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The Methodological Contribution of the New Geographic Technologies to the Study of International Migration

Petru Daniel MĂRAN¹

¹ Babeş-Bolyai University, Faculty of Geography, Cluj-Napoca, ROMANIA

E-mail: petremaran@yahoo.fr

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ABSTRACT

Migration in general and especially the international economic migration is a factor of vulnerability affecting the rural mountain regions. Geography brings a significant contribution to the understanding of the phenomenon of migration and the geo-technologies allow complex quantitative analysis, highlighting the causes and consequences of migration to and from the rural regions. The present study aims to propose a working methodology for the spatial analysis of the phenomenon of migration in the regions of origin and destination of the migration flows. The proposed research methodology is illustrated by applying it to the two geographical regions studied: the Historical Maramureş (Romania) and Castilla la Mancha (Spain). The Geographical Information Systems analysis allows the outlining of the proposed responses to a series of questions on the origin of migration, dispersal, dynamics and impact of these flows on the geographical space. The technology used is ArcGIS Desktop, one of the most comprehensive Geographical Informational System platforms, which facilitates the spatial database, data representation and geostatistical analyses. The spatial models resulted allow a better understanding of the migration trends and answer the questions generated by the complex social and economic phenomena from the rural space.

1. INTRODUCTION

The mobility of population has diverse implications in society and a major impact concerning regional development. The scientific research of the population migration and especially international migration has enabled the development of complex demographic social and economic models. The methodological and theoretical evolution which founded the study of the migration phenomenon was marked by the important contribution of geography. The purpose of geographic research regarding the mobility of population is to answer a series of research questions using the specific methodology of this discipline.

The objective of the present study is to propose a work methodology for the value of data sources necessary for achieving a scientific research concerning

the transnational migration from Maramureş (Romania) to Spain, through geospatial technology. A first specific objective is to create a database by using the Spatial Data Infrastructure of Spain.

A second specific objective is the presentation of a work method that employs the ArcGIS technology in order to optimize the fieldwork and surveys that hold as purpose the collecting of data for the study of international migration.

2. THE ISSUE OF MIGRATIONS RESEARCH AND CURRENT TRENDS FROM A GEOGRAPHIC PERSPECTIVE

The first great geographic contribution to the study of migrations is that of the geographer E. G. Ravenstein (1885) which lead to the emergence of gravitational models. Each theory developed later tried

to answer a series of questions that could not find answers in previous paradigms. The complexity and diversity of questions on migration originated in the multiple facets of a phenomenon as complex as the migration of people. The main stages that followed after the theory of gravitational models were: the development of push-pull models, the theory of neoclassic economy, the new economy of migration, the segmentation of the workforce market, the centre-periphery models, the theory of migrating networks, the cumulative causality theory, the systemic theory and the approach of migration as a transnational phenomenon [2], [3].

Currently there is no overarching theory of the complex phenomenon of migration, being indicated that any study of this area of research is to review the phases taken already, highlighting the advantages and disadvantages of each theory. The current methodologies are generally complex and approach simultaneously several aspects of migration, this mainly due to the involvement of specialists from many fields, in such research, the most represented being generally the social scientists.

The grouping of researchers in multidisciplinary teams to access funds allocated to research projects of international migration is a strategy that is largely due to the fact that there are some difficulties characteristic for the study of migrations. Out of these difficulties, beside the complexity of the studied phenomenon, one can notice: the lack of a universally accepted theoretical and methodological framework, the high costs required by field trips for transnational studies, the lack or high cost of data, the complexity of current methodologies and the specialization of researchers only on certain aspects related to migration.

The role of geographers within these multidisciplinary teams is given by the increased importance that spatial analysis of migration and the impact of the mobility phenomenon hold on a territorial level. Also, another important factor of the involvement of geographers in the study of migration is the territorial planning and the management of important resources in regions where there are rapidly growing immigrant communities. The advantage of geographers within multidisciplinary teams is given by their ability to operate with variable analysis scales, starting from a supranational level down to a local level.

The main questions regarding migration, that geography can provide an answer for, are: where migrants come from, how they reach and where the main immigrant communities are localized. Along with queries that give the main directions of study there are many other questions that allow a deepening and diversification of the research. The geo demographic analysis must be completed by instruments and methodologies specific to the other branches of

geography, especially economic geography, social geography and urban geography [6].

It is the duty of geographers to seek new work methodologies and to put to use in the study of migrations the newest geospatial technology that provides specific tools for the discipline of geography. One of the most important factors that supported the development of geography in recent years has been the emergence and generalization of the Geographic Information Systems (GIS) methodology, which allowed the integration of the mapping techniques into a unitary concept with database management technology.

3. THE FACILITIES OFFERED BY THE NEW GEOGRAPHIC TECHNOLOGIES FOR THE STUDY OF INTERNATIONAL MIGRATIONS

The main question that one can ask is to what extent does the GIS technology bring an extra amount of knowledge as compared to the classical methodologies from the geography of population, that have been used up until now for the study of migration? In order to answer this question it is necessary to define and understand how GIS is modelling the real-world sites and also to know how these concepts have evolved over time.

A GIS is an assembly of specialists, software, equipment, rules and methods aimed at the storage, handling and processing of geographic data referenced to achieve a certain objective [4]. The Geographic Information Systems allow the storage and creation of spatial and alphanumeric data, facilitating the consulting, analysis and spatial representation of these data.

From the perspective of studying the migrations, the main questions, that this methodology can provide answers to, are: where are the areas of origin and destination for the migration flows located, where are certain conditions met and what are the causes that can trigger migration, what are the trends concerning the dynamics of migration in a certain region or locality, what are the routes followed by migrants, what is the framework for unfolding the migration processes?

One must notice the fact that the storage mode and spatial data types have been transformed over time allowing the development of more accurate models of reality because of the emergence of complex software and computer development. Although there are currently several free GIS programs yet they still fall behind the software packages made by the major companies in the field worldwide, especially if they are compared in terms of complex analysis and facilities offered.

One of the most complete GIS platforms is the ArcGIS Desktop software, now being at version 10.1, from ESRI company, which is the world leader on the

market of these technologies. Among the facilities offered by the ArcGIS technology one can notice the appearance, even starting from version 8.0, of the model of "geodatabase" storage type, which allows a better modelling of real world objects, storing geographic data in a centralized way, while improving the integrity of these data [7]. ArcGIS facilitates the spatial analysis, representation and visualization of geographic data, allowing the creation of complex spatial models that provide a better understanding of the territorial impact of international migration[1], [5].

4. CONSIDERATIONS ON THE AVAILABILITY OF GEOGRAPHIC DATA IN SPAIN

If software is constantly developing and can be purchased without problems not the same can be said about the data required to complete a GIS project for the study of international migration. Major differences in the liberalization and access to spatial and statistics data on migration are recorded worldwide.

For the case of the present study we will illustrate by referring to the international economic migration from Maramureş to Spain, which is the analysis necessary to achieve a GIS database for a research project of international migration must refer to the availability of data types in the two countries, Romania and Spain respectively. One must notice the difference between the two countries, concerning access to spatial data.

Romania and Spain are part of the European Union, being engaged in the implementation of the INSPIRE Directive 2007/2/EC regulating an infrastructure for spatial information (Spatial Data Infrastructure, SDI) in the European Community since May 15, 2007. Nevertheless Spain records a considerable head start as compared to Romania, concerning the implementation of its own infrastructure of spatial data.

The spatial data infrastructure is a system that integrates a set of resources allowing access to geographic data through servers on the Internet. These servers perform a number of standards according to the International Organization for Standardization (ISO) and European Committee for Standardization (CEN) allowing interoperability of geographic data based on the regulation Open Geospatial Consortium (OGC).

Spanish Spatial Data Infrastructure facilitates the users through the IDEE geoportal (<http://www.idee.es>) access to spatial data produced in this country.

The increase in the demand of spatial data for the research and the development of geotechnologies has set new operating models of geographic information, reducing the costs of geo demographic studies. The GIS specialists can locate, select and access data managed by the National Geographic Institute of Spain and the use of Spanish Spatial Data

Infrastructure servers in ArcGIS Desktop is an indisputable advantage that allows access to spatial data and the visualization of variable scales and different projections of thematic layers according to the objectives of the research.

Another great advantage of the Spanish Spatial Data Infrastructure is that detailed spatial data have been liberalized to the public on FOM/956/2008 order of March 31. For the scientific use the spatial data can be downloaded in formats recognised by the GIS software, one of these formats being ESRI's shapefile. The geographic data are accompanied by metadata that specify the content, quality, size and other characteristics necessary for the user.

The ArcGIS software allows the import, storage in geodatabase and then the completion of complex spatial analyses based on spatial data downloaded from the Spatial Data Infrastructure Portal of Spain.

The necessary data for the study of international migration in Spain can be accessed through a series of downloading centres, the most important being "Centro Nacional de Información Geográfica" of the National Geographic Institute.

The availability of geographic data depends on their complexity and the way in which they are used for economic and scientific purposes. A first set of data can be accessed and downloaded in a free form and for the use of scientific research another complex set of data can be accessed only by registration as a user.

The data that can be downloaded from the IDEE portal are complex as they are spatial data and also table data. The spatial data available for scientific purposes are given in raster format (topographic maps at different scales, orthophotoplans, and digital elevation models) and data in vector format that had been based on GIS projects conducted by major national ministries and government bodies of Spain.

Here we must mention a few of the most important GIS projects that base Spain's Infrastructure of Spatial Data: the Carto Ciudad project, the Sistema de Información Urbana (SIU) project, the Infraestructura de Datos Espaciales de la Administración General del Estado (IDEAGE) project, the Cartografía Catastral en Internet project, the Sistema de Información Geográfica Nacional de España (SIGNA) project, the Plan Nacional de Ortofotografía Aérea (PNOA) project, and the Sistema de Información de Ocupación del Suelo en España (SIOSE) project etc.

There are also a series of Spatial Data Infrastructures implemented at a level of autonomous community, at a local level and at a cross border level. In this case one may take as an example the Infraestructura de Datos Espaciales de Castilla La Mancha.

In order to generate complex cartographic models regarding the international migration it is necessary to fill in the spatial data with table data that

are available and can be downloaded (in formats compatible for GIS import) from the portal of the National Institute of Statistics from Spain, such demographic data can also be downloaded from portals of the statistics institutes of the autonomous communities.

One of the most important sources of secondary data for the study of international migration is the administrative register „Padron municipal” in which data coming from all the city halls of Spain are centralised, this register being updated every year on the 1-st of January. Data from the Census and the one from „Padron municipal” register include only figures concerning immigrants that have registered as residents in Spain, in these statistics, the illegal migration phenomenon being largely unquantified. Illegal migration is partially registered in the register "Padron Municipal", immigrants who want to have access to education and the health system must be registered in

the register even if not legally stationed in Spain for different reasons.

The National Institute of Statistics carries out its research projects aimed at estimating the resident population in Spain and implements thorough research on the effects of international migration in Spain with the aim of assisting the decisions of government bodies that are responsible for migration management.

These projects are materialised into sources of data accessible to geographer scientists interested in the international migration in Spain, and in addition to this the primary data, specific to each field research. We have to mark the fact that the secondary data sources concerning immigration in Spain are very diverse, out of this The General Immigration and Emigration Secretariat within the Ministry of Labour and Social Security stands out, which through the Permanent Immigration Observatory carries out yearly a large scale work named Anuario Estadístico de Inmigración.

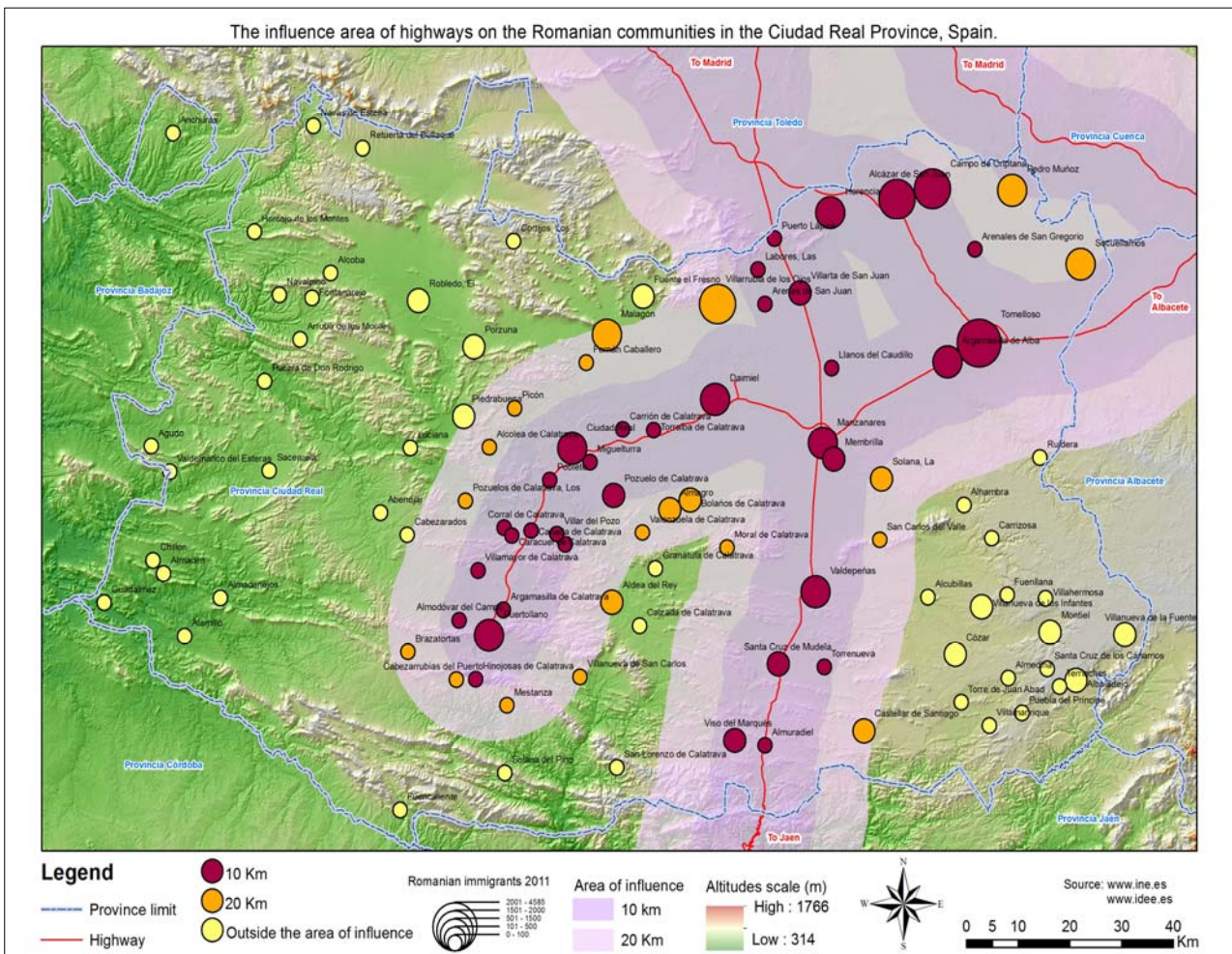


Fig. 1. Example of a map realized using ArcGIS Desktop technology and Spanish SDI.

5. CONSIDERATIONS ON THE AVAILABILITY OF GEOGRAPHIC DATA IN ROMANIA

Compared to the situation from Spain, where a centralization and systematization of data stands out through national projects, in Romania a number of

issues concerning access to spatial data and statistical researchers necessary to accomplish studies on international migration are easily noticeable.

The data availability is much reduced in our country, due to the fact that the policies of governmental institutes that manage spatial data do not

allow free access to these data or due to the dispersion of data at several institutions responsible for their management.

The price of purchasing data is not a factor to encourage the achievement of geographic studies on migrations.

According to the INSPIRE Directive prices should be relatively small and the public authorities should facilitate access to spatial data.

As a consequence of these dysfunctions in Romania, achieving a project for the geography of population, with the purpose of researching the international migration, requires far more consistent financial resources as compared to Spain.

The reduced possibilities for obtaining detailed data determines the GIS specialists to generate their own digitizing vector data through measurements and thus greatly increasing the time for achieving a database. The advantages of using GIS remain obvious for the study of migrations at a regional level in our country, even in the situation in which there is a disparity of development and organising the infrastructure of spatial data for Romania as compared to the case of Spain, presented above.

The restricted access to the spatial data correlated to the insufficiency of statistical data concerning the situation of international emigration of the Romanians does not encourage the geography of population studies. The enhancing of international migration at a regional level in recent years has taken by surprise the institutions responsible for producing statistical data.

The types of migration involving circulatory travels for work in the western countries of the European Union and establishing the Romanian citizens abroad for longer or shorter periods of time are difficult to monitor and quantify in the context of opening the flow of people towards the EU countries.

6. METHODOLOGICAL RECOMMENDATIONS CONCERNING THE USE OF NEW GEOGRAPHIC TECHNOLOGIES FOR THE IMPLEMENTATION OF SURVEYS AND FIELD RESEARCH ON INTERNATIONAL MIGRATION

In the context in which there is an obvious lack of statistical data and consequently poor scientific knowledge of the consequences of migration at a regional and local level it is needed to apply methodologies for conducting survey-based studies on representative samples of the population.

The costs of these types of research are particularly high due to the fact that they involve a lot of travelling and sampling is difficult.

The Geographic Information Systems by providing an abstraction and especially a quick view of the territory at different scales allow a better organization of field work.

A concrete example is to plan a survey aimed at identifying the defining economic international emigration aspects from the region of Historical Maramureş.

The first step necessary to implement this survey is to establish a representative sample for the population of the research project region. This can be done in ArcGIS by selecting some households starting from the random generating of points along the road network and the subsequent selection of households near these points.

The number of selection points may be specified ahead according to the percentage of population of that particular locality from the total population of the region.

Thus is made such a stratified sample in which the number of households selected in each locality is correlated with the demographic size of that respective locality.

After selecting those households in GIS, by loading data from a GPS receiver (which is preferable to be equipped with ArcPad software) it is relatively easy to locate in the field the households where the surveys will be applied without the need of traditional print drawings or maps on paper for orientation and location.

7. RESULTS AND DISCUSSION

The study outlines the possibilities and advantages of using spatial data infrastructures for specific applications, such as the study of international migration, by incorporating and analyzing these resources in the databases by geographer scientists.

It is also briefly presented the value of a Geographic Information System to optimize the labour resources allocated to field data collection for the study of international migration in a region.

8. CONCLUSIONS

The methodological and theoretical evolution from the sphere of migrations was marked by the contribution of geography, which possesses a set of analysis instruments specific for the study of population's mobility.

At present there is a tendency of setting up complex researcher teams, most of them from the area of social science, in order to carry out research projects of international migration.

Geographers have the advantage that by using the technologies specific to geography they can elaborate databases and make complex spatial analyses modelling the phenomenon of international migration from a territorial perspective.

The availability and access to geographic data necessary for these studies differ from one country to another, in the paper elaborating a comparative analysis between the case of Spain and Romania, all this

in the context of conducting a study on the transnational migration of people from Maramureş to Spain.

The establishment of Spanish Spatial Data Infrastructure has as direct consequences lower costs, faster results and more detailed in terms of the territorial impact of international migration in this country.

The GIS methodology reduces costs and allows a better organization of field work for surveys aimed at collecting data on the mobility of population.

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