STUDIA UBB GEOGRAPHIA, LXVII, 1-2, 2022 (p. 75-82)
(RECOMMENDED CITATION)
DOI:10.24193/subbgeogr.2022.05

GEOGRAPHICAL AXES AND MOBILITY. CASE STUDY: CLUJ COUNTY

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ABSTRACT. – Geographical Axes and Mobility. Case Study: Cluj County. The movements of goods, people and information from one point to another have always represented important elements of human society. This mobility can take many forms from public transportation to private transportation or biking. The need of a developed transport system increased with the economic changes and growth of Cluj County, to satisfy the urban mobility. Moreover the direction for the expanding of this sector should be first of all sustainable, environmentally-friendly, a solution to decongest the traffic and must involve not only the government or the local authorities, but also the private and industrial sectors.

Keywords: *environmental, transportation axes, sustainability, green logistics.*

1. INTRODUCTION

The sustainability part of the transportation axes represents an important subject in mobility. According to Rodrigue *et al.* (2013), *"sustainable transportation is the capacity to support the mobility needs of people, freight and information in a manner that is the least damaging to the environment"*.

Cluj County is located in Transylvania, Romania with the county seat at Cluj-Napoca. It is bordered by Maramureș and Bistrița-Năsăud counties in the North-East, by Mureș County in the East, by Alba County in the South and by Bihor and Sălaj counties in the West.

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"Environmental axis is the space-time force line which may embody varied geographic territory, which is allowing the diagnosis and prognosis, in a space-temporally manner of geographic territory, which may embody varied geographic shapes and dimensions in accordance with the components' capacity of polarization. They are developed along valleys or in depressions or major traffic arteries. The axes represent the most important sector of an area or region towards which flows are concentrated and a heavy traffic is carried out" (C.C. Pop, 2016).

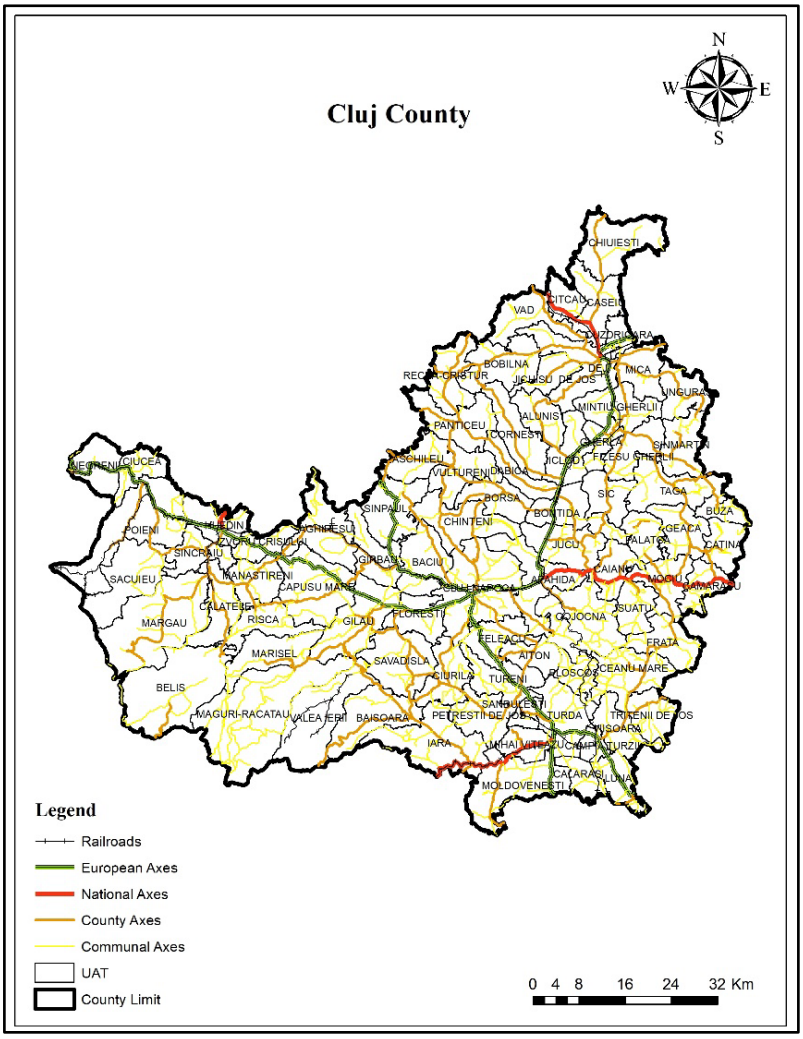

Fig. 1. Transport axes of Cluj County. *Source: the authors*

2. TRANSPORTATION SYSTEMS AND SUSTAINABLE DEVELOPMENT

"Mobility is fundamental to economic and social activities such as commuting, manufacturing or supplying energy. Each movement has an origin, a potential set of intermediate locations, a destination and a nature which is linked with geographical attributes. Transport systems composed of infrastructures, modes and terminals are so embedded in the socio- economic life of individuals, institutions and corporations that they are often invisible to the consumer. This is paradoxical as the perceived invisibility of transportation is derived from its efficiency" (Rodrigue *et al.*, 2013).

The transportation system has a lot of finacial benefits for the comunity but in the same time it makes a lot of damages to the environment. The transportation axes in Cluj County can be considered all the roads, railroads and ways of comunication and flows inside and outside the county. The enviromental and sustainable transportation axes are the systems that are beneficial also for the society, and are able to sustain themselves. They involve not only profits for the local authorities and government but also these systems do not harm or pollute the enviroment or at least the damage to the enviroment are at a low level.

The enviromental impact of the transportation axes involves many aspects, such as the transport modes themselves, the infrastructure, the energy supply system and the emissions. From the point of view of pollution, there are multiple kinds involve like air, noise pollution or damage to the ecological systems.The level of pollution is closely related to the population density. Moreover, the transport activities contribute to the enviromental problems starting from local, regional, national levels like gas emissions and smog to continental and global levels like climate change.

"Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Rodrigue *et al.*, 2013).

The implementation of a sustainable and ecological transportation system also depends on the economy both nationally and locally. From this point of view particularly, in reference to Cluj County, the city of Cluj-Napoca is the main economic centre and most developed city in the whole county and has a richer budget allowed for implementing the so-called "green transportation" than the rest of the cities, which are less developed.

The energy in regarding the transport system is important as it can be both the power source of pollution but also a non-pollutant solution at the opposite end. Clean energy refers to vehicles and trains that use electric energy from a battery or from a power source that does not harm the environment.

In the case of Cluj County, from the point of view of the energy used as a power source in transportation, at present mostly is unfortunately a source of pollution, especially on the main transportation roads which lead to the main attraction centre, Cluj-Napoca. The traffic congestions are mainly early in the morning when most of people go to work or school and in the afternoon when everybody returns home. Between these intervals the air pollution is higher, as mentioned before. The main power source for the cars or trucks which carry merchandise is still fuel like gasoline and there are few electric cars in the traffic.

The reason why electric cars are not so often found in the study area is mainly due to the lack of charging points across the whole county, but also due to the high prices of these types of cars.

For example, in Cluj-Napoca and its surroundings there are around 20 such charging points for electric cars, there are between 1 and 3 charging points in Huedin and Turda and none in the other cities of the county, Dej, Gherla and Câmpia Turzii.

The price is another reason for which electric cars are not so frequent, as mentioned before. As Romania is still a developing country, the annual income per capita is not as high as in the rest of the European developed countries, so even if the Romanian government supports a part of the financial costs and tries to encourage the population to buy electric cars, the financial help is not enough for all citizens to afford a new electric car. Indeed, buying an electric car has its long-term advantages especially when you live in a crowded city like Cluj-Napoca. The long-term benefits are especially financial, but there are also disadvantages like the absence of charging points in many cities of the county.

Other environmental-friendly solutions could be implemented in the train transportation, as this could represent the solution to decongest the traffic for the people who commute every day. It could be also a cheap solution from the point of view of prices for every person who is now commuting to work or school by car.

Unfortunately, the necessary infrastructure for speed trains does not exist and at present the railroads are still quite basic or in need of repairs and upgrading. They are also completely absent in some of the areas of the county. There is still work to do at regional level and also at country level, as there are still passenger or freight trains that run on diesel fuel, and this kind of fuel harms the environment by polluting the air by means of CO_2 emissions and other particles. The green energy and sustainable transportation system can also be implemented by using the bicycles or different means of transportation like electric scooters within the cities. From this point of view, Cluj-Napoca has implemented the necessary system, like bicycle track around the city, even if currently they do not cover the entire city. Regarding the rest of the cities or

settlements in Cluj County, these tracks are either missing entirely or they exist on small distances. Therefore, the population is not encouraged to use the alternative means of transport instead of the cars, nor are these types of transportation highly promoted in the region.

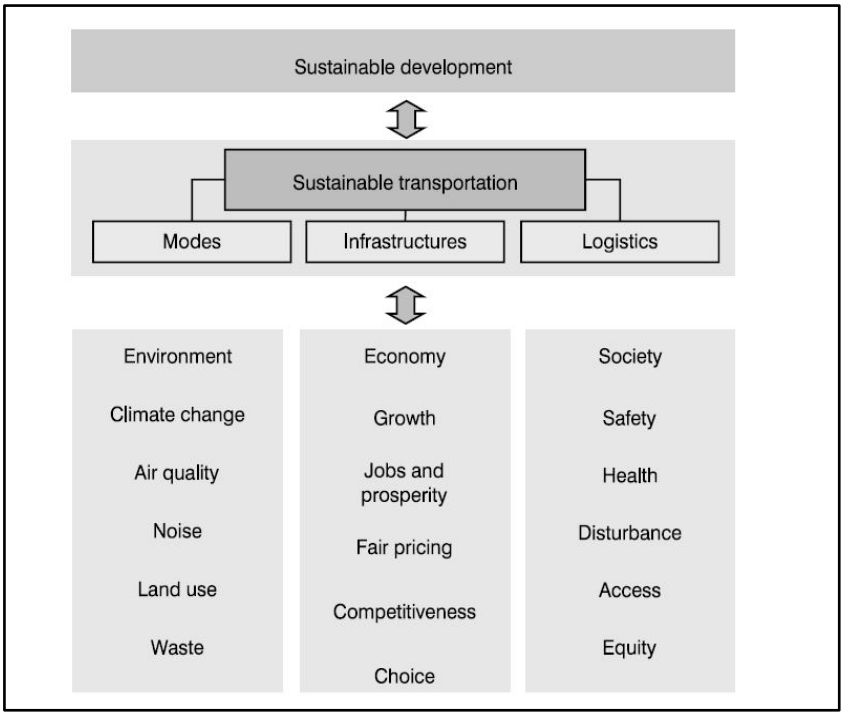

Fig. 2. Sustainable transportation. Source: Rodrigue, J-P., Comtois, C., Slack, B. (2013)

3. ENVIROMENTAL POLLUTION

Regarding the sustainable and environmental transport, the tendency is in general to focus on the passengers' systems of transportation, but freight transport is also important and has a high impact on the environment too. When the transportation topic involves the freight movements, it automatically refers also to logistics.

"Logistics is at the heart of the operation of modern transport systems and implies a degree of organization and control over freight movements that only modern technology could have brought into being. The process of designing and

managing the supply chain in the wider sense. The chain can extend from the delivery of supplies for manufacturing, through the management of materials at the plant, delivery to warehouses and distribution centers, sorting, handling, packaging and final distribution to point of consumption. A more fitted meaning consists in the set of all operations required for goods (material or nonmaterial) to be made available on markets or to specific destinations" (Rodrigue *et al.*, 2013).

The freight transportation system can also contribute to the pollution of the environment, so it is important that measures are taken also in this direction. So here it is involved the concept of *"green logistics which is supply chain management practices and strategies that reduce the environmental and energy footprint of freight distribution. They focus on material handling, waste management, packaging and transport"* (Rodrigue *et al.*, 2013). This concept is applied mainly in three different ways, as the production planning and product design, the materials management and the physical distribution. Mainly they refer to the development of products that have lower or no environmental impact, the logistics operations are performed in a safe and eco-friendly manner, recycling and ecological packaging.

In the case of Cluj County, it means that all the industrial factories where transport is essential for all kinds of products need to perform their logistic activities in a manner that does not affect the environment and recycling should be one of their main concerns. The Romanian law is pretty restrictive especially when it comes to the industrial sector. This mainly happened because Romania has a history when it comes to industrial pollution. In the 1990s, according to the BBC, one of the most polluted cities in Europe was Copșa Mică, where all the pollution came from the industrial sector. During the communist rule in Romania, factories opened up in this city in the 1970s, producing a high level of pollution, which affected even the population of Copșa Mică. Having this kind of black history in industrial pollution, Romania has focused on making the laws more severe when it comes to recycling and pollution in this segment. Nonetheless, all the factories that are still functioning in Cluj County have to obey the regulations and to be environmentally-friendly. This also involves their logistic operations at all levels.

As a result of increasing mobility demands for passengers and merchandise especially in Cluj-Napoca, the transportation activities are highly linked to the environmental problems. So in this case, the city of Cluj-Napoca and the settlements around it, such as Florești, Apahida, or Baciu receive the highest impact from the point of view of the environmental pollution caused by transport. These settlements together with Cluj-Napoca have indeed the highest population density in the whole county.

4. CONCLUSIONS

In conclusion, the infrastructure of Cluj County needs improvement at all levels and one of the major problems is the traffic congestion, while solutions can be found in sustainable and green transportation. The major issue here will be the economic challenges that the local authorities will need to face. Investments are needed so that the county will have an outstanding infrastructure in future.

The air and noise pollution will still remain a major concern and will need also improvements so that the sustainable transportation be implemented.

Good relationships between the citizens, the industrial sector, the private companies and the local authorities are also needed for a harmonious development of the transportation sector, which can be a factor of economic growth.

Environmental sustainability in terms of transportation will be the most difficult to implement in Cluj County, as it faces not only national regulations but also major economic investements and not only for local authorities, but also for the private sector like industrial transportation.

Sustainable development in the sector of transportation also means links between environment, economy and social progess. Transport in general needs to adapt rapidly to ongoing changes and to be cost-efficient simultaneously.

ACKNOWLEDGMENTS

The present work has received financial support through the project Entrepreneurship for innovation through doctoral and postdoctoral research, POCU/380/6/13/123886 co-financed by the European Social Fund, through the Operational Program for Human Capital 2014-2020.

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