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# Maintaining and Rehabilitating Urban Ecosystems, in the Context of European Green Deal

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## ABSTRACT

*The climate change challenges led to inclusive policy making, in all fields, for each European citizen. European Green Deal represents European Union's transition process toward a sustainable and inclusive economy.*

*In this context, the paper aims to analyse the transition process of romanian economy to a green economy. In order to achieve this aspiration, the problem should be considered from ecosystems perspective. Roughly 60% from global emissions are generated by urban areas. In the meantime, around 1/3 from energy consumption is recorded at urban tier. Thus, the direction to rehabilitation and maintenance of urban ecosystems are becoming a priority, because an intense economic activity leads, through indirect activities, to pollution and an irrational usage of natural resources. Environmental protection is still one of the most important issues in order to draw a sustainable society.*

*The article analyses the interdependence among environmental protection and economic activity, in the context of European Green Deal, aiming to offer viable solutions to sustain urban ecosystems. The interrelationship will be analysed from the perspective of an important moment of recent history of Romania, accession to the European Union (2007). Hence, it has been used two moments of reference, year 2006, the last year before Romania's accession to European Union, and year 2018, the last year with available official data. Thereby, through reporting to these two moments of reference it is possible an assessment of Romanian transition to green economy, according to values and targets of the European Commission, being well-known the public agenda of the European Commission which has as main purpose the efficiency of use of resources.*

*Solutions found from research activity are shown as a statistical radiography of Romania's economic development model for the period between 2006 and 2018 reporting to European Union's development model and sustainable consumption, having as main target the importance of urban ecosystems in order to make a sustainable economy.*

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**Keywords:** *sustainable development, European Green Deal, public policy, urban ecosystems*

**JEL Classification:** *O13, P18, Q53, R11*

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## INTRODUCTION

Green economy is a key element related to economic development (Mihăilescu et. al, 2021). Hence, environmental protection activities should be viewed as inter-linked components in the developing process of economy. Starting from this axiom, interrelationship between Population with access to the sewage system and GDP per capita has been analysed. Initially, it has been made a graphic representation for both moments of references, having as key variable Population with access to sewage systems. The research continues with determining the causality relationship between these two series of data above-mentioned. In order to have a relevant image, it were used methods like Gini coefficient (Westfall, 2020) and Lorentz Curve (Estevez, 2020).

In the end, based on causality relationship it is carried out a statistical radiography of Romania's economic development model through comparative analysis between simple regression model and GWR regression model which use spatial weights.

## LITERATURE REVIEW

The world has limited resources, society is obliged to evolve toward a system that uses renewable resources. This perspective was studied by Gaspertos et. al (2017), transition process of global economy to green economy being the most important issue to develop a sustainable economy, idea promoted also by Chojnacka et. al (2020). The transition to green economy is carried out incrementally being focused on linked activities (education, infrastructure, etc.), this transition assuring growth of social welfare and, also, poverty reduction, issue confirmed even by Maria et. al (2014). A reliable example is the concept of Society 5.0 which aims to transform all conventional activities into digitized activities.

An important impact on the environment, played by the economy, is waste water. Hence, a big challenge is to mitigate water pollution. For that, the benefits of reducing water pollution were studied by Kszycki et. al (2021). Also, Seroka-Stolka et. al (2019) approached the efficiency of water usage.

Water treatment and modernization of the sewage system are two of the most important challenges during the transition to green economy (Raheem et. al, 2018). Another interesting approach comes from Nigeria, a country that has huge problems regarding water resources, study carried out by Oladimeji et. al (2021).

Moreover, during the pandemic time, it was noted that within an upgraded sewage infrastructure could have a lot of benefits in the medical sector, as Carillo-Reyes et. al (2020) shown.

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## METHODOLOGY, DATA, RESULTS AND DISCUSSIONS

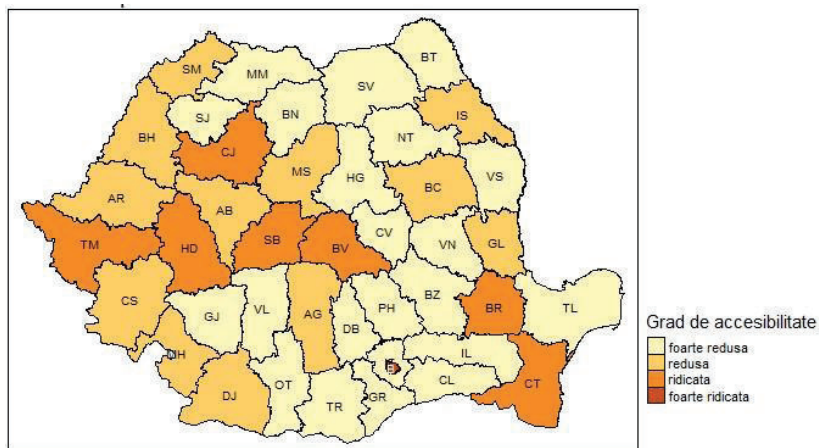
In order to draw a strategy of sustainable development, the most important thing is the starting point. The present should be related exactly using a clear and concise manner to be able to write a pragmatic strategy.

Thus, in order to have a clear idea about evolution of the environmental protection, from Romania's economic activities perspective, it has been used two variables, such as: Population with access to sewage (disaggregated at counties level) system and GDP per capita. These variables were selected for two moments of references (2006 and 2018) which capture the year before Romania's accession to European Union (2006) and the last year with available official data (2018), assuring the comparability between data. In addition, data were standardized by dividing individual value to national's mean. Also, to avoid the correlation between variables and population size, both variables were divided to the number of population of each county.

Jenks algorithm is one of the most powerful cluster algorithms, especially when using heat-map graphs. It has been chosen due to its high level of statistical discrimination during the spatial analysis.

### Population with access to sewage system in 2006

Figure 1



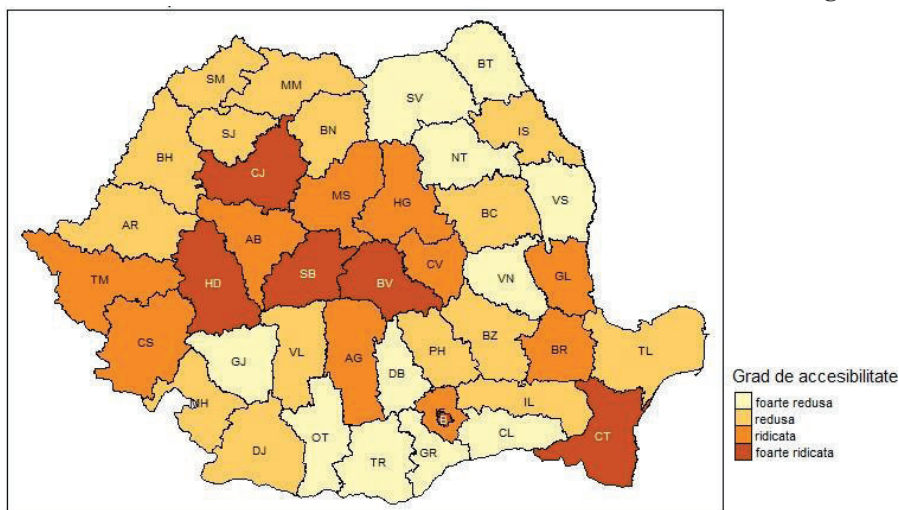
Data source: NIS, own processing using Rstudio

The year 2006 is the last year before Romania's accession to European Union. The access of population to sewage systems was high in Bucharest and in the west of the country, but there were also several counties from south-east of Romania like Braila and Constanta which had a good level.

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### Population with acces to sewage system in 2018

Figure 2



Data source: NIS, own processing using RStudio

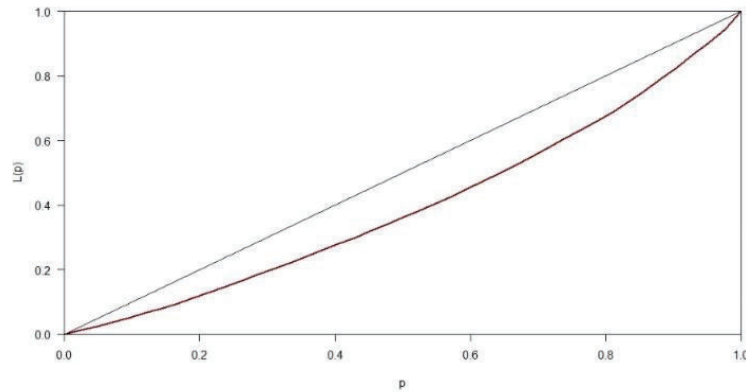
The differences among the two moments of reference are obvious. If in 2006 Bucharest was the only area with the highest grade of access to sewage system, in 2018 is noticed an impressive evolution of several counties, like: Hunedoara, Cluj, Sibiu, Brasov or Constanta (Figure 2). Moreover, it's important to mention the evolution of Ilfov county which has had an exponential evolution, perhaps as a consequence of development of the real estate sector and even as a result of migration of the population from the city center of Bucharest to the nearby areas of Romania's capital.

However, to have a complete image about how large were the discrepancies among counties, for year 2006 and year 2018, it were used Gini coefficient and Lorentz Curve.

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### Lorentz Curve of Population with acces to sewage system in 2006

Figure 3



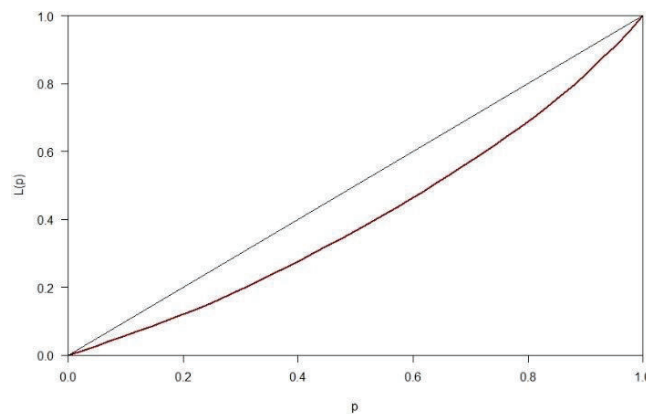
Data source: own proccesing using RStudio

Gini Coefficient= 0.2

The Gini coefficient of the year 2006 reveals a reasonable difference between Romania's counties regarding population access to sewage systems, and also, sewage infrastructure (Figure 3). The situation of 2006 reflects the spatial differences and disparities of teritorial-administrative development, these differences are assumed to be incrementally mitigated, in foreseeable future, through absorption of European funds, and, also, by implementing chorent and efficient public policies.

### Lorentz Curve of Population with acces to sewage system in 2018

Figure 4



Data source: own proccesing using RStudio

Gini Coefficient= 0.19

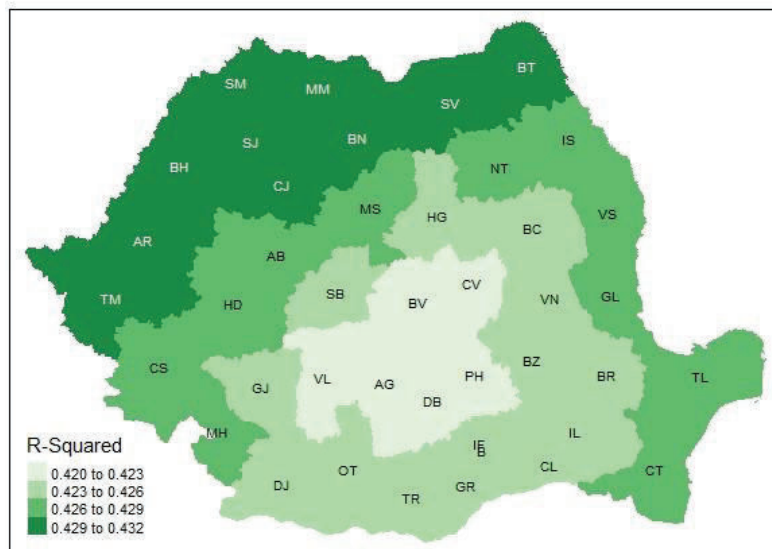
Starting from Romania's accession to the EU, we can observe that disparities among counties shall be reduced for population access to sewage systems. Linked to former graphs, it could be said that disparities shall be reduced, making a real progress in the environment infrastructure field (Figure 4). In other words, the benefits of European Union accession (EU funds, sustainable development strategy, etc.) have had an important impact on the real economy.

To have a better understanding of EU benefits in developing environmental policies, it should be demonstrated the causality relationship between the two variables used in this paper. After the technical stage, it should be affirmed that for both moments of reference there is a causality relationship. Regarding anterior aspects, this process could be watched as a regional development system.

Every time when the target is drawing a regional development strategy it should take into account the specificity of the areas. Hence, to have a better understanding of the interrelationship of these two variables it is useful to use GWR model.

**GWR model with Y= population with acces to sewage system and X= GDP per capita for 2006**

*Figure 5*



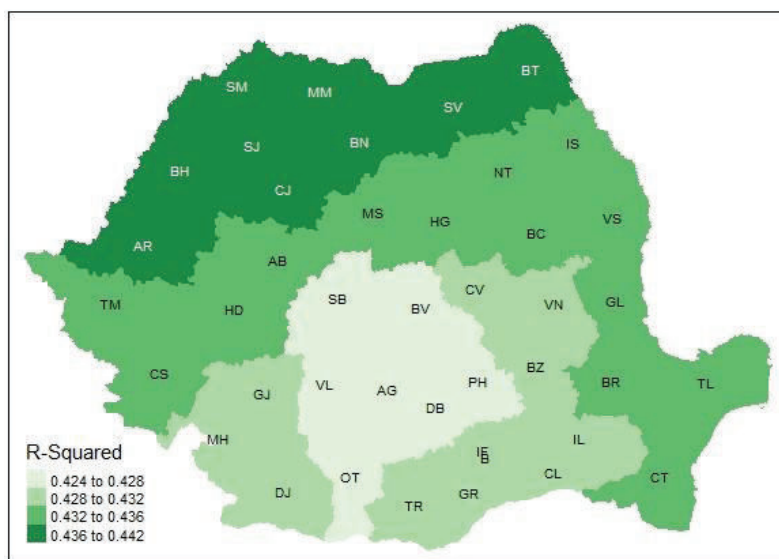
*Data source: own processing using RStudio*

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The differences of that regression model are almost unnoticeable which leads to the conclusion that there is a uniformity of population access to sewage system, not being quite linked with living conditions or economic growth (Figure 5).

**GWR model with Y= GDP per capita and X= Population with acces to sewage system for 2006**

*Figure 6*



*Data source: own processing using RStudio*

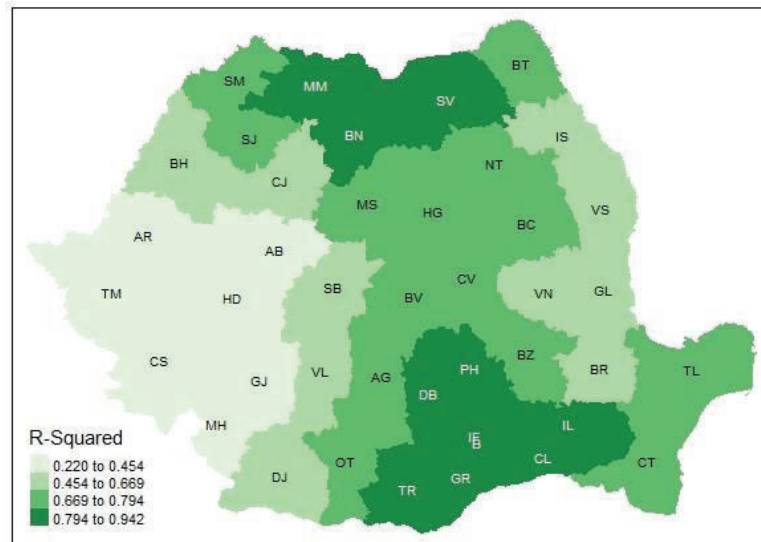
Year 2006 does not reveal big differences from territorial aspect perspective. Briefly, the way was linear, and investments were managed by central administration. Equally, it could be affirmed that GDP per capita hasn't been influenced by environmental infrastructure, like population access to sewage systems hasn't been deliberately influenced by GDP per capita (Figure 6).



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**GWR model with Y= Population with acces to sewage system and X= GDP per capita for 2018**

*Figure 7*



*Data source: own processing using Rstudio*

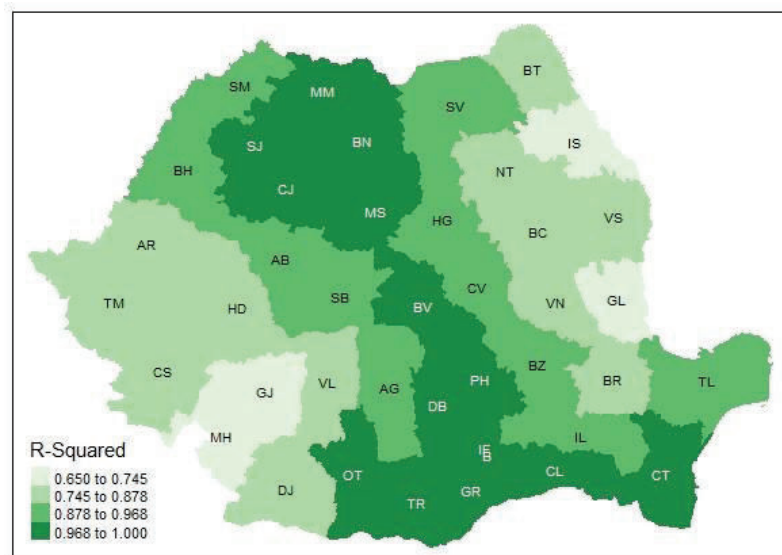
Retrospectively, it has been observed an important growth of influence to GDP per capita, especially in south- east, north and the middle of Romania, the causality being more persistent than was in 2006. Thus, there are several areas where the causality relationship is not too accurate, especially in the west and east of the country (Figure 7). If the west is an area with higher living standards with constant investments in infrastructure , it's very interesting to discuss the reduced causality relationship from Moldova. Moldova is probably the poorest area from Romania, as a consequence of the interrelationship is not as pronounced as is for other areas. Sometimes, to curb disparities and fill the gap among counties, the Government sustains strategic investment, reducing the impact of local economic productivity to social environment and living standards.



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**GWR model with Y= GDP per capita and X= Population with acces to sewage system for 2018**

*Figure 8*



*Data source: own processing using RStudio*

The time evolution is somehow surprising. The interrelationship is more pronounced in south, centre and north of the country, which means, after Romania's accession to the EU, local decidents, by accessing European funds, they made investments in the whole infrastructure sector. Undoubtedly, it may affirm that counties with a high economic randament have modern environmental infrastructure, but, also, the investment in environmental infrastructure could generate value in the economy (Figure 8). On the other hand, the west part of the country noticed a decrease of interrelationship between environmental infrastructure and living standards, access to sewage systems being a standard facility, enough developed in this area of the country. This fact comes from linear evolution of the west zone, not existing a 0 moment or an important trigger to protect and develop ecosystems.

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## CONCLUSION

The path of Romania to a green economy is in growth. The year 2007 means an important one regarding the economic trajectory of Romania.

If year 2006 gives a linear image, couldn't said exactly which are regional development troubles. However, after 2007, absorbing EU funds by local communities lead to increasing two key elements for a durable society, environmental protection and living standards of the citizens. The causality relationship between these two aspects represents the sustainable model that every society should follow up. From that point of view, the hypothesis promoted by Maria et. al (2014) is confirmed.

The specificity of Romanian territory and its heterogeneity of territorial-administrative units play an import role in developing process of counties after 2007. The research shown that the causality relationship among access to sewage system and GDP per capita is more pronounced when it used a regression model which has taken into account the territory specificity (GWR model). In addition, there are several big discrepancies from the development perspective between the west zone and the other areas of the country. The west zone means an atypical category, being an area where standard livings and education have contributed to raise the sanitary level and environment infrastructure. By contrast, the rest of the country, especially the south and Moldovian zone, represents deprived areas for which accession to European Union was a chance to curb the gaps against the developed regions.

In order to achieve all desiderates of European Green Deal, Romania should develop a coherent strategy of ecosystems, even in urban areas and rural areas, to raise economic productivity by more effective use of resources.

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