices. The buyers gain capital and when the next famine happens they are in an even better position to control the market. The affected become more vulnerable not only because they now have less livestock but also because they have lost social capital (i.e. it is harder for them to borrow from neighbours or friends because the latter know the chances of repayment are slim) (Keen, 1994).

So far this paper has examined five ways in which for-profit organisations can gain through hunger. Drive out populations to secure access to resources. Export food disguised as food aid. Be in charge of food aid distribution. Buy or steal human beings and turn them in to slaves. Force the market so that the hungry sell their assets cheaply.

Two points could be made at this time. First, these decisions are not disparate. The methods might differ but the goal is the same: use famine to make money. Second, these decisions do not happen in a vacuum, they are taken in collaboration with first sector actors (people in political power).

The degree of collaboration varies from bribing the local police chief to financing political campaigns (Baye *et al.*, 1993; Austen-Smith and Wright, 1994).

5. NGOS ALSO HAVE DOORS

In very simple terms the humanitarian organisations receive money or other resources from donors and then use these to aid their beneficiaries. Two potential issues can be observed when analysing this system, both of which have power at their centre.

The first potential issue is corruption as defined by Transparency International (2010): “the abuse of entrusted power for private gain”. Focusing only on corrupt politicians and businessman makes us forget that NGOs receive and spend considerable amounts of money under very light regulations (when compared to their first and second sector counterparts) (Trivunovic, 2011). Corruption undermines the programmes’ objectives by diverting funds or through abuse of power. Corruption also leads to an overall decrease in support for aid in general and makes the donor agency lose some of its authority in the face of government partners that it wants to convince to implement anti-corruption mechanisms (Trivunovic *et al.*, 2011). All of these effects reverberate and make hunger reduction less likely. The private gain does not necessarily need to be financial. A report commissioned by UNHCR and Save the Children UK concerning West Africa refugees in 2001 contained “allegations against 40 agencies and 67 individuals, with evidence of extensive sexual exploitation, mostly involving locally employed humanitarian staff trading relief items for sex with girls under 18” (Transparency International, 2010).

The implications for humanitarian organisations are extensive. One way of visualising them is through the alternative responses, or options, that these organisations have available: reputational risk vs. open discussion, too many vs. too few controls, urgency vs. prudence, pressure to spend vs. getting things right, local empowerment vs. standardised procedures and controls, inclusion vs. exclusion targeting errors, transparency vs. staff and aid recipient security, information-sharing vs. legal and liability issues (Transparency International, 2010).

The second potential issue is donor pressure, or power, and the NGO behaviour it generates. Two points can be highlighted. First, the liberal view is that the more NGOs there are the more robust civil society is (Mercer, 2002). The issue with this is that having more NGOs in one sector (e.g. food aid) also increases uncertainty, competition and insecurity for all the organisations in that sector. Second, the use of competitive tenders and renewable contracts creates incentives for NGOs to act more like firms (Heggstad and Frøystad, 2011). In Kyrgyzstan, contracting INGOs relying on one-year renewable contracts

downplayed government subversion of economic reforms, tolerated bureaucratic opportunism, and withheld information about ineffective projects (Cooley and Ron, 2002). This is not about normative agendas or morality it is about dysfunctional organisational behaviour as a rational response to institutional pressures.

6. CONCLUSIONS

By looking at famine as the result of a constellation of economic, political, cultural, and social relations, as well as a process in which some stand to gain this paper has analysed Dessalegn Rahmato's assertion: "Famine is the closing scene of a drama whose most important and decisive acts have been played out behind closed doors."

Some governmental decisions, made behind closed doors for political/economic gain, impact famine within that country as well as in other countries. Denning famine, disenfranchising groups, bad policies, military intervention, and embargoes all seem to be decisive acts that lead to famine.

For-profit organisations sometimes make decisions that benefit them at the expense of the vulnerable and poor. From violence used to secure access to resources to more complicate schemes involving organisations such as the World Bank, an organisation that has only had American presidents (Worldbank, 2012), for-profits engage in actions that appear to play a decisive role in the existence of famine.

Some third sector organisations abuse their entrusted power for private gain at the expense of their beneficiaries as well as the expense of other organisations who now find it harder to attract donors. Finding donors was hard to start with and the result of this competition is a dysfunctional organisational behaviour that focuses on the organisations' well-being as opposed to that of the beneficiaries. Corruption and withholding information about projects effectiveness, inter alia, are important acts that seem to make stopping famine harder.

All of the decisions discussed so far happened "behind closed doors" (i.e. not taken after a transparent process of deliberation but taken by a powerful few, usually in secret, and later imposed on the populace). All of them have worked against the

vulnerable and hungry. It would seem that for the most part Dessalegn Rahmato's assertion is correct.

From the point of view of the person that has just died of hunger, famine is undoubtedly the closing scene and Rahmato illustrates that with sensibility from this author's perspective. From a wider point of view, however, the "closing scene" construct is debatable. If one links Keen's (1994) and Hillhorst's (2004) views mentioned in the beginning of this paper according to which famine is a complex economic and political process on the one hand and that systems have highly complex linkages that allow for minor variations to alter the system on the other it becomes hard to justify why famine is the "closing scene" as opposed to a process interconnected with other processes all of which are ongoing and constantly changing state. Although using a theatre play as an analogy is revealing in that it illustrates how previous actions have created the potential for the closing scene it is limited because after the closing scene there is nothing. The actors are applauded and they go home.

As discussed in this paper famine changes the power structure by making the vulnerable more vulnerable and the rich and/or powerful few more rich and/or powerful. From a systems thinking point of view this change should reverberate across the system with potentially massive effects for all subsystems (countries, companies, people, environment, NGOs, etc.) Seen like this, famine therefore becomes another act in a larger play which has yet to finish.

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GeoPatterns

Space and time visualization book

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Abstract. This contribution aims to present a recently finalized book on digital “Space and time visualization” of cultural heritage: buildings and landscapes. The book is currently in press (in July 2015) at Springer Netherlands.

Topics of the contributions include:

- Network analysis of heritage architecture
- Historic cartography investigation of lost landscapes
- Digital cartography
- Digital landscape architecture techniques
- GIS representations, including of natural hazards
- Computer aided priority setting of risk mitigation on cultural artefacts
- 3D modeling of historic sites affected by natural hazards
- Virtual reality robots
- Digital building survey
- Virtual architecture design studio
- Essays on digital archives and media architecture
- Review of digital art conservation

Authors are from 3 continents, including countries like USA, Sri Lanka, Italy, Switzerland, Greece, Germany, Romania.

Keywords: *digital methods, landscape, architecture history, natural hazards*

1. INTRODUCTION

NeDiMAH (Network for digital methods in arts and architecture) is a Research Networking Programme co-funded by the European Science Foundation in which the first author was steering committee member. The idea of the book (Bostenaru Dan and Crăciun, 2016) started with the NeDiMAH workshop (Bostenaru Dan, 2012) in Bucharest in 2012, but at the end contributors from all over the world were invited to present their ideas on “Space and time visualization”. Some of the experts abroad were involved as reviewers. This workshop reunited participants from two working groups of NeDiMAH, namely “Space and time” and “Information visualization” hence the title of the book. Since the 2012 NeDiMAH workshop in

Bucharest took place in the Centre for Architectural and Urban Studies, the introduction of the book presents the history and architecture of the building in which it functions and its today use as venue for research activities. The preface of the book is written by the secretary general of the centre.

The conclusions show the way research in Romania can be linked with research worldwide. They also offer a view of relevant past and future conferences, and of entrepreneurship programmes, thus laying out a perspective for future work.

Contributions in the book are based on cooperation with scientists from Karlsruhe, either featuring the approach in Germany, where digital humanities are much better represented and build a field of study. For example, Karlsruhe hosts a unique museum in the world for digital art (ZKM,

Centre for Art and Media), and this field was not so well represented in NeDiMAH as humanities. In this sense the book closes a gap. Architecture is also a part of art, since the home university in Romania, dedicated to architecture and urban planning, was classified as university of arts, and the book aims to underline the contribution of architecture, urban planning and landscape to humanities, either as architecture history or digital landscape. In a context in which virtual reality labs are created all over the world, analysing Karlsruhe gives an overview of their economic efficiency. Looking at the other institutions we observe that authors represent the state of the art in these fields in many parts of the world. Especially for urban planning, GIS is a field of interest, and limits and possibilities of its employment are identified. This served the postdoctoral project (Bostenaru Dan, 2015) of the first author which aims to go beyond GIS in working with maps. Except GIS, cartographic material is being considered for investigation of space and time in digital landscape, in the somewhat niche field of landscape history.

This year (2015) at the 300th anniversary of the city of Karlsruhe (Stadtmarketing Karlsruhe GmbH KA300, 2015) the mentioned Centre for Art and Media prepared a programme with a strong component of digital art (Globale). One of the contributions in the book (e-installation) will have an exhibition starting September 4th. We hope that the book will also be dedicated somehow to this anniversary.

2. STRUCTURE OF THE BOOK

The book is divided in 6 sections, to which the mentioned introduction on the framework of the project and some concluding remarks come. The first three sections deal with the fields covered by the book:

- Digital landscape
- Digital art history
- Digital art

The other three sections are dealing with thematic issues. Two of them are dedicated to visualization and the way the 3D real artifact comes into the virtual world, namely:

- Virtual reality
- Virtual recording

These two sections refer to two aspects covered when dealing with digital methods in architecture, urban planning, landscape architecture as arts in general. First for virtual preservation the building has to come into the computer, for which different virtual recording means are evaluated in papers, such as remote sensing and development of photogrammetric methods with of recorders which are different from laser scanning. The potential of Structure for Motion is shown. This is also the subject of the mentioned exhibition. Once reconstructed, based on reality or on information in the archives (similarly to what the landscape archives showed previously), the architectural, artistic or urban objects can be represented in virtual reality. Two essays in the section “digital art history” were dedicated to what archives mean for buildings and urbanity respectively, both drawing on experience of the authors with the virtual.

The last section is a special field, namely digital representation of hazards. This connects to the postdoc project on digital means for analysis and representation of the impact of hazards, and looks thus critically to GIS as alternative to other methods which consider the scale difference between urban scale and building scale.

3. SELECTED PAPERS

The second author authored a paper in the first section, on a project called “Lost gardens”, an overview of the cartographic representation of lost green spaces in Bucharest. This way the change of function over time from unconstructed to constructed space can be followed and mapped. The paper is well integrated within the section and the other works, particularly with the one on “Lost landscapes” which did a similar analysis for disappeared landscapes such as islands, forests, and cities across the whole of Romania.

The first author wrote two papers and a review. The review refers to a European project on “Digital art conservation”, to which a separate book volume was published two years ago. The project had as partner the mentioned museum of the Centre of Art and Media. The review is part of the section of Digital art along with a paper dealing with media architecture/media facades, presented at the

NeDiMAH workshop in Bucharest. The articles refer to the subject of disasters. One of them shows the perspective background for photogrammetric measurement and a Structure for Motion programming approach for recognizing the structure of a building on which it can be built when assessing its vulnerability in earthquakes, a more detailed method than Rapid Visual Screening (FEMA, 2015). This paper is included in the section of virtual recording, along with two papers dealing with GIS, one of them presenting the limits and possibilities while the other connects GIS to remote sensing in modeling of waterways in Sri Lanka. The other paper shows the detailed assessment of this vulnerability in three cases: employing a structural mechanics method called DBELA (Glaister and Pinho, 2003) (Borzi et al, 2008), GIS statistics, or a combination of urban scale and building scale approach with so-called macro-elements (Lagomarsino, 1998), which are repetitive elements describing the behaviour of a building during an earthquake. Such macro-elements are also a good basis to solve the digital connection of 3D CAD Modelling and GIS as aligned with the postdoc scope, being able to build a library of digital building elements. This paper is included in the final section on digital representation of hazards along with a paper presented at the NeDiMAH workshop in Bucharest with GIS employment for simulating dam breaks. This way the dimension of water related hazards is put in dialogue with the geo-hazards represented by earthquakes.

4. SOME CONCLUSIONS

The book tried to show how architecture, urban and landscape design can be seen as a branch of digital humanities and digital arts, depending on which theoretical perspective of the practical/creative process one chooses to employ. In this context, Romanian efforts were placed in the field of global ones. This way the lessons go over the timely limited efforts of the NeDiMAH network and show a way to the future, on what can be learned and what can be shared, what can lead to a spin off from universities into practical applications, from which the museum side seems the most promising at the moment, an example being given.

The book covers some of the topics of the conferences such as:

- the study of landscape over time using historical data sources, through the first section on digital landscape architecture which shows a view on space and time in landscape architecture;
- Remote Sensing and GIS for risk monitoring and the management of cultural resources in both sections of virtual recording and the one dedicated to digital representation of hazards;
- the reconstruction of historical landscapes, in the virtual reality section with the paper on pre-earthquake Lisbon and with a view in the conclusions to connected endeavours in organizing future conferences;
- finally Tools and ideas for creating a platform to share knowledge and data, since the outgoing point of the book is the NeDiMAH network, which aimed at three key outputs: 1. A map visualising the use of digital research across Europe; 2. An ontology of digital research methods; and 3. A collaborative, interactive online forum for the European community of practitioners active in this area. The book contributed to 1. and 3, to 1. through putting Romania on the map of digital research (NeDiMAH, 2015), and to 3. by contributing to organization of events during and beyond the network.

Efforts for a book launch are ongoing. Other launches will follow at the Romanian School in Rome and at Karlsruhe Institute of Technology.

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“Science is the millennial endeavor to identify the underlying patterns that form our world and explains the interconnectedness of the natural and social systems.”

