

RESEARCH ON SYSTEMATIC LAND REGISTRATION AS AN EFFICIENT TOOL FOR URBAN DEVELOPMENT AND NOISE MAPPING IN ROMANIA

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Abstract: *In the context of urban growth, efficient urban planning has a great importance, in order to provide an intelligent spatial arrangement of the cities. The aim of this paper is to make a brief overview against the negative effects of noise upon the environment and the methods of reducing it, in the context of efficient urban planning. The authors make some recommendations regarding the possibility of making noise calculations and noise predictions by using accurate and complete informations coming from the systematic land registration system, integrated in a GIS medium, in order to improve noise mapping. The authors also aim to assess the level of progress concerning the systematic land registration in Romania, which is not close to be completed, due to the economical and social circumstances.*

Keywords: *noise mapping, urban development, environment protection, GIS, systematic land registration.*

1. Introduction

In the context of urban sprawl, efficient urban management has a great importance, in order to provide an intelligent spatial arrangement of the cities. The general urban design has to comprise the existing urban settlement and integrate new elements and details harmoniously. It has to be conceived in order to satisfy the needs of the population.

Due to the population growth in urban areas and economic development, the need for residential and commercial spaces increased. This implies strategical urban planning, in order to avoid congestion, environmental degradation and pollution. Through noise analysis there can be identified the sensitive areas and certain decisions regarding urban management may be influenced, on the behalf of people and their quality of life.

The analysis could also help in identifying vacant and under-utilized land well suited for future development, while protecting environmentally sensitive areas, mitigating natural hazards. [1]

The urban form is defined through the relationship between the landscape, the existing constructions and the demography.

The concept of urban planning encompasses a functional arrangement of private and public areas, in order to create a balanced environment. In the context of urban management, the relationship between the elements of the urban environment must be reviewed. Certain

report between the subsystems of the urban design must be improved or at least they must be maintained: the settlement system, the green system and the accessibility system.

The actual tendency is the creation and protection of green areas, the expansion of open spaces, harmonization of forms, alignments and heights of the constructions and an appropriate arrangement of the accessibility system, connecting new infrastructures to the existing ones.

Noise mapping may serve as a strategic planning tool and noise reduction instrument, as well as an aid for decision making on many environmental noise matters. Sound has a range of different physical characteristics, but only becomes noise when it has an undesirable physiological or psychological effect on people. [2]

The aim of this paper is to make a brief overview against negative effects of noise upon the environment and the methods of mitigating it in the context of efficient urban management. The study also intended to approach the influence of urban form in noise propagation. In this paper, the authors propose an integrated GIS medium, as a tool for noise calculations and noise prediction, using accurate and complete information coming from the systematic land registration system, in order to improve noise mapping. The authors also aim to assess the level of progress concerning the systematic land registration in Romania, which is not close to be completed, due to the economical and social circumstances.

The product of the systematic land registration is a complex, complete, accurate, up-to-date database, containing specific information which is necessary in the prediction and calculation of environmental noise and noise mapping.

2. The influence of noise upon the environment

The idea of a modern city encloses the idea of a healthful environment, with more green spaces and less pollution factors.

One of the most important pollution factors in the urban areas is the environmental noise. This matter have been studied over the years and it has been shown that traffic noise has a negative impact on people's lives and health.

It is understood by noise an unpleasant sound or of annoyance for human beings. The concept of noise is defined as the variation of atmospheric pressure, within the limits of the range and frequency band to which the human ear responds. [3]

Environmental noise, like other forms of pollution, has wide-ranging adverse health, social and economic effects. It has been found that noise interferes with behavior, including communication and concentrated activity, or desired states, such as relaxation and sleep. [4]

Chronic exposure to traffic noise has been found to be associated with health problems such as hearing damage, heart disease, sleep disturbance, high levels of perceived annoyance, distraction, emotional problems such as fear and anger, and communication disturbances. [5]

The urban form affects directly the natural habitats, ecosystems and the different species. Indirectly the urban form influences the behavior of the trajectory, which in turn affects the air quality, the global climate and of course the noise propagation. [3]

Research shows that the effect of noise varies with the height and compactness of the buildings and with the porosity and permeability of the soils. It was proved that high regularity of urban forms, high occupancy of the land and low permeability of soils increase the noise protection level. Nevertheless, it is well known that the more obstacles, the less noise pollution impact upon the environment. Vegetation planting is necessary for noise dampening.

Modern techniques allow us to investigate in advance the potential negative effects of environmental noise within a specific project and it may help designers make efficient decisions.

Environmental noise study and investigation are used in many sustainable city planning for environmental friendly city and urban area. Mapping technique is also used in some environmental qualities analysis and assessment. [6]

In urban designing, there are recommendations referring to new constructions nearby the areas subjected to the effects of noise pollution.

Noise associated with road development and traffic has four main sources: propulsion noise of vehicles, interaction between vehicles and road surface, driver behavior, construction and maintenance activity. [2]

Motorways are one of the main sources of noise pollution, along with aircraft and railway noise pollution. It is essential that they are built with concern for the protection of the environment and the well-being of the population. It must be taken into consideration that the design of highways shouldn't be done in crowded areas like: shopping centers, hospitals or central areas. Before building motorways, it is necessary to assess their potential negative effects on humans. Likewise, new constructions must not be placed near areas with heavy traffic. The position of buildings must be designed at a proper distance from the sources of noise.

International studies suggested that people who live in areas with noise pollution are less satisfied with the quality of life and are more willing to move than others.

In order to provide a friendly environment for motorways, it must be taken into consideration building proper noise barriers on both sides of the motorway to protect people who live in low level houses or who work in office building, near the motorway. Moreover, noise pollution may be mitigated using some types of window protection, such as double glazing window, for the buildings placed in the vicinity of the motorway.

The desire to meet requirements for European Union membership is forcing legislative and administrative action in favor of environmental protection.

In the context of constantly changing contemporary society, it can be distinguished the urgent need to organize a unitary system of all data related to real estate properties across the country.

For a high efficiency on the real estate market, together with the security and liberty of making transactions, registering a property, planning operations, the introduction of an ad valorem tax on property and a rational use of space, it is absolutely necessary to assure the informatization of the activity related to general and multipurpose cadastre, to provide a complete evidence of lands and buildings. The database created may be integrated in a GIS medium, which may be an important tool for urban planning and instrument for the reduction of negative affects of noise pollution, in compliance with the European requirements regarding the environment protection.

3. Noise calculations and noise mapping using systematic land registration database for GIS

A geographic information system (GIS) is a technological tool for comprehending geography and making intelligent decisions [7].

GIS often leads to identifying the optimal location for an investment, the study of the impact upon the environment complying with the general policy of sustainable development. [8]

GIS software allows users from all over the world to share ideas on how to plan efficient land use and protect the environment, in order to ensure the fulfillment of future generations' needs.

ArcGIS Desktop is a GIS software developed by ESRI. This package can be used in a wide range of applications, having the capacity to manage various data formats. The noise prediction method was implemented as one of several extensions of ArcGIS Desktop. [9]

A multitude of data may be integrated in a GIS medium, but there are certain limitations in what concerns the noise mapping. For example, GIS data may include road maps, buildings, population, vehicle count or even speed limit. The information provided by the systematic land registration system may fill some gaps, giving details such as the height of the buildings, the owners, the number of inhabitants, needed for a precise noise prediction. Actual maps provide parcel and building location, shape and dimension.

The height of the buildings is a very important factor in noise calculation. According to Farcas [9], if these informations were not available, the height of the constructions was estimated for each of them, depending on the building surface and the approximate number of residents.

The problem of the population data is a sensitive subject because of the privacy issues involved. [9]

Through integration of the information coming from the systematic land registration system into the GIS, another delicate matter would be solved, namely the one of the exact number of inhabitants. This would lead to a more precise and detailed noise calculation.

The problem of the accuracy of data must be brought into attention. When considering to start an integrated GIS project, information must be reliable. Using data from systematic land registration ensures the correctness of the information, given the fact that it is based on geodetic measurements, ownership documents and the declaration of the owner.

Another problem would be mitigated by using data from the systematic land registration system in the GIS project, namely the one of the differences of scale encountered in different maps. Using the graphical data from systematic land registration prevents the occurrence of possible mismatches, providing precise delimitation of property, correct surface of the parcel and construction and the same accuracy.

If integrating several maps as layers into a GIS project (one for roads, one for property boundaries, one for buildings, one for water streams), there may arise inaccuracies by overlapping layers.

According to Farcas [9], the final products of the integrated GIS project may be: noise map with buildings and population, noise levels on roads, noise levels at building facades, noise at different observer heights, calculated 3D noise levels projected in 2D, noise level before/after applying barrier, basic noise level for roads, noise level for buildings and roads, 3D views of basic noise level, detail of basic noise level, details of noise level for population, details of noise level for roads and population, details of noise level at building facades, detailed view of population exposure to risk, charts presenting the population exposed to noise classified depending on the sex/age or noise level data classified in noise level intervals.

4. Implementation of systematic land registration in Romania

The most important task of the new real estate registration policy is to assure the informatization of this activity, to provide a complete evidence of lands and buildings, in order to create a unitary, complex, realistic and up-to-date cadastral system and to facilitate the access to information, according to European standards.

I.N.S.P.I.R.E. (Infrastructure for Spatial Information in the European Community) is an European initiative in order to establish an infrastructure for spatial information in Europe, with the aim to make spatial or geographical information [10].

The I.N.S.P.I.R.E. directive aims to create a common European Union spatial data infrastructure. This will enable the sharing of environmental spatial information among public sector organisations and facilitate public access to spatial information across Europe. Therefore the spatial information considered under the directive is extensive and includes a great variety of topical and technical themes.

The integrated cadastre and land registration IT system (E-Terra) is A.N.C.P.I.'s (National Agency of Cadastre and Land Registration) main operational computer system that ensures the management of the electronic cadastre and land registration records.

The purpose of this computer system is to unify, standardize and automate the processes of updating and inquiring the cadastral and juridical records administered by National Agency of Cadastre and Land Registration in Romania, having as final target the increase of quality of services delivered to the citizens and the institutions of this country. The system manages a unique database containing the graphical and textual data related to cadastral and legal record.

The main quality of a modern land registration system is represented by the use of digital data at any level of the process.

Thus, each administrative territorial unit and all properties subjected to land operations (first entry, split, merge, change of use category) will be entered into the computer system E-Terra by converting analog data into digital format. Each property is assigned a new cadastral number called parcel identifier, which will be enrolled in a New Land Registry.

All data relating to real estate (administrative territory, area, name of the owners, acquiring property mode, category of use, buildings) are included in the three parts of the converted land book. Land book also includes the buildings and the construction sketch on this, as well as the coordinate inventory points that define property boundaries in the stereographic projection system 1970.

Graphic information is stored in GIS layers, which are visible in the legend: land, buildings, construction, town boundaries, territorial administrative limits, orthophoto. All layers contained in the data set have the same coordinate system. Textual attributes of the real estate in E-Terra are: identifier (electronic cadastral number), territorial administrative unit, area registered in the ownership title, measured area, building condition, parcel, address.

In December 2012, A.N.C.P.I. achieved spatial data sets in accordance with the I.N.S.P.I.R.E. directive. This resulted in 5 sets of spatial data, such as: geographical names, administrative units, land plots, transport networks, hydrography.

Quality assurance for the corresponding metadata documents for spatial data sets and services is achieved through validation application for metadata documents, which is available on the I.N.S.P.I.R.E. geo-portal of Romania. It provides access to metadata, spatial data sets and services held by National Infrastructure for Spatial Information Council members and it can be accessed at: <http://geoportal.ancpi.ro/geoportal>, which is connected to the European geo-portal. [11]

According to the A.N.C.P.I. report in 2013, the desiderates established through the I.N.S.P.I.R.E. directive, in order to create a European Union spatial data infrastructure, have been partially accomplished. There have been made efforts in order to bring the existing system in Romania close to the level of development achieved by the European countries, in all domains, but there are lots of problems encountered during the process and it is very difficult and time consuming to register all the properties across the country, given the social environment.

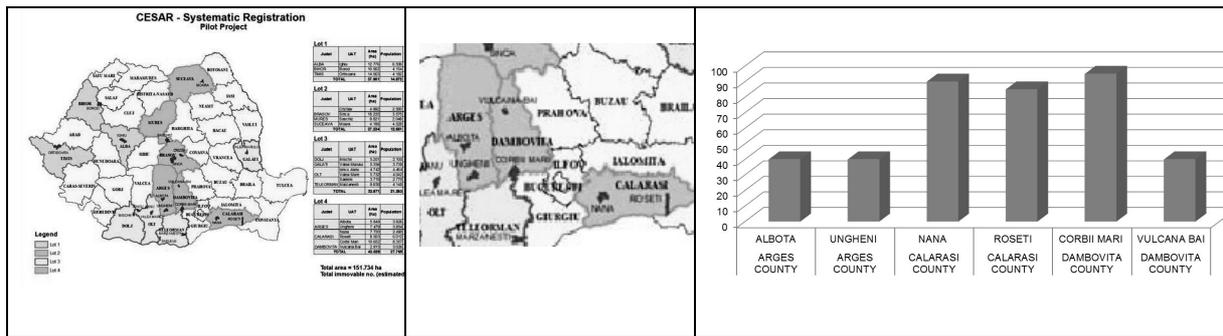


Fig. 4 Stage of progress-C.E.S.A.R Project 1-Lot 4

During 2012, A.N.C.P.I. has signed contracts for the achievement of systematic registration of properties for another 31 administrative units, grouped into four lots. Within these administrative units, the land registration of the properties has not been completed yet, because of the social and economical conditions, respective to the lack of funds from The International Bank for Reconstruction and Development. At the beginning of 2013, A.N.C.P.I. announced that there are no funds allocated for continuing the implementation of the systematic land registration.

5. Conclusions

Environmental protection is undoubtedly one of the most demanding and most complex activities, which has a great importance in urban management.

Accessible, complete, accurate and up-to-date information about the environment is a premise of successful implementation of environmental protection.

It is necessary to conduct a series of surveillance operations, evaluation, prognosis and warning for operative intervention in order to maintain environmental quality. Monitoring and management activity using GIS strategic noise maps has the effect of contributing to environmental impact assessment to improve environmental management [14]. Noise mapping can obviously be an effective tool to manage the noise pollution.

Actual information upon the environment may encourage the growth of environmental awareness and responsibility for the situation, promote participation in the management and conduct education. [11]

A major concern of sustainable cities is transportation and its impact on the environment. [1]

There are some benefits of noise mapping, such as the fact that it can be used as a tool to minimize the extent of noise pollution of noisy places and for the prediction of the future status of noise pollution, as well as an instrument in producing source evaluation and monitoring. [2]

In order to implement effective measures to reduce traffic noise, the information about its area of impact is absolutely necessary.

Geographical Information Systems (GIS) have an important role in noise mapping. Integrating accurate information coming from the systematic land registration of the properties can have an important role in the improvement of noise prediction and noise mapping.

Considering the current need of permanent updating these maps can only be made with the use of a preformat Geographic Information System. More than this, if the system is

managed and monitored adequately by highly trained personnel it can provide useful information in fighting and preventing phonic pollution [12].

National Agency for Cadastre and Land Registration estimates that by the year 2020, in Romania, the process of recording all the real estate properties will be completed.

In conclusion, only after achieving this desideria, the implementation of our proposal concerning the integration of data coming from the systematic land registration will be possible.

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