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Challenges for Sustainable Mobility in Cluj-Napoca Metropolitan Area, Romania

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ABSTRACT

Transportation and mobility lay between the most important critical issues in sustainability, beside others as energy and climate, urban systems, waste management or the public policy. Reaching a sustainable transport system is not just a matter of developing and adopting a number of technological innovations. A broader structural and societal transition is needed in technology, economy, culture, behavioural patterns and institutions. Cluj-Napoca is the largest city in Transylvania, a city that faced a tremendous economic growth after 1990, accompanied by a substantial increase in population in its surrounding area and leading to a rapid and substantial increase in demand for municipal services and supporting infrastructure. The rapid rate of motorization experienced in Cluj-Napoca region and its associated problems like congestion and environmental pollution made it an excellent case study in policy formulation and planning for sustainable transportation. The central idea of this article is that policies promoting transportation mobility, economic development and environmental sustainability can be pursued in harmony with one another, rather than as conflicting goals. In particular, it explores how issues of transportation and environmental sustainability could interact in the context of the studied metropolitan area, in which the rate of growth in population and economic development seems to have outpaced the needed transportation infrastructure. Given the reality of this supply constraint, the article aims in identifying the most appropriate ways to manage transportation demand to reduce the immediate pressure on transportation supply and to accommodate the time needed to replenish or expand the existing supply.

1. INTRODUCTION

Cities are focal points for the activities of societies. They are centres of employment, commerce, education, culture, social or political interaction. They also impose significant demands for civil infrastructure needed to support social and economic activities and a suitable quality of life. The challenges in providing this infrastructure are even bigger in the rapidly growing cities founded in developing countries. The gathering of human population in the surrounding region of these cities is shaping the primary challenges to sustainable global environment, resulting in a myriad of other adjacent challenges with significant impact on economics, transportation, environment, social equity and administration. The turn of the twenty-first century marks a divide from a predominantly rural world to one where

the majority of people live in cities. The management of these urban areas, many of them organized in metropolitan associations, and the provision of shelter, services, mobility and livelihood to their inhabitants in an economically, socially and environmentally sustainable manner will be the major challenges in the coming years. Historically, transportation has been the key to economic growth, welfare of the public, accessibility to employment and the amenities of life, public safety and social cohesion within communities. Even though transportation provides all these benefits, it also has negative effects, particularly related to energy consumption and degradation of urban environment through lowered air quality, increased temperatures, increased noise or ecosystems fragmentation.

The case study is the metropolitan area of Cluj-Napoca, a city that faced a tremendous economic

growth after 1990, accompanied by a substantial increase in population in its surrounding area and leading to a rapid and substantial increase in demand for municipal services as well as supporting infrastructure. The rapid rate of motorization experienced in Cluj-Napoca region and its associated problems of congestion and environmental pollution as well as the lack of a strategy in the transportation sector made it an excellent case study in policy formulation and planning for sustainable transportation.

2. THEORETICAL APPROACH. THE ISSUE OF SUSTAINABILITY IN THE TRANSPORT SECTOR

Sustainable transportation policies promote the movement of people and goods in ways that are consistent with sustainable economic development. There are a lot of definitions for “sustainable development”, each of them reflecting different economic, ecological and social nuances, but they all embody an important idea that is the hallmark of sustainability: sustainable development seeks to preserve environmental quality – whether for less advantaged population, future generations or for the sake of environmental diversity itself – while pursuing opportunities for economic advancement, all leading to an improved quality of life.

How it does so and how decision-makers can account for environmental quality and the value of its preservation, are extremely complicated matters. What is certain is that goals, objectives and policies need to be holistic, they must be based on comprehensive consideration of options, they must consider broadly the impacts of these options on the local and regional economy, ecology and community, they must be analyzed using methods and criteria that can account for this more complex and complete perspective.

One of the major challenges policy-makers are facing in the 21st century is to reconcile the economic and social needs of urban populations in ways that are sustainable. Cities will need to be economically efficient, socially integrated, financially responsible, environmentally conscious and institutionally capable if they want to survive and prosper. Cities have become the focal points of the global sustainability challenge, as they are centres of large scale consumption and distribution of goods and services. With their increasing dependency of trade and the consumption of resources, the ecological impact of major cities extends well beyond their geographical footprint [1].

To address this disequilibrium, cities have begun to apply the criteria of sustainability, myriad systems, organizations and policies under their jurisdictions and have gathered all the polarized areas into metropolitan associations. The following definition is useful to articulate the goals of sustainable urban development: “*Improving the quality of life in a city, including ecological, cultural, political, institutional,*

social and economic components without leaving a burden on the future generations, a burden which is the result of a reduced natural capital and an excessive local debt. Our aim is that the flow principle is based on an equilibrium of material and energy and also financial input/output, plays a crucial role in all future decisions upon the development of urban areas” [2].

The following parameters are considered to be sustainable for any sector, including transport [3]:

- the rate at which it uses renewable resources does not exceed the rate of regeneration;
- the rate at which it uses non-renewable resources does not exceed the rate at which sustainable renewable substitutes can be developed;
- its rate of pollution emission does not exceed the assimilative capacity of the environment.

As strictly regarding the transportation system, although various attempts have been made to define sustainable transport indicators, yet a key set of indicators that adequately reflect environmental, social and economic qualities have not been identified. Ideally, theory based conceptions and operationalisation of sustainable transport indicators should be developed, first by defining sustainable transport, and then by deriving significant performance indicators that enable us to measure sustainable transport. Many performance indicators have been derived from current practices (e.g. in transport plans and policies) and stakeholder perceptions of sustainable transport. Indicator development often has not been based on an explicit definition or vision of sustainable transport [4].

Sustainable transportation might be considered by examining the sustainability of the transport system itself, focusing on the positive and negative values and externalities of traffic and transport as they are apparent in the near future. Such kind of indicators has been used by governments [4] to set sustainable transport goals and to monitor whether the current transport system is moving towards sustainability. In some cases, future projections are also made, to forecast developments in transport and relevant sustainability indicators. Various attempts have been made to list such indicators [4, 5].

Examples are energy use, CO₂ emissions, emissions of toxic and harmful substances, land use, disruption and fragmentation of natural areas, waste, traffic safety, noise pollution, health consequences of transport, crash costs, the contribution of the transport sector to economic welfare and accessibility. Also, there have been defined indicators that are based on the quality of the current transport system, including commuting speed, congestion delay, variety and quality of transport options available in a community, accessibility of activities (for drivers and non-drivers), and the proportion of household expenditures devoted to transport [5].

One may also assess the effects of possible future transport systems on sustainable development in general. In this case, a broader range of sustainability

indicators may be considered. Changes in the transport sector may induce changes in various other sectors, which in turn may affect sustainable development. For example, they may induce macro-economic changes (e.g. lower production values in transport, and higher production values in trade and industry) resulting in changes in GDP and employment levels [6]. Thus, valid sustainability indicators are needed to examine the extent to which possible future transport systems affect sustainable development. Various methods and models have been developed to assess environmental, social and economic effects of transport [7]. These models need improvement. In particular, social indicators are rarely included, because of a lack of knowledge and rigorous methods, tools and techniques for assessing the social impact of transport changes.

Sustainability indicators are needed to examine possibilities and conditions for sustainable transportation. The extent to which various sustainable policies would affect important sustainable transport indicators should be assessed by systematically examining the economic, social and environmental effects of these transport systems. Economic indicators should measure possible effects on economic welfare, such as macroeconomic changes, GDP, economic efficiency, income distribution and unemployment rates. Social indicators should reflect effects on societal and individual quality of life, such as health and safety [1].

Environmental indicators should measure effects on environmental qualities, such as: resource use, emissions and waste, and the quality of soil, water and air that may affect human (and non-human) life [1, 8].

It may be concluded that we should not only examine which transport scenarios or plans are sustainable on a collective level, but also whether such scenarios are acceptable to the public and why, especially when significant changes in travel behaviour are needed to achieve transportation sustainability. More specifically, it would be extremely helpful to know which critical factors in alternative sustainable transport scenarios cause such scenarios to have low acceptance ratings.

Among other things, this will depend on the extent to which members of the public expect that the scenarios would affect their quality of life. Obviously, we can hardly speak of sustainable transport when most citizens believe it will significantly reduce their quality of life.

The Brundtland Commission also stressed the importance of quality of life in their definition of sustainable development: "*meeting the needs of the present without compromising the ability of future generations to meet their own*" [9]. This definition emphasizes that *quality of life* depends on the extent to which current and future generations are able to fulfil their needs. Thus, sustainable transport should also be

concerned with human needs and values. The effects of strategies aimed at stimulating sustainable transport should also be assessed in terms of human needs and values.

3. CASE STUDY - CHALLENGES IN URBAN MOBILITY IN CLUJ-NAPOCA METROPOLITAN AREA

Keeping a high level of mobility in its territory is one of the major challenges Cluj-Napoca Metropolitan Area is facing. This city can indeed only remain viable and ensure its ability to grow with an efficient transport system.

The policies carried out in this field will have major consequences on the quality of life of inhabitants, competitiveness of companies, efficiency of the retail sector and the kind of urban development. In the midst of urban transport systems, public transport could provide one of the answers to the mobility needs of people. This can be explained by its high share of trips, its social role and its contribution to reducing damage caused to the environment.

The analysis of recent tendencies in European metropolises shows the crucial role of public transport, especially in the dense areas of cities. Public transport makes up indeed for about one third of all motorized trips in EMTA member cities (European Metropolitan Transport Authority) and more than half of the trips in city centres. But these good results could only be achieved through an active policy of public authorities. The patronage of public transport is linked to many factors, only a few of which depending on the transport operators (e.g. quality of service). Other factors depend on public authorities and on their policies regarding urban planning and traffic management.

Lastly, the economic growth or the changes in life styles significantly influence mobility needs and the use of public transport. In fast changing societies, public transport must adapt quickly to remain attractive in competition with the automobile, which has always been strong at incorporating technological innovations. It must also consider the needs of people for door-to-door trips and therefore think as itself as a part of longer trips using other modes. In this context, transport authorities must pay much attention to understanding on-going changes and must always adapt themselves to bring in new and appropriate answers to the needs of people.

In order to elaborate an optimal transportation strategy, authorities should have at their disposal some data on the following topics:

- overall mobility and its evolution in Cluj-Napoca Metropolitan Area. The function of a *mobility observatory* should be to produce regular statistics that are useful for transport operators and key indicators for all policy makers to guide their strategic decisions;
- attitude of people when choosing between different transport modes. This knowledge and the

understanding of the factors at stake can help define strategies to increase the share of public transport;

- forecast the future trends of mobility. The trends of mobility should be analyzed in relation to demography (ageing population), trends of life styles (new forms of work, consumption and leisure) or progress of technology. The objective is to be able to anticipate and prevent some negative trends which may affect the transport system.

For all these fields of investigation, national or international comparisons can be very useful. Benchmarking programs launched by the EU or exchange of information between EMTA cities are ways of increasing knowledge in the sector, of disseminating examples of good practices and eventually of making right decisions.

On the other hand, the complexity of mobility-related issues in metropolitan areas makes it necessary for public transport authorities to consider other fields outside the sphere of public transport so as to be able to offer travellers an integrated system of transport that should take into account the following aspects:

- a relevant metropolitan territory. For an efficient coordination of transport services in metropolitan areas, transport authorities must have a geographical competence consistent with the reality of the mobility of people. This relevant territory must be devised so as to encompass all the trips of people in the metropolitan area, be them related to work or not;

- an integrated public transportation system. In this relevant metropolitan territory, the main mission of transport authorities should be to implement an integration of services provided by the transport operators so as to offer travellers a real network. The first stage of this process aimed at facilitating the trips of people is usually the fare integration between the different operators. Integrated information and timetables are also of great importance;

- an integrated approach for public transport and other modes. Public transport issues can only be addressed in relationship with private car policies. Transport authorities have to organize a real differentiation and complementariness between public transport and private car, so that the private car is used only when it is necessary. An integrated approach will therefore be needed to attract people out of their car. The promotion of Mobility Management approaches and the development of Mobility Plans, like those devised in Belgium (Plan IRIS) or in France (PDU), with the objective of reducing the use of car and stimulating alternative modes of transport (walking, cycling and public transport) must be encouraged. Parking provision and costs are key elements in this respect. There is a need to develop traffic management techniques and parking policies that would minimize the amount of car traffic in the cities. At the same time, intermodality between public transport and other modes should be fostered: the attractiveness of public

transport stations can be increased through P&R facilities as well as bike routes and secure parking for bikes;

- an integrated approach for transport issues and urban planning. The current trends on land use are not in favour of public transport. The control of urban expansion is a major concern for metropolitan authorities. Public transport authorities have to work in close cooperation with the public bodies in charge of urban planning. The aim is to take into account the impact on mobility in general and on transport modal shift of new urban developments. Public transport authorities have to firmly promote the idea that the current and potential public transport accessibility in urban planning at the different scales (regional and local) is a major concern to achieve a sustainable urban mobility.

In the absence of a strategy in the transportation sector in the focused metropolitan area, we have analyzed the Integrated Development Plan for the Cluj-Napoca polarized area (2009-2015) [10]. The following conclusions can be pointed out:

- the policy in this sector has focused in the last years mainly on improving the existing road infrastructure and the construction of some new ones (Transylvania motorway, some road rings to avoid the city by vehicles in transit, new parking areas); most of these investments were directed to the urban pole, whilst the road infrastructure in the surrounding rural areas is extremely degraded and needs urgent investments; in this case also, we underline the lack of the coherent strategy at the level of the whole metropolitan territory;

- there were some attempts to promote bike using, but without any correlation to other transport modes and therefore inefficient;

- decay of the tram and railway transportation as a result of decreased service quality and lack of investments;

- under-dimensioning of the Cluj-Napoca Airport facilities, especially the extremely short ramp, urgent investments being needed in order to face this situation (the construction of a ramp with a length of at least 3500 m). Then, the airport is not correlated at all with other transportation modes (railway, tram, bus), excepting a bus line, taxi is the single opportunity to reach the town, fact which is unacceptable within the international context;

- the lack of an efficient public transportation system (decreased connectivity, high costs etc.) that reduces mobility within the metropolitan territory and prevents the economic development. The public transportation system was not correlated to the urban dynamics; the lines are the same as they were 30 years ago, one of the single improvements being a slight bus renewal scheme which did not bring many benefits to the public transport users. All these weak points, as well as some statistical data as the average speed in the city

Cluj-Napoca – 13 km/h, road density in the metropolitan areas – 0.36 km/km², railways density in Cluj County – 34.8 km/1000 km², underline the urge for an efficient and unitary transportation strategy in Cluj-Napoca Metropolitan Area. In our opinion, such a strategy should focus on the promotion of the public transportation and on non-motorized ways like biking and walking, as the morphological features prevents (at least in the case of the main city) the areal extension of transport infrastructure. A sustainable strategy should be based on the analysis of at least the following aspects:

Density of population. Cluj-Napoca, as usually all the centres of metropolitan areas, is more suited to public transportation than private cars, as space is scarce and causes problems both for car driving and parking. At the level of the European metropolitan areas, public transportation share often exceeds 50% inside the metropolitan centres than in the rest of the metropolitan area. It can also be observed that the car ownership (motorization) rate is generally lower at the heart of the metropolitan areas than in other part of the urban association. This tendency does not characterize the analyzed metropolitan areas, fact that reveals the lack of any strategic approach and the chaotic development in the transportation sector.

Location of population and employment within the metropolitan area. From this perspective, we can mention that Cluj-Napoca follows the most common tendency at European level, as in most of them suburban areas are growing faster than the centres, which are stagnating or even declining. However, Cluj-Napoca still plays a key economic role in spite of the overall growth of the metropolitan areas. The increase of suburban housing and economic activities lead to an increase of dispersed trips within the suburbs (Florești, Apahida, Gilău, Săvădisla, Tureni, Feleacu, Baci, Mera etc.). The suburbs of Cluj-Napoca are described by extremely poor public transportation services, thus car use increasing faster, frequently generating congestion at peak hours.

Transport infrastructure. The modal choice depends naturally on the level of existing infrastructures. Thus, the density of road infrastructure has a direct impact on private car use. Usually a high level of motorway density is a very strong incentive to the use of private cars in deficit to public transportation (more roads, more cars). So, in this respect, the decision factors in Cluj Metropolitan Area should embrace the projects to build new infrastructure with programs to stimulate and promote public transportation, which will help in reducing pollution, noise and the urban stress in general.

Level of economic development. There is a strong relation between the level of economic development and the car ownership rate of the population, as many examples show. However, the increase of car ownership and the decrease of public

transportation use are not unavoidable. Though the increase of car ownership is strong up to a certain level of wealth, it can then slow down and even be reversed under certain conditions: urban density, attractiveness of public transportation, policy of public authorities aiming at reducing private car reliance through a limitation of parking possibilities or increasing private car costs for the user. It is apparent that such conditions are usually gathered in the centre of large metropolitan areas. These factors can account for the low level of car ownership in some European cities. Then, economic short-term trends have an impact on mobility. Indeed, they influence directly the number of trips to work, as well as trips linked to shopping or leisure activities.

Public transportation supply. The PT supply depends on the density of the networks (measured by line km/km²) and on the average headway. For historical reasons (radial lines towards city centres), centres usually have a much greater density of networks, this being also the case of Cluj-Napoca city. It is also very important to take the interchange possibilities into account. However a distinction must be made between suburban areas that are not well served by PT networks for historical reasons (radial railways) and areas badly served because their density of population is not sufficient to support efficient public transportation networks. In the first case, solutions can be found (tramways, bus lanes etc.). In the second case, however, only innovative solutions can be economically viable. Then again, the quality of service (speed, quality of information provided to passengers, comfort, tidiness and good organization of waiting areas, convenience of interchange, and stability of networks over time etc.) should be also analyzed. Another important aspect to be analyzed in relation to the public transportation is the cost and the fare structure.

Parking policies. As discussed previously, the existence of highways (radial and bypass motorways) and the availability of easy and cheap parking are two key factors underlying private car reliance. Parking is a very important factor, whether it is short-term (shopping, leisure) or long-term (work place, residential). Indeed, it is no use trying to deter people from using their car if parking space availability is high. But Cluj-Napoca is rather deficient at this aspect, fact that again should determine a public transportation oriented strategy.

4. CONCLUSIONS

The road towards a sustainable transportation strategy in Cluj-Napoca Metropolitan Area should start from the foundation of a transportation management association acting as a coordinating body that brings together the main actors of the transport system and thereby ensuring an integrated and coherent approach to the transportation system. In this sector, during the last years, the decision factors in the analyzed region have focused rather on adopting hard measures

(construction of new roads and parking lots), whereas the soft measures (managing the demand for car use by changing travellers' attitude and behaviour through good communication and information, organising services and coordinating activities) were not at all approached. A successful transportation strategy should but aim in achieving a good mobility management, a concept promoting sustainable transportation and embracing in an appropriate way the two above mentioned categories of measures: adopting soft measures that enhance the effectiveness of the hard measures. In the end, we point out some aspects to be taken into consideration when analyzing the competition between public transportation and private car in a transportation strategy in Cluj-Napoca Metropolitan Area.

These aspects were revealed by a survey conducted within l'Ecole polytechnique fédérale de Lausanne [11]:

- travellers usually prefer the automobile, which is synonymous with freedom, comfort and speed, whereas public transportation is often regarded as slow, constraining and requires sharing space with strangers. This means that a large majority of car users do not pay attention to the quality of public transportation supply and only contemplate using public transportation when the use of car is made difficult because of parking restrictions (scarceness, fees);

- public transport is often better than people think. This is another proof of the general preference for the automobile;

- environmental consciousness only incites a minority of travellers to use public transportation;

- minimizing travelling times is not the only criterion for travellers. Therefore, in many cases when public transportation goes faster than private cars, people will prefer private cars nonetheless;

- an efficient public transportation supply is necessary but is not enough to reduce the use of private cars;

- parking conditions are a key determinant of public transportation use;

- problems in reaching a destination can lead to changes in the choice of destination. Any policy aiming at deterring private car use in town must ensure that acceptable alternative solutions exist. Otherwise there is a risk of people choosing new destinations (housing and work) that would be more accessible by car;

- modal choices belong to life styles and cannot be changed without consequences for the everyday activities and habits.

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