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Principles of Modelling Development Processes at Regional Level

Valeriu Stelian NIȚOI[1], Constantina CHIRIAC[2], Marius GÎRTAN[3]

Abstract

The paper aims to be a general analysis material on the principles of modelling sustainable development processes at the regional level, by studying sustainable development of the economy of the regions by supporting regional socio-economic activities, i.e. those processes leading to a sustainable and harmonious development of the region and which do not result in adverse impacts on the human health or the environment. In this context, a regional development plan is proposed that sets out aspects structured on the following dimensions: economy, ecology, social. The plan analyzes all these areas but, what is very important, the adopted measures include elements common to the three spheres, as it is not advisable to prioritize the sectors.

Keywords: *Modelling, sustainable development process, positive impact, ensuring economic security, equitable societies, reduction of environmental degradation.*

1. Introduction

At the end of the 2nd millennium and the beginning of the 3rd millennium, the transport sector shows an environmentally-unfriendly evolution, through a year-by-year increase in the number of motor vehicles, with an impact on the increase of oil production as this is a vital element in the functioning of transport systems. As such, in carrying out the transport process, motor vehicle-specific emissions are being released in the atmosphere, resulting as well in a spatial fragmentation and occupation or an artificial fragmentation of the ecosystems which gradually becomes more and more pronounced, causing thus major prejudice to the natural environment.

Within the framework of the latest policies of transport sustainable development (infrastructures and operations) which are being designed on the basis

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of the current trends, the requirements of sustainable development can be taken into account.

The principles modelling the sustainable policies in the transport sector are based upon the previous statistical evolution which guides us in adopting measures and solutions for the future developments (Brundtland, 1987). The sustainable transport policies may develop by following clear required goals, and by aiming to adopt plans envisaging their achievement. Therefore, for the policies based upon statistical evolution (Romanian National Institute of Statistics, 2015), all efforts will be made to avoid unintended situations while following-up the solutions requires adopting measures needed to attain the envisaged goals. Modelling transport development policies puts a strong emphasis on the current developments at the expense of the future goals. The specific policies set out the unconditional growth of the transports as a basic pillar of sustaining development globally, of the growth of overall welfare.

Accumulations are quite conjectural, and most transport actions use, on a discretionary basis, non-renewable, which are not renewable or slowly renewable resources, thus generating severe long-term adverse effects on the environment and human health.

Inevitably, new approaches to transport policies are needed to strike a balance between modes of transport and the environment, leading to a perspective that could be that of sustainable transport, as defined by the concept of sustainable development of society on the road. whole.

Further to the United Nations Conference on the Human Environment in Stockholm in 1972 (Brundtland, 1987), mankind started to recognize that there is an absolute inseparability between welfare and environmental aspects and economic processes in general. In this respect, the UN World Commission on Environment and Development was set up with the task of defining a new concept of overall development of the human society for the remaining decades of the 2nd millennium and beyond.

In 1987, the Commission identified a number of definitions of the new challenge and, after a round of debates, adopted the Brundtland Report entitled "Our Common Future", the main component of which was based on reconciling the economy and the environment in a new way. development that supports the progress of society for a long time.

The main objective of sustainable development is to find a balance between the levels of economic and social development, to ensure a dynamic and flexible functioning process. A definition of sustainable transport, resulting from these requirements can be stated as a complex system that ensures the sustainability of mobility, while protecting the environment and reducing energy consumption (Fistung, 2008a). In recent years, discussions on the environment in the European Union's transport policy have focused on the development of sustainable transport systems.

In the Common Transport Policy, the European Commission highlights the fact that the current upward trends of the passenger and freight road and air

transport business fail to comply with the principles of sustainable development, in what concerns the ecological impact at the local, regional and global levels.

The Green Paper – Towards a European strategy for the security of energy supply (November 2000) of the European Commission emphasizes the important share of the transports in the growth of energy and CO2 emissions. In 2010, the transport accounted for 26% of the total CO2 emissions. A rise by 40% is expected in 2020 as compared to the year 2000 in greenhouse gas emissions resulted from transport, while the overall total of CO2 emissions will remain at the level of the year 2000. The road transport is the main cause of this situation, as its share accounts for 84% of the total CO2 emissions.

To promote a sustainable transport system along with other desiderata, the European Commission's Directorate General for Mobility and Transport considers that over the long term, the development of the future transport policy, the climate change environmental topic, the reduction of biodiversity, the use of conventional energy resources, the degradation of the environment and overall quality of life, including the human health level – will play a role as important as the one determined by economic and social factors.

Consequently, we will need an economic growth which should be achieved without a simultaneous increase in traffic and, implicitly, without the adverse effects on the environment and health generated by transport, and at the same time, it is necessary to ensure a reliable functioning of the entire transport system and a fair access to transport system. In this context, the Sustainable Development Strategy of the European Union highlights the following as its main aims: decouple transport growth significantly from growth in Gross Domestic Product; a more pronounced development of less-polluting transport modes and a more balanced development of regional infrastructures, resulting in a reduction of disparities at the regional level (Fistung, 2008b). To achieve this goal, the European Union adopted in 1980 the decision to create a common market of sustainable market and develop a Trans-European Network (TEN) as a strategic element to speed up the achievement of social and economic cohesion. This project has been designed so that to ensure interconnection, interoperability and access to national infrastructures. The achievement of this goal has required and still requires huge amounts of funds, with very long investment recovery periods, which often rendered them unappealing for private investors. Unfortunately, for a long time the urban transport infrastructure has not been included in this policy. However, over the last few years, EU initiatives such as the programs CIVITAS or CUTE attempted to remedy this issue and draw attention to the topic of urban traffic and the improvement of its management, by promoting sustainable transport. The initiatives are in their final stages, and the first projects already started, as a matter of fact, in 2000 (European Economic and Social Committee, 2007).

A combination of several factors is needed to achieve long-term transport, especially for economic ones, finding reliable solutions for the development of transport sectors, but also of a developed infrastructure.

This can be translated, at urban level, in the set-up of priority lanes for less-

polluting means of transportation (public transport and transport by non-polluting transport modes or even pedestrian lanes), as well as adequate multifunctional terminals. There are currently a few initiatives promoting sustainable urban transport, most of which aiming to integrate and develop the public transport (such as Dublin, Paris, Brussels, Berlin), use of green fuels (as it can be found in Budapest), restrictions on the access of motor vehicles in central areas, development of infrastructures allocated to walking or riding of bicycles as well as the development of the "park and ride system" at the level of public transport terminals (throughout most of the European capitals).

Even though a large part of the current European infrastructure existed before the adoption of the TEN programs, since its enforcement the development process of the infrastructure system in Europe has been established as such in its current configuration by facilitating investments in a number of priority sectors.

The existence of non-public European financing sources available for the development of this program has thus fostered the upgrading of mostly road infrastructures, at the expense of other modes of transport, which are still currently depending to a large extent on government funds and subsidies. This tendency has unfortunately been decisive for the existing imbalance of the transport system, resulting mostly in the dominant growth of the demand and, inherently, of the offer in road transport sector, by far the least green mode of transport, at the expense of the other modes. The speed of infrastructure development in the European area has been affected by the available financial resources, so that some areas managed to develop faster while others lagged behind. A new development model has been proposed, which could assist and encourage the development of poorer areas.

That was the reason of the restructuring in 1988 of the Structural Funds system. The European Regional Development Fund (ERDF), the largest of the Structural Funds, has consequently became the major source of investments in the European transport infrastructure. Since 1993, the Cohesion Fund is meant to supplement the ERDF, aiming to support sustainable transport projects. To access such grants, there is however a binding requirement for the envisaged projects to aim the development of TEN or the development of areas with access to this network. Of the member states, four countries with a GDP/inhabitant level below 90% of the European average have been eligible to accessing regional funds. These countries were Portugal, Greece, Spain and Ireland, and the funds allocated to infrastructure projects from ERDF and Cohesion Funds amounted to over 40% of the total allocated to the entire European Union.

These funds, along with the governmental resources allocated by each and every member state, were the source of the rapid development of the transport infrastructure in these areas. However, the degree of absorption of community funds was different, due to the low capacity of Greece and Portugal to submit feasible projects, while Spain and Ireland developed European funds-financed infrastructure projects accounting to over 60% of the total financial resources employed. As such, by obtaining only the mandatory financing amounts needed for infrastructure upgrading from European funds, Greece and Portugal were

compelled to additionally resort to significant loans from the European Investment Bank. The total amounts allocated to these four countries, over the period 2003-2009 exceeded EUR 18 billion, but the vast majority of the funds were predictably allocated, however, to the development of road infrastructure (Unitedd Nations Environment Programme, 1972).

Table. 1. Structure of financing infrastructure development projects in Spain, Portugal, Ireland and Greece from EC sources, over the period 2013-2019

Mode of transport	ERDF resources (%)	Cohesion Fund resources (%)
Highways/ other road types	56	69
Railways	24	23
Bridges	4	3
Airports	5	5
Other types of infrastructures plus technical assistance	11	-

Source: European Commission (n.d.)

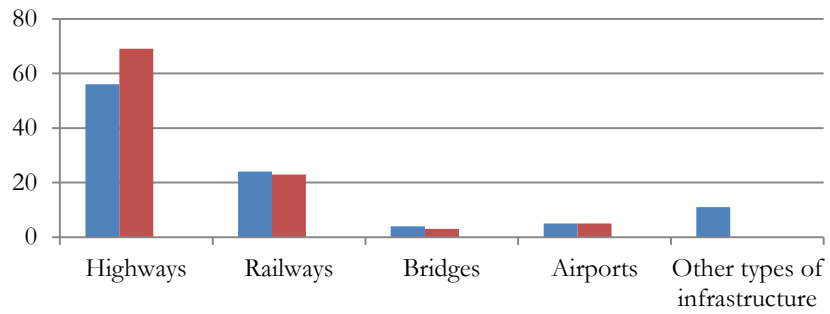


Fig. 1. Breakdown on transport modes at the level of the European Union over 2013-2019
Source: Fistung (2008a)

The "support" given to the development of road infrastructure is obvious. The share of financing road works has been almost constant, i.e. around 62% of the total amounts allocated to transport infrastructure overall in the European Union.

Significant changes in European transport modeling policy have led to the development of efficient transport.

The OECD Conference on Sustainable Transport in Vienna in October 2000 presented the ideas needed for its development, which consist in the long-term development of transport that is beneficial to human health and environmental protection.

At the same time, the evolution of the transports over the long term has been taken into account, considering every material aspect,economic, ecological and social.

For EU candidate countries, additional recommendations have been issued

on regional development, involving them in the preparation of impact studies in the field of transport.

The recommendations lead to conducting an impact study not only on one mode of transport but on several modes.

The tendency of the transport policy was established for the development of the road networks to the detriment of the railway one.

2. Avoiding disproportional investments at regional level.

The regional development policy is based on financial solidarity between Member States so that the least developed who have projects in development, through their own contribution but also through the absorption of financial funds, to implement them thus allowing them to develop the areas targeted in projects.

In addition, priority projects should in fact be integrated into national development projects, assessed in terms of their contribution to the area and not only the importance of a particular route in international trade transactions (those in the European corridor), appropriate measures for the financial evaluation of one mode of transport with another mode of transport, including pollution taxes and use of infrastructure. Transport policies must constitute the development of corrected relations between all transport systems.

A series of aspects need to be simultaneously taken into consideration to develop modelling processes of a Sustainable Transport System (STS), as follows:

a) At the socio-ecological level, in order to increase the accessibility of STD, the best decisions must be made in order to achieve transparency and the movement needs of the population, at the same time being necessary the involvement of the public in coming up with ideas for a transport ecological system.

There is a need for a continuous provision of information and a education in proposing STS to assess the social and ecological impact.

b) On an economic and ecological plan, on the ecological-economic level, research and development programs can be implemented, to be supported by introducing external expenditures with them, in the strategic plans, resulting in their internalization leading to a development of the sustainable transport systems.

STD for the encouragement of ecological transport must ensure a level of use of renewable resources that will lead to the use of new types of materials, but which will have as material support, the administrative measures but also those imposed by the fiscal system.

All of these requirements regarding the need to develop a sustainable transport system in Romania may seem out of the real context of the current evolution of the national economy. Nonetheless, it is our duty to look into the future, and this requires us to take into consideration the principles of sustainable development, otherwise we run the risks of deepening the lack of efficiency and the inequity generated by the current transport development concept, leading not only to serious environmental imbalances, but also to a future marginalization of the Romanian transport system by the European and international markets.

Within the Common Transport Policy, the European Union emphasizes that the effort to maintain the current upward trends of the road and air transport business does not fit into the sustainable development principles in what concerns the environmental impact at local, regional and global levels.

Along with other goals promoting a sustainable transport system, the Directorate General for Mobility and Transport of the European Commission considers that, over the long term, in preparation of a future transport policy, the environmental topics – such as climate change, reduction of biodiversity, use of conventional energy resources, environment and life quality degradation, including the health level, will play a role at least as important as the economic and social factors. It is necessary to provide an economic growth which would not automatically entail a simultaneous growth in traffic, and alongside, the transport-related negative impact on the environment and human health. At the same time, the good functioning of the entire transport system must be provided, as well as fair access to transport services.

3. Transport sustainable development policy. Topics and progress at international level

Following the United Nations Conference on Environment and Development in Rio de Janeiro (3-14 June 1992) and before the World Summit on Sustainable Development (Johannesburg, 2-4 September 2002), the European Council of June 14th, 2001 in Gothenburg brought together head of states and governments and adopted the proposal of the European Commission called „A sustainable Europe for a better world: A European Union strategy for sustainable development". Referring to a consultative document of March 2001, the strategy puts forward measures directly linked to the threats on the quality of life, tackling environment-related issues such as climate change, poverty and health, and it stood as the first really consistent answer to the problems arising from the relation between environment and economic development.

Four years earlier, between 18th and 20th of June 1997, in Göteborg took place the third Environmental Conference of Regional Ministers and Political Leaders in the European Union.

Therefore, five years after the Summit in Rio de Janeiro and the publication of the Agenda 21, „there is still a lot of work to do until we could be justified to say that we are going towards a sustainable development". During this conference, it was found that the „delay in applying environment policies is the weak link of the Community's environmental legislation and in promoting the implementation of the directives and initiatives".

The European Commission's proposal to the European Council of Gothenburg of June 14th, 2001 laid the basis and even went further by representing the first document taken into discussion the sustainable development policies, providing thus the first supporting document of the actions oriented towards achieving the sustainable development goal (European Commission, 2011).

For the guidance of the sustainable development policy, the Environmental Conference of Göteborg has retained six priority topics:

1. Climate change;
2. Public health;
3. Poverty and social exclusion;
4. Aged society;
5. The management of natural resources;
6. Mobility and Transport.

These six topics led to the premise that a sustainable transport system is meant to contribute to the economic development and the social welfare, without harming the natural environment or the human health (Brundtland, 1987).

The areas of significant interest for this topic include the growth of traffic volume and the level of congestion, noise and pollution. The envisaged actions should foster the use of transport modes that protect the environment and ensure that the price of using various modes better reflect the real social cost.

The development of the transport sector is dependent on the economic growth, there is a close relationship between them, and the volume of goods and passengers transported increases in proportion with the economic development.

At the first level, there is a single ratio, the total energy consumed in the transport sector, while the other levels are focused around three sub-topics.

Table 2. Co-development relationship between economy and transport

Level 1	Level 2	Level 3
growth of traffic volume and congestion level	noise	pollution
Growth of transports	Share of private cars within the domestic passenger transport Share of road transport within overall freight market	Modal shares of passenger transport .Modal shares of freight transport. Volume of cargo transport. Transport energy consumption by mode.
Transport prices	Not defined yet	Not defined yet
Social and environmental impact of the transport	Emissions of ozone precursors in road transport. Greenhouse gas emissions in transport.	Fatalities in road transport accidents. Fatalities by age group. Nitrogen oxyde emissions released by road vehicles

Source: Organisation for Economic Co-operation and Development (2000)

The European trend in the transport sector consists in the development of the ecological and sustainable one.

The assessment of the evolution of long-term transport has taken into account specific quality objectives, based on the criteria and standards of

environmental protection and health, which respect the principles of sustainable development.

The EU transport policy takes the current breakdown of the market by transport mode (road 44%, railway 41%, inland waterways 8%, air 4%, other modes 3%) at the level of 2010, which is considered to be an alarming situation, particularly when it is noticeable the aggravation tendency from the increase by 50% of the road transport over the period 2018-2020, due to the lack of measures which would have shifted the flows of goods to other modes of transport (Organisation for Economic Co-operation and Development, 2000).

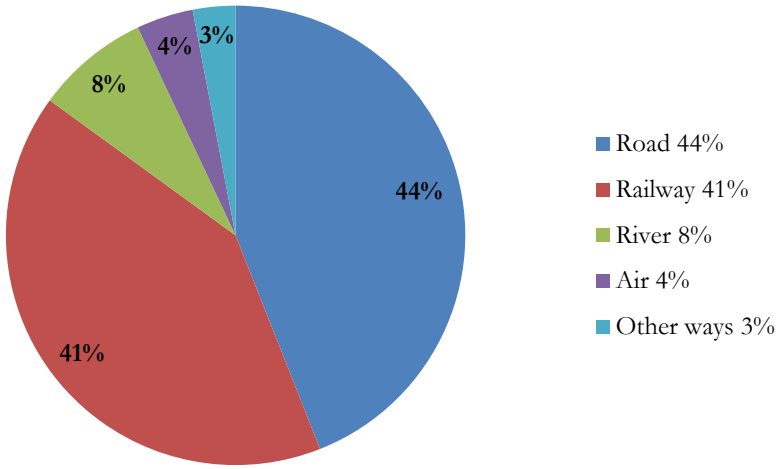


Fig. 2. Breakdown per mode of transport in EU at the level of the year 2010 Source: Fistung (2008a)

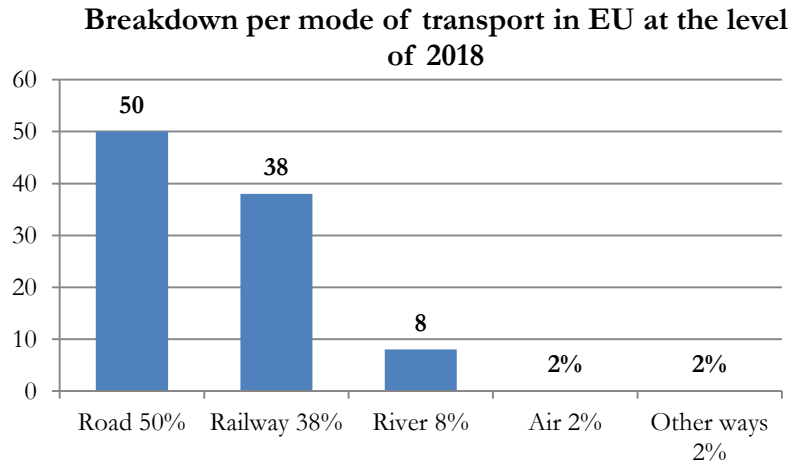


Fig. 3. Breakdown per mode of transport in EU at the level of the year 2018 Source: Fistung (2008a)

From the perspective of territorial complementarity, the transport generates longer transport flows than the uniformity of a specific country territory, and the preparation of territorial policies is made on local, national and continental layers, resulting thus in a continental, national and regional structural complementarity.

It can be easily noticed, at the level of EU, that a rather simple liberalisation took place in the road transport sector, while the railway sector is permanently looking for new solutions for the last 25 years.

The European concepts of sustainable development in the transport field envisage the design of a viable transport development strategy. The most important concepts are the following:

a) Sustainable development of the public and private transport systems, concept encompassing both aspects related to resources, wastes, pollution etc., and the social dimension of the transport development – the trade of goods and population mobility;

b) Competition in the transport sector must be transparent and equal

c) Integration of services at modal level, the transport sector must integrate other economic sectors

d) Stimulating information sharing as well as knowledge about transport services, by means of best practice and advanced technologies;

e) Establishing quality criteria for transport

f) Efficient use of financial instruments so as to streamline the economic contribution in the area consemned.

g) Social equity - the interdependence of transport with socio-economic activities

h) Environmental protection (Fistung, 2008a).

At EU level, the European Commission given to the European Council a series of measures for the modelling of transport systems in accordance with the principles of sustainable development. In the transport field, the land utilization aspects are treated within the European Union's political strategies among the most important topics, which involves that an important objective within European transports will be an intermodal transport mode, at the expense of a door-to-door transport. (In the U.S., for instance, the reduction of the transport time by promoting door-to-door transport is a priority and it is applied to all modes of transport).

As an argument in support of this option, given the development and intensification of transport networks throughout Europe, the limitation of territorial development, as well as the high capacity on short distance transport, has led to a number of problems related to transhipment and storage of goods.

The achievement of the objectives within the transport markets, topic which was under debate at the European Consultative Forum on the Environment and Sustainable Development sets its goals and tasks for a competitive and sustainable development and aims the following **main objectives**:

- *Decouple transport growth from growth in GDP*, in order to reduce congestion and other negative side-effects of transports;

- *Bring about a shift in transports*, in order to replace road by rail and inland waterways, as well as individual transport by public passenger transport, so that the share of road transport is no greater than the one in 2018);

- *Promote more balanced regional development* by reducing disparities in economic activities and maintaining the viability of rural and urban communities, as recommended by the European Consultative Forum on the Environment and Sustainable Development, (January 2015) (UNSPECIFIED, 2005).

The European Commission proposed in 2012 a framework model for transport costs, to be ensured by 2022 so that the prices of the different modes of transport reflect their total social costs (including external costs).

- The implementation between 2010 and 2013 of the methodological frameworks would promote intelligent transport initiatives, interoperability of payment systems in the road transport, fostering technological progress allowing for price setting for road transport,

In particular, the Commission proposed in 2011 a significant reduction in funding for road transport by revising the directives for trans-European transport networks and promoting the improvement of transport systems and resolving the links between them (liberalization of the rail transport market, air traffic system) at E.U level.

- The assessment of the coherence of the „sectorization„ of various EU policies will take into account their objectives (e.g. NATURA 2000, which envisages the most disadvantaged agricultural regions, areas eligible for obtaining subsidies by means of Structural Funds or state aids).

- Fostering local initiatives to tackle with the issues generated by urban areas; submitting recommendations for integrated development strategies for urban areas and sensitive environment areas.

4. Conclusions

The evolution in time of the transport systems took place as a reaction to the requirements of the society. The more and more pressing needs regarding the mobility of the goods and persons were met with corresponding means, modes of transport which are gradually more sophisticated, both at technical, logistic and infrastructure level. In their design process the economic reasons always prevailed and only on a secondary level the social aspects were also considered. Therefore, we may consider that not too long ago, the transport was not a purpose in itself, but a means towards achieving a multitude of practical solutions. The acknowledgment of any movement of persons and goods depends exclusively on the envisaged purpose, on the economic and social effects to be obtained. Nonetheless, the overall evolution of the human society proved that taking the human activities (including the transport activities) out of their natural context is not only "un-beneficial" for the society as a whole, but it can actually become dangerous for the quality of the

human life and the environment.

The transports influence and, in their turn, are being influenced by features of economic development. It is worth knowing that transport contributes to a significant extent to the GDP, to creating labor force employment opportunities as well as indirect benefits oriented towards regional development and globalization. For all these reasons, it can definitely be said that transports are an economic force, a bonding agent and an influence over the other business sectors.

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