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**A COMPARATIVE STUDY OF THE URBAN MORPHOLOGY IN EUROPE  
USING GMES URBAN ATLAS: THE POST-SOCIALIST CITY VS. THE  
CAPITALIST CITY (ROMANIA VS. FRANCE)**

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**ABSTRACT**

The urban morphology represents the study of the city, namely its built environment. Consequently, this paper investigates the urban form and its characteristics in two countries which have been under different political and socio- economical regime after the Second World War (WWII), therefore being submitted to different urban planning policies. Nowadays, there is an important debate about the particularities of the urban form in the countries which have been under the influence of the former USSR before 1990 and have after that undergone a transition to the market economy. It is possible to observe major distinctive features between the urban form of the Romanian cities and the French ones? Therefore, can we speak of a post-socialist city in Romania which is different from the capitalist city in France? What role plays the European identity in the urban planning of both countries? Are the remade cities similar to those in the Western Europe, namely the capitalist world? What role plays the socialist legacy in the urban planning of the post-socialist city? (see large industrial plants, collective housing lots etc.) These are the questions this paper address in order to identify the outlines of the urban form of the post-socialist Romanian city, as well as its similarities and dissimilarities to the capitalist city. The database used for this analysis is GMES Urban Atlas, which is an urban atlas developed by EEA which provides comparable land use and land cover data for the European Large Urban Zones with more than 100.000 inhabitants as defined by the Urban Audit. Hence, GIS and statistical analyses are mobilized in order to derive the particularities of the urban areas of Iasi from Romania and Lyon from France, seeking to identify what makes the post-socialist city unique with regard to the capitalist one. The main results show the fact that adopting a policy of « shock therapy », the urban areas from Romania tried to copy the western model of the capitalist city, but without a solid legislative and financial back-up and being also confronted to the socialist heritage, it resulted into a hybrid urban development.

**Keywords:** post-socialist city, GMES Urban Atlas, capitalist city, GIS

## INTRODUCTION

The object of study of the urban morphology is the physical form of the human settlements [10]. The word “form” refers in any language to a notion of appearance. From the Latin word "forma" meaning “form”, shaping a city, implies to associate it to a certain composition, a representation that can lead to subjective interpretation that each individual gives derived from his own perception. For Conzen [2] the study of urban form refers to the analysis of the physical form of the city, doubled by its functional analysis. Moreover, as Conzen also points out, one should not forget the historicity of the urban spaces when analyzing the urban form, view that is also shared by Foucault [4]-, who also suggests a morphological analysis of the urban form taking into account the links between the physical and social aspects of a city.

As Foucault [4] said “space itself has a history”, therefore the European cities bear the imprint of the complex history that characterize the European continent. The forces that shaped the urban morphology of the European cities are complex and various. Taking into account only the events of the last century, one can think to the end of the Second World War and the division of post – war Europe in two parts, as a result of the Yalta Conference that created the premises of divergent evolutions for the Western European cities and the Eastern ones, which entered under the socialist influence of the USSR. The result was the emergence of a spatial dichotomy between the West and the East through two different ways of urban planning: the capitalist and the socialist city. This divergent evolution came to an end with the falling of the communist regime between the years 1989-1991, but the return to the capitalist regime didn't necessarily mean a homogenization in what concerns the urban development. Confronted with a new era, the socialist city, became the post-socialist city and despite several mechanisms of reintegration directed by the Western Europe and the USA (e.g. the Washington Consensus), the former socialist countries had still to cope with the marks of the socialist heritage, which led to the arise of different questions. How, if anything, did the socialist legacy perturbed the European identity of the former socialist cities? Are those remade cities similar to those in the Western Europe, namely the capitalist city? Or are there major distinctive features between the urban morphology of the capitalist and post-socialist cities?

Taking these questions as a starting point, this paper focuses on outlining the major particularities of the urban form of the post-socialist Romanian city, as well as its similarities and dissimilarities to the capitalist city. For this study, the urban morphology of Iasi (Romania) and Lyon (France) was analyzed with the aid of different indicators, that were found studying the literature on this topic. Hence it is possible to identify two main categories. The first is represented by indicators that quantify the shape of the city starting from its spatial structure and the second is represented by socio-economic indicators[11].Therefore, on one hand, we have the analysis of the urban areas with the emphasis on the physical structures, that are more or less inert over long periods of time [6],[8] and on the other hand, the researchers add the socio-economic aspects [9], [12] as the population is in fact the element that inhabit and transform an urban area in function of their needs.

## 1. DATABASE AND METHODOLOGY

### 1.1 Database – GMES Urban Atlas

Land-use patterns for the identification of the particularities of the urban morphology of Iasi and Lyon are derived from the GMES Urban Atlas, that is a database developed by the European Environment Agency (EEA). This database represents a significant improvement from Corinne Land Cover datasets (scale: 1:100.000 ; MMU : 25 ha), as the GMES program has allowed the realization of maps with a higher degree of resolution (scale:1:10.000 ; MMU : 0.25 ha - artificial surfaces and 1 ha - other surfaces ) which allow a more detailed analysis in what concern the land use in the 27 countries of the European Union. [13] This program covers the urban areas with more than 100 000 inhabitants, as defined by the Urban Audit for the reference year 2006. Data processing and satellite images were done by specialists, according to the GSE mapping guide, realizing adjustments where necessary. In order to obtain the land cover maps for each city, a classification into 20 classes was used, depending on the type of land use (e.g. residential, industrial, green spaces, etc.).

- The **Residential class (RES)** - predominant residential use which includes five sub-classes, according to their degree of imperviousness, as it follows:
  - *Continuous Urban Fabric* with a sealing Degree above 80%;
  - *Discontinuous Dense Urban Fabric* with a sealing degree between 50% - 80%;
  - *Discontinuous Medium Density Urban Fabric* with a sealing degree between 30% - 50%;
  - *Discontinuous Low Density Urban Fabric* with a sealing degree between 10% - 30%;
  - *Discontinuous Very Low Density Urban Fabric* with a sealing degree below 10%;
- **Green Urban Areas (GUA)** - public green areas, forests are not included being identified as a different class
- **Industrial, commercial, public, military and private units (IND)** – degree of soil sealing greater than 50%, occupied by buildings with non-residential use

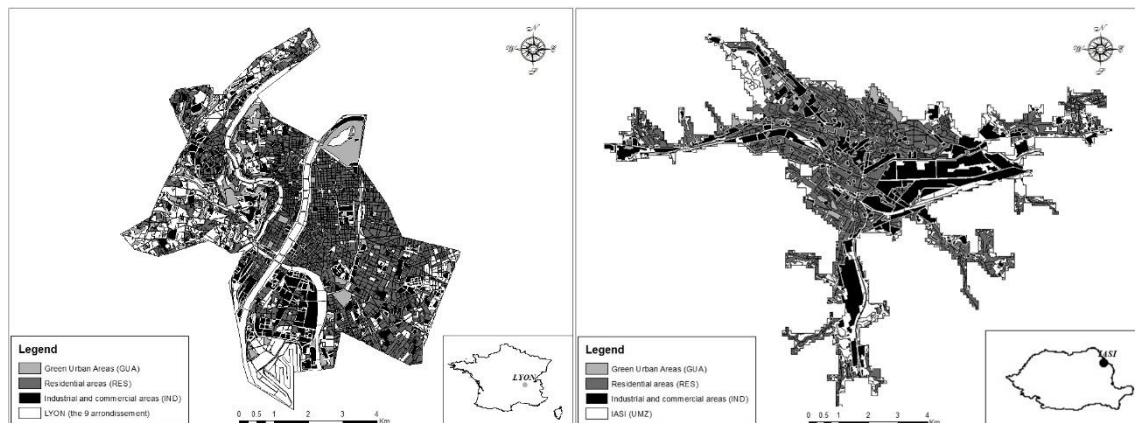


Figure 1 - The land use classes choose to study – left Lyon, right Iasi (Source: GMES Urban Atlas)

## 1.2 Methodology

Taking into account the fact that the GMES Urban Atlas provides, as mentioned above, data concerning the land-use types in an urban area, the methodology used in this study is limited to the analysis of the land-use patterns, that were derived using indicators that focus on identifying spatial patterns of the structure of the urban tissue. Thus, a set of indicators combining statistics and GIS techniques were calculated varying from simple ones like *the median area* of residential/green/industrial zones or *the average distance* from a residential zone to a green urban area to more complex ones like *Compactness coefficient*, *Circularity index*, *Diversity index*, *Coefficient of Geographical Linkage* and *Moran's I Autocorrelation Index*.

The *Compactness coefficient*, as well as the *Circularity Index* focus on the regularity of the spatial extent of an urban area, being a good indicator for the degree of the urban sprawl phenomenon. A value close to 1 indicates a compact/circular shape. The more the value increases, the more the urban area is dispersed.

The *Diversity index* is generally used by ecologists, being more commonly known as the Shannon diversity index. For this study, the index takes into account the number of all classes of land use and their relative abundance for the two urban areas analyzed. The index can obtain values between 0 and 1, a value that approaches zero meaning an urban zone without a great diversity in what concerns the land-use types.

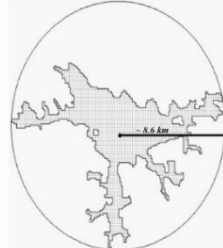
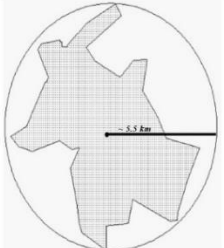
The *Coefficient of Geographical Linkage (G index)* highlights the degree of association of two sets of variables by the systematic evaluation of the dissimilarity or the congruence in their distribution. [3] This index is in fact expressing the interdependence of two variables as a direct result of geographical distance. A value above 80 indicates a congruence in the distribution of the sets of variables and thus a high spatial association, while a low value ( $G < 60$ ) reveals a dissimilarity in the distribution of the sets of variables.

Finally, the *Moran's I autocorrelation Index* was calculated taking into account the distance in order to see if the degree of clustering appears at a certain distance from the barycenter of the urban area and also if there are any spatial gaps in what concerns the spatial autocorrelation trend. The Z-scores were also derived, as they reflect the intensity of spatial clustering.

## 2. RESULTS AND DISCUSSION

### 2.1 Results

It should be noted that in order to have an equitable comparison between Iasi and Lyon, the area of study for the latest was reduced to the urban area of the nine "arrondissements" that compose the city of Lyon, as the surface of the Urban Morphological Zone of Lyon was too large in comparison with the surface of the Urban Morphological Zone of Iasi, while the total surface of the nine "arrondissements" is closer (see Fig. 2)

	<b>IASI</b>	<b>LYON</b>
		
<b>Area (km<sup>2</sup>)</b>	<b>51.03</b>	<b>47.86</b>
<b>Population</b>	<b>290422</b>	<b>484344</b>
<b>Compactness coefficient</b>	<b>2.46</b>	<b>1.19</b>
<b>Circularity index</b>	<b>0.16</b>	<b>0.70</b>
<b>Diversity index</b>	<b>0.11</b>	<b>0.33</b>
<b>G index (GUA/IND)</b>	<b>75.08</b>	<b>81.25</b>
<b>G index (REZ/IND)</b>	<b>63.12</b>	<b>89.29</b>
<b>G index (GUA/REZ)</b>	<b>81.27</b>	<b>77.80</b>
<b>Median area of RES (m<sup>2</sup>)</b>	<b>13401</b>	<b>5400</b>
<b>Median area of IND (m<sup>2</sup>)</b>	<b>118.3</b>	<b>97.5</b>
<b>Median area of GUA (m<sup>2</sup>)</b>	<b>19817</b>	<b>6324</b>
<b>Average distance RES – GUA (m)</b>	<b>1126.1</b>	<b>483.8</b>
<b>Average distance RES – IND (m)</b>	<b>360.9</b>	<b>327.3</b>

**Figure 2 - General statistics and calculated indexes for Iasi and Lyon**

Analyzing the results in the figure 2, it can be observed that the urban area of Lyon presents a higher degree of compactness, while the urban area of Iasi has a greater irregular spatial extent. In what concerns the diversity index, one would note that there is no big difference, Lyon having a slightly greater value. For the median area of a residential zone, one should note the almost double value for Iasi, the situation being the same for the green urban areas where Iasi has almost a triple value than Lyon, while the median area of industrial and commercial areas is less different, Iasi obtaining however a greater value. Notice that the average distance from a residential area to a green urban area is also more than double for Iasi in comparison to Lyon, while the distance between residential zones to industrial and commercial ones are more or less similar. Finally, the G index varies from 69 to 89 for the spatial association of RES/IND, Lyon obtaining this time a greater value, fact that reveals a high spatial association for these two categories for this city. In what concerns the values obtained for GUA/IND and GUA/REZ they vary from 75 to 81 showing a high degree of spatial association for both analyzed cities.

One should note from analyzing the figure 3 that both cities present a high degree of clustering for the residential areas, that decrease as we go farther from the barycenter of the city, the peak of Z scores being at a distance of 1000 and 2000 m for Iasi and at 2000 and 3000 m for Lyon. In what concerns the industrial and commercial areas, one could also observe a more sinuous trend of spatial autocorrelation for Lyon, while for Iasi, the degree of spatial clustering decrease with the increase of the distance, recording a very small ascendant trend after 6000 m. The values of the Z-scores also reflects the intensity of change of the spatial autocorrelation for both cities, the peaks being at a distance of 3000 and 4000 m for Lyon and at 2000 m for Iasi, with a small secondary peak at 6000 m.

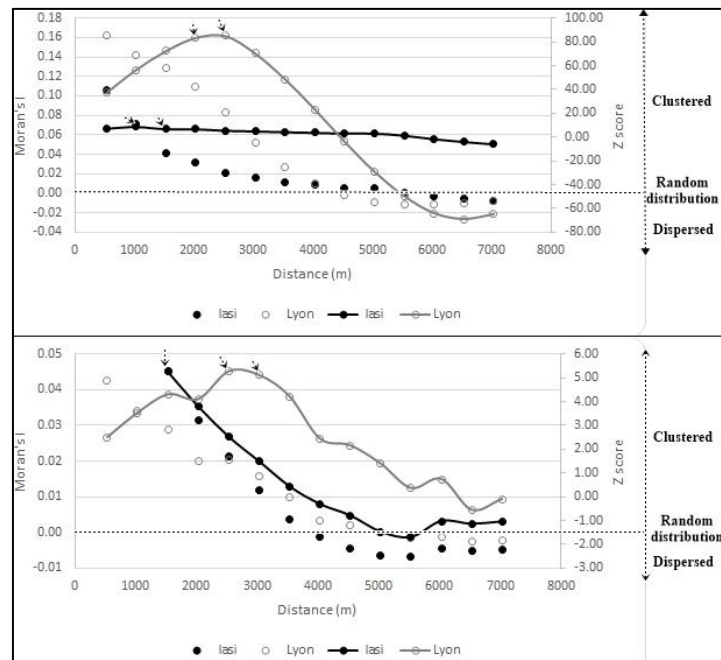


Figure 3 - Moran's I and Z score for RES (top) and IND (down)

## 2.2 Discussions

The urban areas are the socio-economic engine of the society. Being dynamic entities in time and space, the urban areas integrate in their development specific features derived from the historical and economical events that have succeeded over the years. Therefore, for the central-eastern European cities that have been submitted to an important number of political and socio-economic changes over the time, one could expect a hybrid type of urban development that encompass the European identity, the socialist heritage and the urban policies imposed by the European Union. However, the question that follows is how similar is this hybrid type of urban area, namely the post-socialist city to the capitalist city, which was promoted as the model to be adopted in order to re-integrate in the new globalized world.

The comparative analysis of the indexes that were calculated for the two urban areas allows on one hand the identification of specific features for Iasi (the post-socialist city) that are primarily due to the socialist heritage, but also due to the process of institutional and socio-economic transition to a pluralistic society, that meant among other things a loose control over the spatial development. When analyzing the median area of the green urban areas, one could derive a couple of adverse effects of the land privatization. Namely, taking advantage of a loophole in the legacy of the socialist urban plans that did not delimit the small green and open spaces that were inside the perimeter of the residential lots as an individual category but regarded them as belonging to the residential complex, the new market actors transformed them in new residential or commercial zones without changing in appearance their use [7], but in fact reducing the total area of green spaces. Therefore, the ones that stayed more or less untouched were the large parks or public gardens. Consequently, this is what explains the big difference in terms of size between the two urban areas, as the western capitalist city already has an important tradition on focusing in conserving the green urban spaces, while the post-socialist city is at the beginning of road, trying to align to the demands of a sustainable urban development and encompass the limitations inherited from the socialist urban

planning. Also considering the great value of the median area for the residential zones for Iasi, one could identify the strong socialist heritage in the form of vast collective housing lots. Yet, the same cannot be said about the industrial and commercial zones, as the median area for both cities is rather similar. This similarity can be explained by the fact that despite having inherited large industrial plants from the socialist period, in many post-socialist cities, Iasi making no exception, a great number of them have been closed due to low productivity, low market demand or high cost of raw material acquisition.

On the other hand, it is possible to observe also some similarities, mainly, derived from the shared European identity that no political regime can erase. Both Lyon and Iasi have an historical core with a predominant residential function, proof of their European distinctiveness. (see Moran's I index – fig. 3). Moreover, in what concerns the spatial autocorrelation of the industrial and commercial zones, it should be noted that both urban areas have a degree of spatial clustering that decrease with the increase of the distance and making a parallel with the degree of clustering of the residential zones, one could observe that both Iasi and Lyon are prone to sub-urban residential development, the compactness coefficient (see fig. 2) also validating the fact that both areas are dispersed and therefore confronted with the urban sprawl, a characteristic of the capitalist city, as the socialist city was distinguished generally by the high degree of the compactness of the urban form [5]. In addition, taking into account the coefficient of geographical linkage (see fig. 2), another similarity is derived as one could observe the high degree of spatial association for the residential and green urban areas, as well as for the industrial and commercial zones and the green urban areas. This spatial association shows the alignment of the post-socialist city (Iasi) to the defies of promoting a sustainable urban regeneration by reducing the intensive degree of soil-sealing inherited from the speeded-up socialist urbanization when the economy of space was quasi-non-existent.

To sum up, the results obtained sustain the fact that despite having particular features, Iasi still preserves key features regarding its European identity, and on the overall level, one could not identify major distinctive features between the urban morphology of the capitalist and post-socialist cities.

## CONCLUSION

It should be mentioned that the “socialist city” is a disputed term, as there is no consensus in the literature that the socialist regime has indeed created a distinctive urban model [1], and therefore its post-version model is also questionable. Nevertheless, as the exploratory analysis conducted in this paper showed, the former socialist city has some distinctive features inherited from the socialist period (e.g. the large collective residential lots), but in the same time, the European identity acquired over centuries of development is preserved, (e.g. the historical urban core) and the major characteristics of the western capitalist city are also observable (e.g. the urban sprawl). Thus, there is a mix of old and new elements, that materialize in a hybrid urban development that searches its new identity, but “the post-socialist” term can be validated precisely by the inherited socialist particularities that are embedded in the new urban development adopted by the former socialist countries and that represents in fact its individuality vis-à-vis the western capitalist cities.



Therefore, when analyzing the morphology of an urban area, one should not forget that the urban tissue keeps the memory of the past through its spatial structures, a good evidence being the fact that the socialist policies could not alter the already built-up environment and therefore created new spatial structures, which in turn cannot be erased overnight and that's why the cities that were under the socialist regime will always have some distinctive features in regard to the western capitalist city.

Finally, it is important to emphasize the fact that this study has limitations derived from its extensive focus on the functionality and form of the urban areas, while a city is not limited to only these two elements. It is also necessary to consider adding socio-economic datasets in order to capture the social dimension of the city, not just the physical one in what concerns the future researches, but for an exploratory study it offered valuable information.

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