Centrul de Cercetare a Mediului și Efectuarea Studiilor de Impact
Bld. Nicolae Bălcescu, nr. 1, sector 1, cp: 010041, București
Tel: +40213103872; e-mail: office@ccmesi.ro*; website:* www.ccmesi.ro

Final report – briefing

Developing a model of integrated planning regarding the public and private services accessibility in metropolitan areas

M.Acc.Net

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Director:

Lector Dr. Gavrilidis Athanasios Alexandru

Mentor:

Prof. univ. dr. Laurențiu Rozylowicz

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Detailed report request: athanasiosalexandru.gavrilidis@g.unibuc.ro

Contents

1. General presentation of the project's results

1.1. Objective's fulfilment of the project

***Project's goal**: Establishing a methodological framework for improving the accessibility network of public and private services in metropolitan areas*

Objectives	Activities (accomplishment indicators)	Level of fulfilment
O1: Establish the general framework for evaluating public and private services in metropolitan areas	- Evaluation of the functionality of metropolitan areas (indices of circularity, concentricity, homogeneity, built expansion). - Identifying the socio-economic profile of metropolitan areas (socio-economic statistics of metropolitan areas). - Determining the degree of coverage with public and private services (maps with the level of coverage with various public and private services). - Identifying the actors involved in the planning of metropolitan areas (SNA analyses on the degree of involvement and collaboration of actors at different levels of government).	100%

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O2: Assess the degree of accessibility to public and private services in metropolitan areas	- Assessment of the degree of connection to public and private services (indices on the efficiency of the transmission network - ICT, TSI, PTC; indices on the degree of accessibility to public and private services at building level - ODL, TIAD, GMI); - Mapping the levels of accessibility to public and private services (maps with the degree of accessibility to public and private services in metropolitan areas).	100%
O3: Proposing a model of efficient planning of network accessibility by public and private services in metropolitan areas	- Identification of the necessary public and private services in the metropolitan areas according to the socio-economic profile (SNA analyses regarding the position of the types of services in the network of accessibility to public and private services). - Create a network of public and private services in accordance with the spatial characteristics of the metropolitan area (maps with suggested locations for each type of public or private service in metropolitan areas).	100 %

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1.2. Expected results and deliverables

Dissemination and scientific visibility - participation in scientific conferences		
Expected deliverables	***Deliverables provided***	**Level of fulfilment**
4 conferences (2 national, 2 international)	1. **Gavrilidis A.A.**, Niță A., Niculae M.I., **Rozylowicz L.** (2019), Romanian metropolitan zones: A status without a specific approach?, Ecosmart International Conference – Environment at a CrossrOads: SMART approaches for a sustainable future, 5-8 September, Bucharest, Romania; 2. **Gavrilidis A.A.**, Niță A., **Rozylowicz L.** (2019), Landscape structure: a fundamental criterion to be considered when planning metropolitan areas, 10th IALE World Congress – Nature and society facing the Anthropocene challenges and perspectives for landscape ecology, 1-5 July, Milan, Italy 3. **Gavrilidis A.A.** (2020), *The influence of morphological and structural landscape features on metropolitan connectivity*, ELI-IALE International Conference on: Socio-Ecological Practice Research for Sustainable Landscape Governance, September 06-08 September, Bucharest, Romania (on-line event) 4. **Gavrilidis A.A.** (2020), *Metropolitan efficiency in providing access towards public and private services throughout their territory*, The 2nd International Conference on Reshaping Territories, Environment and Societies: New Challenges for Geography, November 20-21, Bucharest, Romania (on-line event)	**100 %**
Dissemination and scientific visibility - published articles		
Expected deliverables	***Deliverables provided***	**Level of fulfilment**
2 scientific articles submitted for publication	1. **Gavrilidis A.A.**, Popa A.M., Niță M.R., Onose D.A., Badiu D.L., (2020), Planning the "unknown": Perception of urban green infrastructure concept in Romania, Urban Forestry & Urban Greening, in press, Impact factor 3,734; 2. **Gavrilidis A.A.,** Niță A., Niculae M.I., (2020), Assessing the Potential Conflict Occurrence Due to Metropolitan Transportation Planning:A Proposed Quantitative Approach, Sustainability, 12 (2), 527, Impact factor: 2,592.	**100%**

Project management - scientific		
Expected deliverables	***Deliverables provided***	**Level of fulfilment**
2 annual report	2 annual report	**100%**
1 final report	1 final report	**100%**
Project management - scientific		
Expected deliverables	***Deliverables provided***	**Level of fulfilment**
1 online platform for the project	https://ccmesi.ro/?page_id=1160	**100%**
Project management - financial		
Allocated budget	***Budget spent***	***Investment in the project***
249.525,00 RON	249.525,00 RON	**100%**

2. O1: Establishing the general framework for assessing the private and public services accessibility in MA

2.1. Assessing the functionality of the Romanian MA

In most cases, the metropolitan areas established in Romania considered mainly the political criteria when questioning their composition. Thus, aspects related to morphology, local geography, historical relations, or socio-economic realities were put in the background or ignored. Starting from the hypothesis that a circular shape is a stable shape and easy to manage (Medda, Nijkamp et al. 1998) we analysed the shapes of the metropolitan areas. The results indicate that the metropolitan areas of Oradea and Cluj-Napoca are the closest to a perfect circular shape, at the opposite pole being the metropolitan area of Craiova which has a rather sprawling shape. Applying the circularity formula, we notice that the metropolitan areas of Constanța and Iași also have irregular shapes, but in these cases the result is justified by the fact that the two metropolitan areas are located in the coastal area or close to the state border.

To determine the concentricity of the analysed metropolitan areas we used the classic formula of concentricity which represents the ratio between the minimum and maximum distance between the centre point and the edges. In the present study, the focal point was represented by the centroid of the metropolitan area, established in ArcGIS. The distances were calculated between the centroid and the edges of the metropolitan area that intersect imaginary lines on the 8

cardinal points. The results indicated that the Cluj-Napoca metropolitan area registers the best values both in the case of *Coned* and in the case of *Consrd*. From a territorial planning perspective, the *Consrd* value can be considered more relevant, as it indicates that metropolitan localities are positioned concentrically to the polarizing city center, an advantage in the event of developing measures to improve connectivity between metropolitan localities. Another interesting aspect is the one related to the difference between *Coned* and *Consrd* for each case. These indices can also project the degree of decentralization of the metropolitan areas, because the greater the difference between the indices, it means that the centre of the polarizing city is further from the geometric centre of the metropolitan area.

Another important criterion in the preliminary assessment of the functionality of metropolitan areas is their degree of homogeneity. In this case, it was wanted to determine the degree of homogeneity of the built-up area at the metropolitan level. Thus, the homogeneity index of built surfaces (BHI) was calculated at metropolitan level and the results indicate that the metropolitan area of Brașov is the most heterogeneous in terms of dispersion of built nuclei. This is normal because, we will see later, this metropolitan area is characterized by a high degree of fragmentation of the relief, a reality that does not allow construction on compact and large surfaces. At the opposite pole is the Târgu Mureș metropolitan area, which registers a homogeneity score of the built-up areas of 0.95, remarkably close to the upper threshold.

There was also calculated another index revealing the *Building Expansion Trend* (**BETI**). In the case of the metropolitan areas included in the present analysis, the BETI values are negative in 4 cases - the metropolitan areas Baia Mare, Botoșani, Brașov, Iași and Târgu Mureș, the latter registering the lowest value (-1.26). In the case of these metropolitan areas these values can be generated by several phenomena. The first could be suburbanization, when the urban population builds buildings with residential functions in rural areas due to environmental and living conditions superior to those offered by the city, but also in the context in which the rural population.

Another important aspect in the initial assessment of the efficiency of metropolitan areas is related to local geographical features. The complexity of these characteristics determines the degree of difficulty related to the expansion of some infrastructures but also the degree of attractiveness for housing. In this sense, they have extracted characteristics related to altitude and

slope, important elements in planning the extension of the levels of accessibility to public and private services within the metropolitan areas.

2.2. Identify the socio-economic profile of MA

Within stage II of the M.Acc.Net project. the economic profile of the nine analysed metropolitan areas was made. The CAEN codes were used to establish the economic profiles, the indicators used to be the number of units per administrative unit and the average number of employees involved in each activity. The results indicated that in all the metropolitan areas analysed, the trade activity is the most accentuated, both in terms of number of units and in terms of average number of employees. However, the metropolitan areas analysed are not based solely on consumption, as production activities are more numerous. In general, in addition to consumer activity, metropolitan areas are also characterized by activities of the manufacturing industry; constructions; transport and storage or professional and scientific activities.

2.3. Establishing the coverage of public and private services in MA

Within this activity, the degree of coverage at metropolitan level of the following types of services was established: a) leisure and leisure; b) culture; c) education; d) security; e) landscaped green spaces; f) running water supply; g) sewage and h) natural gas supply. Initially, this analysis also included sanitation services, but in the absence of data, this indicator was abandoned. The results indicate that in terms of the indicator on coverage with health services, all administrative units within the metropolitan areas analysed benefit from at least one unit that provides such services.

2.4. Identifying the actors involved in metropolitan planning

The establishment of metropolitan areas involves a decentralized way of managing the territory. Within this activity, the evaluation of the degree of decentralization of the metropolitan areas chosen for analysis was considered. It was found that metropolitan areas collaborate more intensively with local actors, followed by collaborations with regional, private, and national actors. This indicates that metropolitan areas have a decentralized approach to spatial planning. The results showed that the main services for which local public authorities collaborate with other actors to increase their coverage at the metropolitan level are sewerage services, water supply, education, green spaces, health, transport or recreation and leisure.

3. O2: Assess the accessibility levels of public and private services in MA

3.1. Assessing the coverage of public and private services

The connection of residents to public and private services is ensured by the existing transport infrastructures at metropolitan level. In this sense, the transport infrastructure in each metropolitan area was evaluated, the target being the evaluation of three characteristics: the complexity of the transport infrastructure, the sustainability of the transport infrastructure and the degree of coverage of the public passenger transport network at metropolitan level.

The establishment of the degree of complexity of the transport infrastructures was made at the level of each territorial administrative unit within the metropolitan areas. The obtained results projected the fact that eight out of nine metropolitan areas analysed register an average degree of complexity of the transport infrastructure, ZM Constanța being the only one that registers a high level of complexity of the transport infrastructure.

To assess the sustainability of transport infrastructure at the metropolitan level, the lengths of different types of infrastructure were used, differentiating the types that allow or encourage the use of non-polluting means of transport compared to traditional transport infrastructures. The obtained results showed how three metropolitan areas are below the low sustainability threshold for this indicator, only one of them - ZM Oradea being above the high sustainability threshold, the rest registering a medium degree of sustainability

For the third analysis used in assessing the degree of connection to public and private services in metropolitan areas, a new indicator has been proposed that determines the degree of coverage of private passenger transport - PTC in metropolitan areas. The results of the network analysis show that most metropolitan areas are represented by a monocentric structure of the passenger transport network, except for the metropolitan area Baia Mare where the results show that, in this case, the network structure is polycentric.

At the end of our approach to assessing the degree of connection to public and private services in metropolitan areas, we used previously developed indices to which we added a series of data processed using GIS solutions taken either from open source or from public data provided by institutions, generating the global mobility index - BMI. The obtained results show us that in the metropolitan areas the situations differ, a common point being represented by a relatively good connectivity to the public education infrastructure in the case of all the analysed areas. In 7 out of

9 metropolitan areas analysed, the connectivity to cultural services is low. The only metropolitan area that does not register any negative value of GMI / service values is ZM Baia Mare.

3.2. Mapping the accessibility levels in MA

The degree of accessibility to public and private services in metropolitan areas is reflected in GMI values. By being calculated at the building level, reflects a remarkably high degree of detail and offers the advantage of being mapped. In addition, all indices used in the creation of the GMI algorithm can be used individually, each expressing different characteristics of the transport infrastructure (ICT, TSI), public passenger transport network (PTC), distances to certain services (ODL) or access buildings to different types of transport infrastructure (TIAD).

4. O3: Create a model to develop an accessibility network of public and private services in MA

4.1. Identifying the required services by MA based on their socio-economic and environmental profile

Within this objective, priorities have been set for the expansion of public and private services needed in metropolitan areas based on their socio-economic realities. Demographic indicators were grouped according to demographic characteristics: school population, active population, retired population and unemployed. The economic component has been rearranged into groups that differentiate economic activities according to employees' exposure to pollutant emissions and stress. Also, a network of accessibility to public and private services was created, considered ideal in any situation, using the open source software SocNetV2.5. to calculate the degree centrality indicator. Thus, the more centrally positioned a service is, the more accessible that service must be within the metropolitan area.

Next, based on the previously calculated accessibility indices, the accessibility network was designed for each metropolitan area analysed. The results were then compared with the ideal situation, as a standard sample. The results for the 9 metropolitan areas analysed indicate that commercial services have an average degree of accessibility. This is also since commercial units are numerous and are the largest employer in metropolitan areas in terms of the number of employees. Given the fact that the socio-economic profiles of the analysed metropolitan areas are similar, the public and private services that need expansion are similar. The main conclusion is

that commercial services may stagnate in expansion, while the accessibility of health services must focus on the efforts of local actors involved in planning.

4.2. Creating a network of services according to the spatial features of MA

Within this activity it was wanted to propose locations for the location of the necessary services in relation to the areas that have been identified as isolated from a certain service. Relevant cartographic materials were prepared for this purpose, using information extracted from the ESM database, namely unconstructed and vegetation-free areas according to the initial codes. Thus, locations at a maximum distance of 1 km from buildings with extremely low accessibility to a service were proposed.

5. Conclusions

The completion of all stages within the MAccNet project meant the provision of complex results necessary to understand the planning deficiencies at the metropolitan level in Romania. The creation of the integrated planning model regarding the accessibility of public and private services in the Romanian metropolitan areas has the potential to provide decision-makers at the metropolitan level with a scientific tool usable in planning existing and proposed metropolitan areas. The calibration of the methods and indices proposed in the development stages of the project was performed using as case studies the metropolitan areas with legal status in Romania. Thus, in addition to increasing the visibility of Romanian research in the field at national and international level and the scientific substantiation in the field of the project director by achieving the results proposed in the project, the potential for transferring the proposed model in practice was strengthened. In this way, the discrepancies between the Romanian scientific environment and local and regional decision-makers and urban planning policies can be reduced.