

Towards Transport Sustainability in the Cluj-Napoca Metropolitan Area

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Introduction

THE CURRENT paper aims to identify, given the reality of this supply constraint, the most appropriate ways to manage transportation demand to reduce the immediate pressure on transportation in the Cluj-Napoca Metropolitan Area and to accommodate the time needed to replenish or expand the existing supply. The article offers an overview regarding the concept of sustainability and its significance in relation to the transport sector, in general, and then focuses on the case study of the Cluj-Napoca Metropolitan Area, a city that saw tremendous economic growth after 1990, accompanied by a substantial increase in population in its surrounding area, which led to a rapid and substantial increase in demand for municipal services as well as supporting infrastructure. The rapid rate of motorization experienced in the 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. The article also emphasizes the main factors that ought to be considered in a strategy formulation for sustainable transportation that would support authorities when rethinking the metropolitan transportation system.

The Issue of Sustainability in the Transport Sector

CITIES ARE focal points for the activities of societies. They are centers of employment, commerce, education, culture, social or political interaction. They also come with significant demands for the 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 found 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, serv-

ices, 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 a key factor for economic growth, public welfare, accessibility to employment and the amenities of life, public safety and social cohesion within communities. While transportation provides all these benefits, it also has negative effects, particularly related to energy consumption and the degradation of the urban environment through lowered air quality, increased temperatures, increased noise or ecosystems fragmentation.

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 the less advantaged population, the 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 a comprehensive consideration of options, they must broadly consider 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 facing policy-makers 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 centers 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 (OECD 1996). To address this disequilibrium, cities have begun to apply the criteria of sustainability, with myriad systems, organizations and policies under their jurisdiction, 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” (Urban 21 Conference 2000).

Daly (1992) specifies certain parameters for any sector, including transport, to be considered sustainable:

- 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 regards strictly the transportation system, although various attempts have been made to define sustainable transport indicators, a key set of indicators that adequately reflect environmental, social and economic qualities has not been identified yet. 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 (Gilbert and Tanguay 2000).

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 for the near future. This kind of indicators has been used by governments (Gilbert and Tanguay 2000) 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 (Gilbert and Tanguay 2000; Litman 2003). 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, the health consequences of transport, crash costs, the contribution of the transport sector to economic welfare and accessibility. Also, indicators have been defined that are based on the quality of the current transport system, including commuting speed, congestion delay, the 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 (Litman 2003).

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 (Geurs and Van Wee 2000). 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 the environmental, social and economic effects of transport plans (Geurs and Van Wee 2003). 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 the possible effects on economic welfare, such as macroeconomic changes, GDP, economic efficiency, income distribution and unemployment rates. Social indicators should reflect the effects on societal and individual quality of life, such as health and safety (OECD 1976, 1982). Environmental indicators should measure the 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 (OECD 2002; Steg et al. 2003).

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 behavior 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. This will, among other things, 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 needs” (WCED 1987). This definition emphasizes that “quality of life” depends on the extent to which current and future generations are able to fulfill 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.

Case Study: Cluj-Napoca Metropolitan Area —Challenges in Urban Mobility

CLUJ-NAPOCA, THE capital of Cluj County, is located in the northwestern part of Romania and represents the largest city in Transylvania in terms of population. Due to its educational prestige and favourable geographical position, approximately halfway between Bucharest and Budapest, Cluj-Napoca experienced 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 the 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.

As related to the road infrastructure, the metropolitan area is crossed for about 41 km by the E60 highway (DN1): Bucharest–Braşov–Cluj-Napoca–Oradea–Budapest–Vienna. The most important element of the road infrastructure is the Transylvania motorway, whose length within the metropolitan territory measures around 33 km. In terms of road traffic related to Cluj-Napoca, there are general dysfunctions caused by the lack of functional connections between the city’s access points. Thus, crossing the city on the W-E (Oradea–Dej) or S-N (Turda–Zalău) directions is made through the city center, due to the lack of bypasses, as some morphology constraints make their construction difficult (Irimuş et al., 2010). The crossing is hampered by congestion at the entrance/exit of the city, especially at rush hours due to the insufficient lanes (Corpade et al. 2012). Furthermore, there are poor functional connections between downtown and the new residential areas. As related to the extremely necessary ring roads for the city of Cluj-Napoca, some progress has been made and the issue



FIGURE 1. Cluj-Napoca Metropolitan Area—territory and road infrastructure

continues to be present in all the development strategies. At the moment, due to the lack of bypass roads, the traffic of commercial vehicles has been directed to routes avoiding the downtown area, but these routes overlap most of the time with the main neighborhood axes. The consequence of this aspect is that on these residential streets one can find all categories of traffic, leading to high levels of pollution and accidents. The municipal traffic is slow and exposed to jams. The urban traffic is hampered by the extremely high number of cars and the downtown urban architecture (narrow, winding streets and old buildings). In terms of the road infrastructure serving the villages in the metropolitan area, in many cases roads are in an advanced state of degradation, rehabilitation being thus needed to ensure functional links. A map of the metropolitan area and of the existing road network is provided in figure 1.

The experience of EU member states as regards the concept of metropolitan areas emphasized the administrative, economical and financial benefits these entities bring to the local authorities. These arguments led to the creation of the Cluj Metropolitan Area at the end of 2007. The Cluj Metropolitan Area covers about 23% of Cluj County and includes Cluj-Napoca, as the urban development pole, and the following communes: Aiton, Apahida, Baciu, Bontida, Borşa, Căian, Chinteni, Ciurila, Cojocna, Floreşti, Gârbău, Gilău, Jucu, Petreşti de Jos, Sânpaul, Tureni și Vultureni. These communes cover an area with a radius of 30 km, surrounding Cluj-Napoca. The aim of the associative structure was the sustainable development of the area, by reducing the discrepancies between the urban and rural areas. The main objectives of the association are (according to Decision no. 415, 2008):

- Zonal, urban and rural economic and institutional development;

- Environmental protection;
- Infrastructure development and improvement;
- Development of services for the purpose of an improved quality of life.

Keeping a high level of mobility in its territory is one of the major challenges facing the Cluj-Napoca Metropolitan Area. 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, the competitiveness of companies, the efficiency of the retail sector and the type of urban development. In the context 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 the 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. In cities in members the EMTA (European Metropolitan Transport Authority), public transport makes up indeed for about one third of all motorized trips and more than half of the trips in city centers. But these good results could only be achieved through an active policy of the public authorities. The patronage of public transport is linked to many factors, only a few of which depend on the transport operators (e.g. quality of service). Other factors depend on the public authorities and on their policies regarding urban planning and traffic management. Lastly, the economic growth or the changes in lifestyles 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 ongoing changes and must always adapt themselves to bring in new and appropriate answers to the needs of people.

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

- Overall mobility and its evolution in the Cluj Napoca Metropolitan Area. The function of a “mobility observatory” should be to produce regular statistics which are useful for transport operators and key indicators for all policymakers to orient their strategic decisions;
- The attitude of people when choosing between different transportation 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 in mobility. The trends in mobility should be analyzed in relation to demography (ageing population), trends in lifestyle (new forms of work, consumption and leisure) or the 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 the exchange of information between metropolitan areas 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 travelers 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 they related to work or not. At the moment, the development of the metropolitan area, spins around the central core (the city of Cluj-Napoca), as extremely contrasting economic and demographic profiles emerge when the rural part of the metropolitan territory is compared to the urban part (Dranca 2013);

– 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 travelers 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 complementarity between public transport and private cars, so that the private car is used only when it is necessary. An integrated approach will therefore be needed to divert people from their cars. The promotion of Mobility Management approaches in the development of Mobility Plans, with the objective of reducing the use of cars 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 which 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 public relations facilities as well as bike routes and secure parking for bikes.

– An integrated approach to transport issues and urban planning and a proper valorization of axes in territorial development strategies (Cocean 2011, Deac et al. 2013). The current trends on land use are not in favor 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 the 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 different levels (regional and local) is a major concern to achieve a sustainable urban mobility.

The following conclusions can be pointed out as a result of analyzing the situation of transportation in the Cluj-Napoca Metropolitan Area:

– 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 (Transilvania 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, while 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 usage, but without any correlation to other transport modes and thus inefficient;

– Decay of the tram and railway transportation as a result of decreased service quality and lack of investments;

– Insufficient facilities at Cluj Airport, especially the extremely short runway, urgent investments being needed in order to face this situation. Then, the airport is not connected at all with other transportation modes (railway, tram, bus); excepting one bus line, taxi is the single opportunity to reach the town, a fact which is unacceptable within the international context;

– The lack of an efficient public transportation system (decreased connectivity, high costs etc.) which reduces mobility within the metropolitan territory and hinders economic development. The public transportation system has yet not been correlated to the urban dynamics, the lines are the same as they were 30 years ago, in the majority of cases, one of the few improvements being a slight bus renewal scheme which didn't bring many benefits to the public transport users;

– The continuous increase in the number of cars in the city (the increasing rate being of 17% between 2010 and 2014; Sustainable Urban Mobility Plan 2015);

– Streets were not designed with the possibility of enlargement, if traffic volume requires it in time;

– Problematic fluency for the roads connecting the urban pole with the metropolitan communes from the west and northwest (Sustainable Urban Mobility Plan 2015);

– Environmental concerns will increase along with the number of cars. As regards traffic gas pollution, the situation is being monitored by the Agency for Environmental Protection located in Cluj-Napoca. Throughout the whole metropolitan area, there is only one traffic air quality monitoring station, the one located on Aurel Vlaicu Boulevard, in the city of Cluj-Napoca. In December 2015, measurements showed maximum detected values close to the maximum allowable limit in the case of PM10 sedimentary powders (48.23 $\mu\text{g}/\text{cc}$ compared to the value of 50 $\mu\text{g}/\text{cc}$ provided by the Ministry Order 592/2002). The same report stipulates that flue gas pollution associated with traffic (nitrogen oxides, sulphur dioxide, heavy metals, etc.) falls within acceptable limits (Report on the state of the environment in Cluj County in December 2015). Within the metropolitan area, noise level is monitored only in 5 points in Cluj-Napoca by the local environmental agency. Results of the monitoring in December 2015 shows a critical situation, as in all the sampling points the maximum allowable limit (65 dB) was exceeded. The maximum value, 74.6 dB, was recorded in the city center.

All these weak points underline the need for an efficient and unitary transportation strategy in the Cluj-Napoca Metropolitan Area. In our opinion, such a strategy should focus on the promotion of public transportation and on non-motorized means, such as cycling and walking, as the morphological features prevent (at least in the case of the main city) the spatial extension of the transport infrastructure. A sustainable strategy should be based at least on the analysis of the following aspects:

– Density of population. Cluj-Napoca, as usually all the centers of metropolitan areas, is more suited to public transportation than to private cars, as space is scarce and causes problems for both driving and parking. At the level of the European metropolitan areas, the public transportation share is often 50% higher in the metropolitan centers 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 parts of the urban association. This tendency does not characterize the analyzed metropolitan area, which reveals the lack of any strategic approach and the chaotic development in the transportation sector;

– Location of population and employment within the metropolitan area. Along this line, 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 centers, which are stagnating or even declining. That being said, Cluj-Napoca still plays a key economic role in spite of the overall growth of the greater metropolitan area. The increase in suburban housing and economic activities lead to an increase in dispersed trips within the suburbs (Florești, Apahida, Gilău, Săvădisla, Tureni, Feleacu, Baci, Mera etc.). The Cluj Napoca suburbs are defined by extremely poor public transportation services and thus car use increased faster, frequently generating congestion at peak hours;

– Transport infrastructure. The modal choice depends naturally on the level of existing infrastructures. Thus, the density of the road infrastructure has a direct impact on private car use. Usually a high motorway density is a very strong incentive for the use of private cars at the expense of public transportation (more roads, more cars). So, in this respect, decision makers in the Cluj Metropolitan Area should pursue new infrastructure projects 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 link between the level of economic development and the car ownership rate of the population, as many examples show. However, the increase in car ownership and the decrease in public transportation use are not unavoidable. Although the increase in 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, a 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 met in the centre of big 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 directly influence the number of trips to work, as well as of the trips linked to shopping or leisure activities.

– Public transportation supply. The public transportation 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 centers), the centers usually have a much greater density of networks, this being also the case of Cluj-Napoca city. It is also very important to take into account the interchange possibilities. However, a distinction must be made between suburban areas which aren't well served by public transportation 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, the quality of service (speed, quality of information provided to passengers, comfort, tidiness and good organization of waiting areas, convenience of interchange, stability of networks over time etc.) should also be analyzed. Another important aspect to be analyzed in relation to 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 (workplace, 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 in this respect, which again should determine a public transportation-oriented strategy.

Conclusions

THE ROAD towards a sustainable transportation strategy in the Cluj-Napoca Metropolitan Area should start from the founding of a transportation management association acting as a coordinating body that brings together the main actors of the transport system and thereby ensures an integrated and coherent approach to the transportation system. In this sector, during the last years, decision makers in the analyzed region have focused rather on adopting hard measures (construction of new roads and parking lots), while the soft measures (managing the demand for car use by changing travellers' attitude and behavior through good communication and information, organising services and coordinating activities) were not at all approached. A successful transportation strategy should aim at achieving a good mobility management, a concept promoting sustainable transportation and embracing in an appropriate way the two abovementioned 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 in developing a transportation strategy in the Cluj-Napoca Metropolitan Area:

- The promotion of soft management in urban mobility (promotion of public transport, restrictions for car use) usually faces at the beginning opposition from communities, as people elsewhere in the world usually prefer the automobile, whereas public transportation is often regarded as slower, constraining and requires sharing space with strangers. This means that a large majority of car users don't pay attention to the quality of public transportation supply and only use public transportation when the use of the car is made difficult because of parking restrictions or traffic congestion;

- Environmental awareness that would stimulate people to choose more environmentally friendly transportation modes generally affects a small part of the population;

- Minimizing travelling times is not the only criterion for travelers. Therefore, in many cases when public transportation is faster than by private car, people will nonetheless prefer private cars;

- An efficient public transportation supply is necessary but is not enough to reduce the use of private cars. Not even the minimization of travelling time can determine people to use public transportation instead of private cars;

- People's choices are determined by their lifestyle; that is why, a deep investigation of the inhabitants' perception in relation to transportation would indubitably constitute a success factor in the rethinking of the mobility strategy in the Cluj-Napoca Metropolitan Area. Hard management, focusing almost exclusively on the construction of roads and parkings, as is the case with the current planning of mobility in the area, has failed in reaching the main goals of sustainable transportation systems.

Among the measures that the authorities in the metropolitan area could take in order to increase mobility, we consider the following (Corpade et al. 2012):

- Setting up an authority responsible for outlining the vision on mobility in the metropolitan area;

- Introduction of some pilot projects in schools with schemes or transport plans to facilitate safe public travel for children in moving to school;

- Correlation of land use plans with the urban transport plans, for example by introducing new lines of public transportation to the new residential areas (Bună Ziua, Floresti, Apahida, etc.);

- Expansion of public transportation in the metropolitan area from the urban pole to its periurban areas, as at present mobility between them is carried out almost exclusively by private car;
- Introduction of a more efficient fare system, common to all modes of public transport (buses, trolleybuses, trams), which is a central element in trying to stimulate people to use public transportation;
- Organization of mobility education campaigns in schools and universities;
- Organization of training courses on mobility management for the local and metropolitan administration employees;
- Introduction of secure and intermodal bicycle routes and construction of bicycle parkings in strategic locations that facilitate inter-modal connection (the central train station, bus stations, universities etc.).



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Abstract

Towards Transport Sustainability in the Cluj-Napoca Metropolitan Area

Transportation and mobility are among the most important critical issues in sustainability, alongside others such 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 saw 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 the Cluj-Napoca region and its associated problems of 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 seem to have outpaced the needed transportation infrastructure.

Keywords

metropolitan areas, mobility, economic and population growth, sustainability