ROMANIAN CADASTRE INVOLVMENT IN CLIMATE CHANGE POLICY

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***Abstract**: This paper aims to present the usefulness of cadastral data integration in analyzing the effects of climate change. Based on the experience of developed countries in the EU and on the necessity of stopping, if possible, the effects of climate change, is necessary also in our country to take urgent action of public and authorities awareness campaigns in this direction. We will try to demonstrate that cadastral data can provide support policies to mitigate the effects of climate change, especially in urban areas.*

***Keywords:** cadastre, database, orthophoto, GIS, climate change*

1. Introduction

The effects of climate change no longer falls only within the scope of environmental issues, becoming social and economic threats felt more strongly in everyday life. The recent studies shows that world population tends increasingly to leave rural areas in favour of urban areas. Even if only 2.8% of the Earth's surface is covered by urban centres, it was found that more than 50% of the population lives in urban areas with a large concentration in the periphery, in the slums.

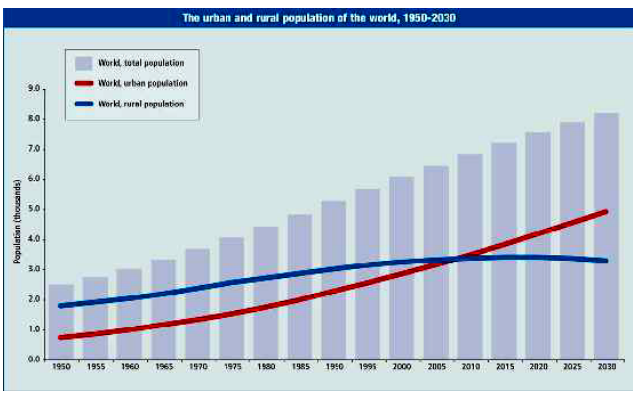


Fig.1. The urban and rural population of the world, 1950-2030
(Chryssy A. Potsiou, 2011)

If in 2005 the urban population was approximately equal to the rural population, it is estimated that in 2030 will reach 60% of the global population and in 2050 will exceed this threshold (Fig.1).

National Climate Change Strategy 2013-2020, addresses two distinct parts: the reduction of gas emissions with greenhouse effect to achieve the assumed national objectives, and the adaptation to the climate change effects, taking into account the EU policy on climate change and documents developed at European level.

In the process of fighting climate change, currently seen in specialized international forums as a threat with irreversible potential for our society and planet, the adoption of measures to reduce emissions of greenhouse gases, with compliance to the objectives and principles of United Nations framework Convention on climate change and to the Kyoto Protocol, represents a fundamental part of national policy on climate change (Romania's national strategy on climate change 2013-2020).

Greenhouse gases (GHG) are the result of both natural processes and human activities. The major sources of those resulting from human activities are:

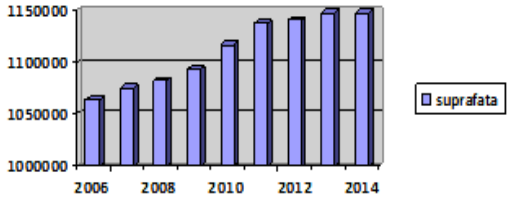
- burning fossil fuels (coal, oil and natural gas) to produce the energy, transport, industry and households (CO2);
- agriculture (CH4) and changes in land use such as deforestation (CO2);
- storage of household waste (CH4);
- the use of fluorinated industrial gases.

European Environment Agency monitors and provides data on:

- annual inventory of greenhouse gas emissions effect in the European Union;
- annual assessment of progress of EU member states and European countries in terms of their objectives related to the Kyoto treaty and those to be achieved by 2020;
- analysis of the mutual and synergetic benefits resulting from policies relating to climate change and air;
- analysis of the impact of climate change in Europe;
- analysis of the problems regarding the climate change and adaptation to them, including a review of adaptation actions taken by individual countries;
- vulnerability analysis of certain regions to climate change.

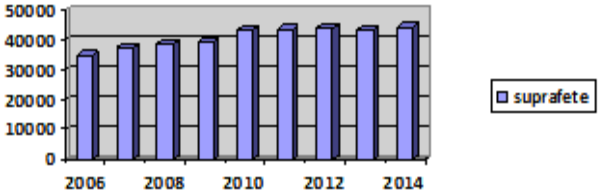
2. Materials and methods

With this challenge to stop or decrease the effects of climate change we need to consider urban agglomerations. Having as model the experience of EU countries and especially the Netherlands, which was the first country that has developed a national policy regarding climate change (Gupta et al., 2007), Romania has adopted the National Strategy on Climate Change 2013 -2020. Here it is estimated that in our country there are approximately 8.1 million owners and 4.85 million houses, leading to the idea that the potential for reducing greenhouse gas emissions in residential and commercial sectors is considerably. It should not be neglected that the time evolution of artificial space can put us a first question mark (Fig.2,3,4).



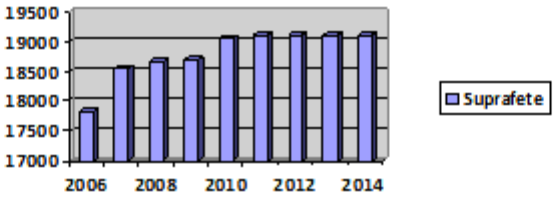
Years	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Surface (ha)	1048156	1064077	1075820	1082440	1093030	1117164	1137580	1140623	1148198	1148080

Fig.2. Romanian situation



Years	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Surface (ha)	33761	34925	37670	38861	39307	43669	43962	44285	43681	44512

Fig. 3. Ilfov county situation



Years	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Surface (ha)	17711	17819	18546	18679	18694	19054	19123	19123	19123	19123

Fig.4. Bucharest municipality situation

The energetic intensity of the residential sector in Romania is 8 times higher than the EU-15, due to the inefficiency of heating and the lack of thermal insulation of most houses / apartments (National Strategy on Climate Change of Romania 2013-2020).

In the national action plan on energy efficiency envisaged a reduction of greenhouse gas emissions in the residential sector with 41.5% in 2020 compared to the average 2001 - 2005. For new residential buildings shall prevail the Norms for design and execution of thermal insulation on buildings - C107 amended regarding the calculation of the global coefficient of thermal insulation in residential buildings, and the obligation to obtain a certificate of energy efficiency for private buildings that are sold, will significantly improve the energy efficiency of buildings of GHG emissions and for existing buildings will continue the thermal rehabilitation.

In the Netherlands these regulations have been adopted since January 2008. Linked to cadastral data, there is a requirement that when for a property is made the cadastre and

tabulation to be also mentioned the energy level of that construction, and this information to be publicly available to any individual or legal person that wants to trade that property. In our country it came into force in 2013 the requirement for energy certificate at the time of the cadastre and tabulation, but nowhere is mentioned in land registers this information from the energy certificate. Furthermore, Dutch studies have shown that is a correlation between the information regarding the energy performance of buildings and the social status of owners. In the table below we can track how can be correlated the information from cadastre with the energy certificate and how they can be managed to reduce greenhouse gas emissions (Table 1).

Table1. Correlation between cadastre and energy certificate information's (VRANKEN M., et. al, 2012)

Dwelling & owner information	**Data source**	**Variables/unit**
Dwelling type	Cadastral Key Register	Apartments, construction with one level, etc
Year of construction	Cadastral Key Register	Year
Type of ownership	Cadastral Key Register	Owner / private or rental
Owner age	Cadastral Key Register	Date of birth
Guarantee or maximum mortgage	Cadastral Key Register	Currency - sum
Energetic label	Energy certificate	A++, A+, A, B, C, D, E, F, G
Geographical location of house	Cadastral Key Register	Geographic coordinates/ cadastral map

Once the information considered and centralized in one place, they can make queries on different criteria, thus obtaining information on the energy potential of a residential district or the possibility of reducing in a certain time the gas emissions or reduction of fuel consumption. Combinations of data can be projected up so as to have customized information packages named energy characteristics of the built environment. They can be integrated in a GIS such that to have all the information at the cadastral sector level, locality or UAT.

In the figure below (Fig. 5) we can see an example of cadastral plan of the Netherlands which together with the cadastral information are also found the energy ones:

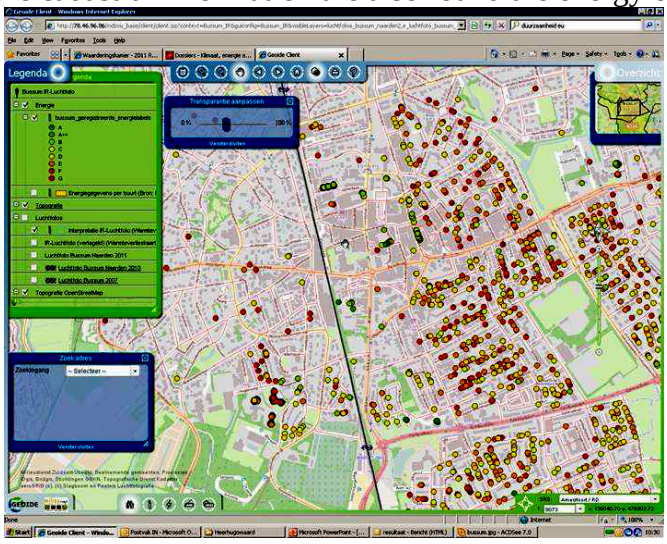


Fig.5. An example of cadastral plan with energy data (VRANKEN M., et. al, 2012)

From this it can then be done the city plan with areas where there are opportunities to reduce energy consumption and CO_2 emissions on different levels (Figure 6):

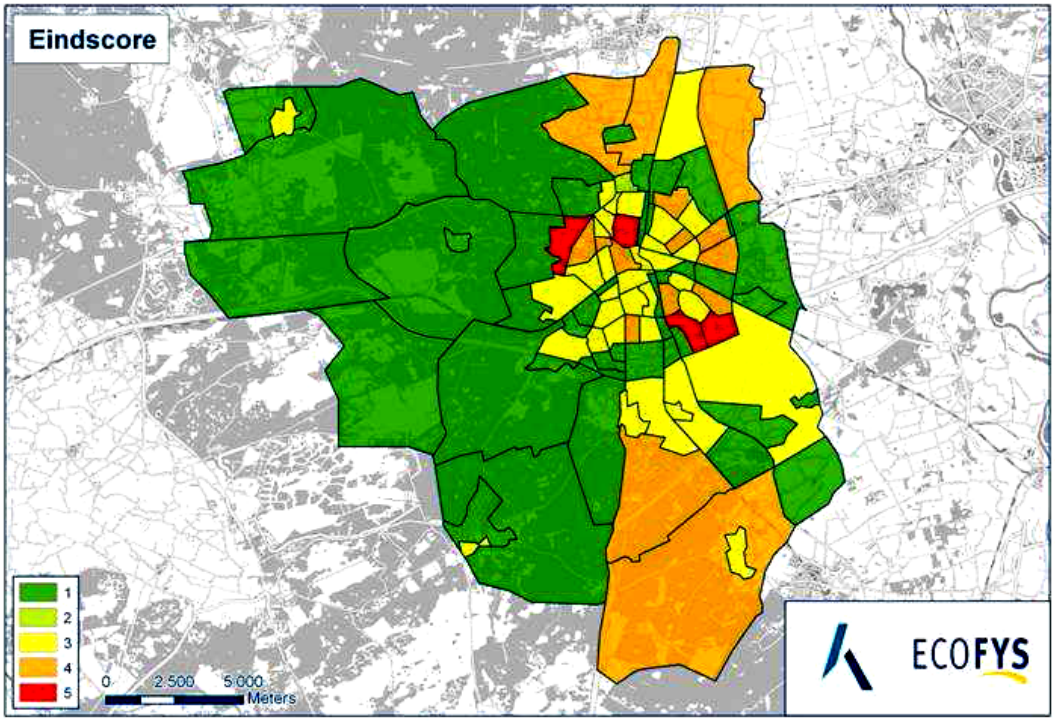


Fig.6. Example of reducing energy consumption and CO_2 emissions on various levels from 1 to 5, 1 lowest and 5 highest (VRANKEN M., et. al, 2012)

3. Results and discussions

In Romania these situations presented can be taken as an example and implemented quickly. It is not too late because according to official data provided by ANCPI exactly what started the National Plan for Cadastre and Land Register April 30, 2015, but on 27.10.2016 the number of buildings managed by the informatics system of cadastre and land registry is 9.074.242, representing 22,69% of the approximate 40 million estates.

While the cadastre Law and real estate advertising appeared in 1997 it seems to mark time and we are still at very beginning.

An implementation example of this methodology is given in the Western Plain of Romania situated in the Jebel locality, Timis County (orthophotoplan already entered into a GIS Fig. 7). In compiling the map with the buildings isolation situation of the territory was made an inventory of buildings and photographing them. Have been identified similarities in terms of construction and classification was carried out.

Based on chromatic classification of the energy certificate for buildings, of the construction geometries entered in the land register database of ANCPI and trough the identification at the scene we have materialized on the map the 7 types of houses (Fig. 7).

With this can be done an estimate of CO_2 emissions and may propose measures to reduce them. It can also quantify data on the year of construction of every building, type of activity that takes place in these buildings, the construction material, etc. and can estimate the average energy consumption for each building.

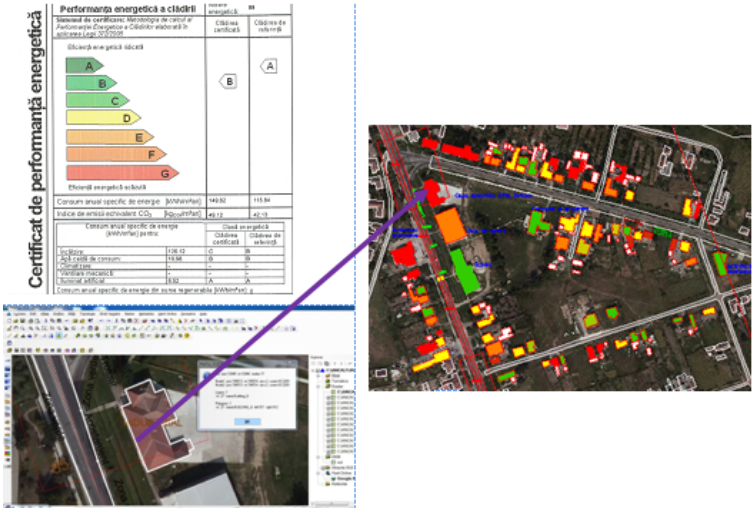


Fig.7. The map with the 7 classes of energy performance

Having results close to reality, the action plans to determine the carbon footprint should be realistic, that would insure that money invested in both the study and the methods of reducing CO_2 emissions will yield results. The result would be the reduction of greenhouse therefore increasing health and quality of life in urban areas.

4. Conclusion

In conclusion updating databases with as much information is aimed at wider benefits for 2030 in terms of climate change mitigation. In 2015, EU countries were invited to communicate the measures to reduce emissions that contribute to global agreement. Through a complex GIS based on cadastral data to be better handled by specialists, measures to reduce the gases emitted by housing would be more efficient.

The possibility of knowing the carbon footprint of each house offers the chance to study in terms of the building materials used; the types of equipment used and even the efficient space used. On long-term is aims that until 2050 to succeed crossing to a life and a competitive economy with a low emission of carbon dioxide.

5. References

1. *Gupta, J., Lasage, R., and Stam, T - National efforts to enhance local climate policy in the Netherlands, Environmental Sciences, 4:3, 171-182. (2007)*
2. *Chryssy A. Potsiou - Cadastre and climate change, Additional notes for the optional course «Cadastre and LIS» of the 8th semester SRSE NTUA, 21 p, (2011).*
3. *Martinus VRANKEN, Sanne BROEKHOF - Contribution of cadastral information to climate change policy in the Netherlands, FIG Working Week 2012, Knowing to manage the territory, protect the environment, evaluate the cultural heritage, Rome, Italy, 6-10 May (2012).*
4. *Strategia națională a României privind schimbările climatice 2013 – 2020, (2012).*
5. *Anca-Maria Moscovici - Contribuții la monitorizarea poluării fonice în construcții și gestionarea datelor preliminare într-un Sistem Informatic Geografic, ISBN: 978-606-554-985-2, (2015).*