COST-BENEFIT ANALYSIS FOR TRANSPORT INFRASTRUCTURE PROJECTS: EASTERN EUROPEAN CASES

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Abstract: *Cost-benefit analysis is the most well-known technique of rational allocation of resources. This way of evaluating spending programs is an attempt to measure the costs and earnings of a community as a result of running the evaluated program. During the paper, I stressed the importance of a cost-benefit analysis regarding the decision to allocate financial resources, for a project from the transport sector. Our analysis is oriented to infrastructure projects from Romania and Republic of Moldova.*
Keywords: *Cost Benefit Analysis, transport sector, Eastern Europe*

1. THEORETICAL ASPECTS REGARDING THE COST BENEFIT ANALYSIS IN THE TRANSPORT INFRASTRUCTURE PROJECTS

The realization of an investment project (transport infrastructure, ecological depot, research center, land improvements, electricity production or distribution infrastructure) can have beneficial effects such as local or regional economic development, optimization of transport flows, reducing pollution, improving soil performance, but it can also have negative effects such as: demolition of properties, displacement of inhabitants, cutting and decommissioning of land, noise pollution, environmental change. It is not a direct decision-making procedure, but one that leads to a better-oriented decision, if it is respected (Henley and Spash, 1993; Randall, 1987).

The purpose of the cost-benefit analysis for public spending programs is to determine whether a certain level of public spending can produce a greater benefit than if the respective funds were used in an alternative public program or if they were have been kept in the private sector (Boardman, Greenberg, Vining, 2004). Thus, the cost-benefit analysis in the public sector consists of a set of techniques that are designed to ensure that limited resources are allocated effectively between the private and public sectors, and subsequently, between alternative projects within each sector. The cost-benefit analysis estimates and summarizes the value-monetary equivalent of the present and future social costs and benefits, from the citizens' point of view, of the public investment projects, in order to decide whether they are in the public interest (Bueno, Vassallo, and Cheung, 2015). The main purpose of the cost-benefit analysis is to help make social decisions, more precisely, to facilitate the more efficient distribution of the company's resources. Basically, cost-benefit analysis is a method of evaluating a policy that quantifies in monetary terms the value of all the consequences of this policy on all members of the company. In principle, the impact of the projects from all points of view must be evaluated: financial, economic, social, environmental. The objective of the cost-benefit analysis is to identify and quantify (respectively to give them a monetary value) all the possible impacts to determine the costs and benefits of the project; subsequently, the results are collected (net benefits) and concluded if the project is appropriate (Henley, Spash, 1993).

Traditionally, costs and benefits are evaluated by analyzing the difference between the "project" scenario and the alternative to this scenario: the non-project scenario (so-called "incremental approach"). Next, the results are aggregated to identify the net benefits and to determine if the project is timely and worth implementing. Therefore, the cost-benefit analysis can be used as a decision-making tool for assessing the utility of investments to be financed from public resources. Therefore, the cost-benefit analysis proves its usefulness when preparing the feasibility studies for choosing the optimal variant (economically, ecologically, socially, technologically) of the investment projects.

Between the transport infrastructure of a country and its economic development there is a two-way relationship. The development potential of a region is even greater as the region has a more modern transport infrastructure. Such a road network facilitates the reduction of travel time to different destinations, increasing accessibility in the region. The lack of adequate transport infrastructure can stifle development, and the national / regional economy is stagnating or even regressing. The difficult access (measured in time and cost) to the areas with economic, residential or leisure functions of a region makes that region less attractive for both the business environment and the population. The high costs of transporting the goods (whether we are talking about raw materials, semi-finished products or finished products) and moving in difficult conditions of people in a certain area are factors that discourage economic investments and lead to the gradual decline of that area.

The construction and maintenance of the transport infrastructure are activities with a powerful multiplier effect, which creates numerous jobs and drives the economic development. The construction sector, the building materials industry, the metallurgical industry, the construction machinery and equipment industry, tourism, auto transport and design services are the economic areas that have the most to gain from investments in infrastructure. The area that has been given the most attention in terms of studies based on cost-benefit analysis is the field of public transport. This section illustrates investments for the development of new or existing transport infrastructure. These investments may include the construction of new transport lines or connections, the completion of existing networks, as well as the interventions to modernize existing infrastructures. The proposed methodology focuses mainly on the modes of road and rail transport. However, the general principles can also be applied to other modes of transport, for example, maritime and air. The socio-economic objectives of the transport projects are generally related to the improvement of the travel conditions for goods and passengers, both within the study area and to / from the study area (accessibility), as well as to improving the quality of the environment and the well-being of the population served.

In more detail, the projects will deal with the following types of transport problems (Comisia Europeană Direcţia Generală Politică Regională, 2008):

- reducing congestion by eliminating capacity constraints on the unique nodes and connections in the network, or by building new and alternative routes or routes;
- improving the performance of a connection or network node by increasing the travel speed and by reducing the operating costs and accident rate through the adoption of security measures;
- orienting demand towards specific modes of transport (many of the investments made in recent years, where the issue of environmental externalities has emerged as a critical factor, have sought to change the modes of transport in the demand for travel in order to minimize pollution and limit the impact on the environment);
- completion of missing links or poorly connected networks: transport networks have often been created at national and / or regional level and can no longer respond to transport requirements (especially in the case of railways);
- improving accessibility for people in the outlying areas or remote regions.

The first step is to clearly establish the main direct objectives of the transport project (reducing bottlenecks, changing transport modes), as well as those related to the environment (energy savings, reducing emissions) and separating them from the indirect objectives (regional development, employment etc.). Once the objectives have been clarified, the next step is to check if the project identification is consistent with the objectives (Matei; Stoica; Săvulescu; 2009).

Types of investments (Comisia Europeană Direcţia Generală Politică Regională, 2008):

- new infrastructures (roads, railways, ports, airports) to meet the growing transport demand
- completing the existing networks (missing links)
- expansion of existing infrastructures
- renovation of existing infrastructures
- investments in security measures on existing links or networks
- better use of existing networks (for example, better use of under-utilized network capacity)
- improving intermodal transport (transhipment nodes, accessibility to ports and airports)
- improving the interoperability of the networks
- improvements in infrastructure management

Functional characteristics of investments (Korytárová and Papežíková, 2015):

- increasing the capacity of existing networks
- reducing congestion
- reducing externalities
- improving the accessibility for the peripheral regions
- reduction of operating costs for transport

Types of services:

- infrastructures for densely populated areas
- infrastructures for the request for long distance travel
- freight infrastructures
- infrastructures for the transport of passengers

The following tables show examples of monetary values for time savings in freight and passenger transport, CO2 emissions and accidents from HEATCO and IMPACT studies. Studies provide estimates for EU-25; the tables below also include values that have been estimated by JASPERS for Bulgaria and Romania, by applying a simplified approach using a linear extrapolation of GDP per capita to the value of time and to the values of victims of accidents in countries from Eastern Europe.

Table 1 HEATCO Estimated Values for Time Savings for Business Travel and Road and Rail Freight Transportation People Transportation Goods

Country	Plain	Bus	Car	Truck	Train
Austria	39,11	22,79	28,40	3,37	1,38
Bulgaria	13,35	7,78	6,69	1,58	0,65
France	38,14	22,23	27,70	3,32	1,36
Hungary	18,62	10,85	13,52	1,99	0,82
Germany	38,37	22,35	27,86	3,34	1,37
Romania	13,47	7,85	9,78	1,59	0,65
UE(25)	32,80	19,11	23,82	2,98	1,22

Source: HEATCO Project (http://heatco.ier.uni-stuttgart.de/) and http://ec.europa.eu/transport/costs/ handbook/index_en.htm.

Table 2 HEATCO estimated values for avoided accidents (price factor, purchasing power parity: Euro 2002)

Country	Deaths	Severe accident	Slight accidents
Austria	1.685.000	230.100	18.200
Bulgaria	459.195	64.646	4.599
France	1.548.000	216.300	16.200
Hungary	808.000	108.400	7.900
Germany	1.493.000	206.500	16.700
Romania	465.445	65.415	4.657
UE (25)	1.302.000	161.800	12.200

Source: HEATCO Project (http://heatco.ier.uni-stuttgart.de/) and http://ec.europa.eu/transport/costs/ handbook/index_en.htm.

The projects in the transport sector can have an impact on the economic structure of the regions. Theoretically, this is a controversial issue and the conclusions, which seem to be universally recognized, show that the effects can be both positive and negative. In the presence of market distortion, increasing the accessibility of a suburban area or region can lead to a competitive advantage, but also to a loss of competitiveness if the industry is less efficient than in the central regions. In this situation, increasing accessibility may force the local industry to get out of business (Crescenzi; Di Cataldo and Rodríguez -Pose, 2016).

2. COST-BENEFIT ANALYSIS FOR THE DEVELOPMENT OF THE TRANSPORT INFRASTRUCTURE: ROMANIA - BUCHAREST-BRASOV HIGHWAY

This chapter aims to exemplify the way of applying the methodology of Cost - Benefit Analysis that aims to develop transport infrastructure in Romania and other countries in the European Union. With a road density of 350 km / 1000Km2, Romania is well below the European average of 1196 km / 1000Km2, at position 23 in 30 European countries analyzed and, respectively, below the Eastern European average of 933 km / 1000Km2, per position 8 of the 9 European countries analyzed. One of the problems of adventure in Romania, with a significant negative impact on the economic and social status of the country, is the lack of a satisfactory network of fast road transport, highways and express roads. Romania currently has 670 km of motorway in use. In this situation, the development of the road transport network is a national priority for achieving the objectives of ensuring the capacity necessary to carry out the freight and passenger traffic, the safe and rapid connection of the western and central area with the south and south-east of the country, for obtaining economic, environmental and social benefits, translated by increasing the volume of investments, providing new jobs, reducing pollution, improving and operating the road corridor by increasing the speed of travel, reducing operating costs over the entire life cycle of the project, reducing the number accidents by improving comfort during travel and reducing traffic congestion (Maniu and Pantelescu, 2015).

The project of the Comarnic-Brasov highway, is an integral part of the Bucharest-Brasov highway, is part of the general network of highways surveyed at national strategic level. The Comarnic-Brasov highway project fully meets the development objectives of the road transport infrastructure mentioned above, also ensuring direct, comfortable and quick access to the tourist resorts on the Prahova Valley throughout the year. The Comarnic-Brasov highway is part of the Bucharest-Brasov highway, which is divided into the following sections: Bucharest - Vlasiei Mill; Mill Vlasiei - Ploiesti; Ploiesti - Comarnic; Comarnic - Brasov. Among the specific objectives of the project, designed in such a way as to maximize the contribution of the project to achieving the objectives of the governance program, are (Comisia Nationala de Prognoza, 2017; Compania Nationala de Administrare a Infrastructurii Rutiere, 2014; Ministerul Transportului, 2014):

- Reducing the number of accidents due to the implementation of the project, resulting in the direct decongestion of a crowded route (DN1) and making available to traffic participants a safer alternative route (Comarnic-Brasov highway), which leads to the saving of 10 human lives in - one year, according to the cost-benefit analysis elaborated for this project;
- Reducing travel time (and generating cost savings in terms of travel time) for passenger and freight traffic transiting the project area, by providing a road alternative that allows for increased speed, resulting in cost savings. estimated at almost 80,000 hours per day for users; for example, with regard to the Comarnic - Predeal sector, one of the busiest road sectors on the Bucharest-Brasov route, in the absence of the motorway, the estimates show that at the level of 2020 a the vehicle would travel the respective road

sector in about 120 minutes, while the motorway section would travel in about 12 minutes, so a reduction of up to 10 times the travel time.

- Reducing the degradation of the road structure within the localities located on the alternative routes to the proposed route of the project, especially as a result of the use of the highway by trucks (these being the ones that contribute most to the deterioration of the road infrastructure), as well as the reduction of the operating costs of the vehicles due to the reduction of the route and the state of the infrastructure used;
- Improving the quality of the environment and the health of the population, by reducing air pollution and noise level within the localities located on the alternative routes to the proposed route of the project, as well as by reducing the amount of pollutant emissions. Thus, according to statistics at European level, road traffic is the largest source of pollutant emissions. As for greenhouse gas emissions (CO_2, N_2O, NH_4), the implementation of the project would result in a reduction of 630000 tonnes per year of CO_2 emissions, respectively 435 tonnes per year of NO_x emissions. Higher speeds on the highway also favor the reduction of pollutant emissions generated by road traffic.

The Feasibility Study for the Bucharest - Brasov Highway project was developed in 2002 and updated in 2006. In the context of the Feasibility Study for the Bucharest-Brasov Highway, a cost-benefit analysis was developed, with the purpose of determining the social and economic benefits resulting from implementation of the new road sector. As a result of the passage of time from the moment of the initial cost-benefit analysis, as well as the changes of the route and the technical solution according to the results of the competitive dialogue stage of the award procedure, an updated cost-benefit analysis was designed to take into account the the route and the current technical solution of the Comarnic-Brasov highway. The model used for the elaboration of the cost-benefit analysis is the DCF (Discounted Cash Flow - updated cash flow) model, which quantifies the future costs / costs and revenues / benefits generated by a project in the implementation and operating stages; the difference between them is updated ("brought" at present) in order to ensure comparability of data, according to the principle of time value of money. Following the calculation of the indicators mentioned above, the economic profitability of the project has obtained positive results, indicating that the proposed investment is feasible from a socio-economic point of view. The social gains resulting from the implementation of the Comarnic-Brasov highway project show the significant impact it has on the lives of citizens: saving 10 human lives every year, saving time up to 100 minutes / vehicle on the busiest section of Bucharest and Brasov (Comarnic-Predeal), improving air quality by saving pollutant emissions of up to 63,000 tonnes of CO_2 per year, respectively 435 tonnes of Nox per year, creating new jobs both during the execution of the motorway and its operation (Comisia Nationala de Prognoza, 2017; Compania Nationala de Administrare a Infrastructurii Rutiere, 2014; Ministerul Transportului, 2014).

Concession vs. traditional public procurement. At the general level, we have two option for the realization of the Comarnic highway, namely:

a) the award of a contract for the design and execution of works for the construction of the motorway and, subsequently, after completion, of maintenance and rehabilitation contracts;

b) awarding a public works concession contract, covering the entire life cycle of the project, from designing and obtaining financing to the execution of works and the permanent subsequent maintenance of the infrastructure, in the form of a public concession / partnership structure -private (PPP).

The choice of one or the other of the two options is based on an analysis (study to substantiate the concession decision), which results in whether the project concession / PPP project is more economically efficient than the project acquisition stage. classic public or not.

Technical description of the Comarnic-Brasov Highway. The starting point of the motorway at Comarnic was established as km 111 + 875. In the area 111 + 700 km is the first road node, which will have to be built when the section Ploiesti - Comarnic will be built. Thus, in order not to impede the further development of the motorway, a solution was chosen to start with this road node designed at the Feasibility Study level.

Access to the Comarnic - Brasov highway is therefore planned to be made by placing a roundabout intersection in the area where DN 1 intersects DJ 101 R (the bridge to Breaza), from which a connection to the highway will leave. The starting point of the freeway in Cristian is provided at km 165 + 090. In addition to the two accesses to Comarnic and Cristian, three unpaved road nodes will be located, in Busteni (km 131 + 600), Predeal (km 144 + 400) and Rasnov (km 158 + 750). Most of the route of the highway runs in the mountainous area, with accentuated windings due to the railway, steep slopes and watercourses, the current project of the Comarnic-Brasov highway aiming to overcome these constraints by ensuring a linear journey from the beginning to the end of the highway.

The highway is divided into 5 sections, as follows (Comisia Nationala de Prognoza, 2017; Compania Nationala de Administrare a Infrastructurii Rutiere, 2014; Ministerul Transportului, 2014):

- Section 1: Comarnic Sud - Comarnic Nord from Km 111 + 875 to Km 115 + 300
- Section 2: Comarnic Nord - Buşteni road node from Km 115 + 300 to Km 131 + 600
- Section 3: Buşteni road node to Predeal road node from Km 131 + 600 to Km 144 + 400
- Section 4: Predeal road node to Râşnov road node from Km 144 + 400 to Km 159 + 645 15
- Section 5: Râşnov road to Cristian from Km 159 + 645 to Km 165 + 090 + new connecting road between the highway and DN73 (Cristian) + rehabilitation DN73B.

The design and execution of the motorway will be realized in compliance with the technical norms and standards in force. By carrying out the project, the impact on the local community is a positive one, the route of the highway not interrupting the routes of the existing roads. Thus, the current activities of the inhabitants of the area will not be affected. Moreover, the roads adjacent to the motorway will be rehabilitated, which will lead to better and safer travel conditions. As part of the concessionaire's work schedule, along with the works related to section 1 of the freeway described above, the concessionaire will rehabilitate a 3.5 km section of DN1 that will connect with the future section of freeway.

The rehabilitation works of the section of DN1 will be carried out in order to improve the road conditions and to ensure the taking of the traffic from a national road to the motorway sector in safe conditions and will include (Comisia Nationala de Prognoza, 2017; Compania Nationala de Administrare a Infrastructurii Rutiere, 2014; Ministerul Transportului, 2014):

- The existing part of the road will be reconfigured in the sense of providing 3 lanes of traffic, of which a reversible lane that will take over the traffic on the 1st or 2nd lane, depending on the most crowded direction at different times.
- The existing asphalt coat will be milled and new asphalt layers will be laid.
- Horizontal and vertical signaling elements will be installed to ensure road safety conditions, especially visual signals on portals that will indicate the number of lanes available on each lane according to the above;
- Pre-signaling elements will be installed approximately 1 km before the start of the 3-lane reconditioned road sector, with the purpose of informing users about the changes that have occurred in the respective road sector;
- The existing parapets will be replaced, especially in the area of the railway and the areas where the minor riverbed of the Prahova river stretches to the base of the road embankment, in order to increase road safety conditions.

The concession tariff and the toll system. By the Comarnic-Braşov Highway a "semi-closed" toll system will be implemented, which will provide barriers on the entire road at the two ends of the highway, located in the Comarnic and Rasnov area, as well as cabs. of taxation in Sinaia-Busteni and Predeal. The concession tariff will be charged once the entire highway is completed and becomes operational. A detailed description of the toll system includes the following (Comisia Nationala de Prognoza, 2017; Compania Nationala de Administrare a Infrastructurii Rutiere, 2014; Ministerul Transportului, 2014):

- A full width barrier located on Section 1 or Section 2,
- Toll station on the access lanes of the Busteni road node, allowing the following traffic flow to be charged (only of this flow): The flow from Predeal to Busteni, at the exit from Busteni.
- Toll station on the access lanes of the Predeal road node, allowing the following traffic flow to be charged (only this flow): The flow from Buşteni to Predeal, at the exit of Predeal.
- A full width barrier located on Section 4,
- A charging station on the access lanes of the Rasnov road node, allowing the following traffic flows to be taxed (only of these flows): The flow from Cristian to Rasnov, at the exit from Rasnov, and the flow from Rasnov to Cristian, at the entrance to Rasnov.

The concession rate to be paid by a car for the entire length of the motorway is expected to be 7 lei with VAT included, subject to indexation. The level of the tariff charged is established according to the distance traveled by the vehicle. The level of the concession rates for each category of vehicle is generally established below that existing in most European states. The concession rates will be introduced only when the highway is open to traffic, and the estimated nominal value of the revenues to be obtained from taxation and rents for service spaces will be directly related to the traffic registered on the highway, the level of the tariff / axle, the availability of the highway, traffic mix etc. The level of the concession tariff mentioned above can be modified by the public authority, in accordance with the commercial and macroeconomic needs.

The main contractual stages. The concession contract is structured in three main stages as follows:

Table 3 HEATCO estimated values for avoided accidents (price factor, purchasing power parity: Euro 2002)

	Stage	Duration
1.	Preliminary period	12 months from the date of signing the contract
2.	Construction period	36 months from the end of the preliminary period
3.	Operating period	26 years since the end of the construction period

Source: HEATCO Project (http://heatco.ier.uni-stuttgart.de/) and http://ec.europa.eu/transport/costs/ handbook/index_en.htm.

Presentation of the costs and revenues of the Project. The costs of the project will be borne by the Concessionaire and will consist mainly of the following (Comisia Nationala de Prognoza, 2017; Compania Nationala de Administrare a Infrastructurii Rutiere, 2014; Ministerul Transportului, 2014):

- the costs related to the construction works (design, project organization, project management, field studies and actual works),
- costs related to the operation and maintenance activity, which covers the operating costs, current, periodic and major maintenance, maintenance of the tax equipment, service and parking spaces, maintenance centers,
- the costs of financing for the whole duration of the project, consisting of the costs of the long-term loans, the costs of the shareholders' equity contribution, bank fees, the hedging costs in terms of the interest rate, etc.

The total construction cost, based on the winning bid, is approximately 1.8 billion Euro (adjustable according to the above), out of which a cost of 198.5 million Euro, representing 11% of the total mentioned cost, covers the construction work of the Section 1 of the freeway, the rehabilitation works of DN1, the realization of the technical project for the entire freeway, the organization of the project, the management of the project and the costs incurred by the concessionaire for carrying out field investigations for the entire route of the freeway. A breakdown, by main cost categories, is shown below:

Table 4 HEATCO estimated values for avoided accidents (price factor, purchasing power parity: Euro 2002)

Cost item	Total (€) excluding VAT	Percentaje in total cost
Engineering and design costs, including investigations	109.701.500	6%
Construction	1.663.806.078	91%
Other costs (insurance, Independent Engineer, etc.)	54.850.750	3%

TOTAL	1.828.358.328	

Source: HEATCO Project (http://heatco.ier.uni-stuttgart.de/) and http://ec.europa.eu/transport/costs/handbook/index_en.htm.

The construction costs cover not only the tread surface, respectively the part of the motorway seen, but also many other works that cause this tread surface to rise to a high quality level. These are important works of earthworks as well as the consolidation of the slopes due to the geological and geotechnical profile of the area crossed by the highway, works whose stability is directly influenced by the execution of a large and judicious system thought and realized by taking and removing the meteoric waters or by infiltration.

The project provides important works of art, including 19 viaducts and 16 bridges with a total length of approx. 4 km, as well as 10 km of tunnels with double tunnel (or about 20 km of single wire tunnel), representing one of the most complex engineering challenges. Also, are included 3 road nodes, the access roads to the highway, as well as ensuring the continuity of the existing roads that the highway could interrupt, relocation of the various utility networks that the highway affects, hydrotechnical works and mitigation of the impact on the environment. In addition, there are a variety of other works specific to a highway project, such as traffic monitoring system, road marking and signaling, emergency call system, ITS (Intelligent Traffic System), toll system, centers maintenance, service and parking spaces. Compared to the cost estimates made in the Feasibility Study phase, in 2006, the costs of the various categories of works presented by the winning bidder in his bid are generally comparable, with the variations that are largely due to the route variant proposed by the winning bidder, which is different from the one proposed in the Feasibility Study and which resulted in new engineering solutions, as well as the modifications of the regulations of the national legislation, 24 of the national and European technical ones and the technological advances that have been registered from 2006 until now (Comisia Nationala de Prognoza, 2017; Compania Nationala de Administrare a Infrastructurii Rutiere, 2014; Ministerul Transportului, 2014).

All these are illustrated in the following table, in which the costs of the main categories of works are compared, these being substantially similar.

Tabel 5 The costs of various categories of constructions category

Construction category	Feasibility study cost (Thousands Euro)	Winning bid cost (Thousands Euro)
Road works	371.831,93	616.708
Bridges, passages, viaducts	537.254,62	275.932
Tunnels	141.344,54	396.368

Source: http://www.cnp.ro/user/repository/Investitii_strategice_in_parteneriat_public_privat/Studiu%20fundamentare%20autostrada%20Ploiesti%20Brasov.pdf

3. CASE STUDY. CONSTRUCTION OF M3 ROAD IN THE REPUBLIC OF MOLDOVA

The M3 road from Moldova provides the shortest and most important connection between Chisinau and Giurgiulești, providing access to the Danube and the Black Sea. In addition, the M3 corridor is an integral part of the European road E577 Poltava - Kirovograd - Chisinau - Giurgiulești - Galați - Slobozia. It ensures the connection between the corridors of the European network IV and IX. At the moment, the corridor has at times a higher level of deterioration and a reduced load capacity, which leads to the restrictions of the weight on the axis and the diversion of freight traffic, the high transport costs and respectively the reduction of local business opportunities and transit traffic (Gherman, 2017).

The objective of this study funded by the EU, as specified in the Terms of Reference (ToR) is "... to ensure a study of banking, financial, environmental and institutional feasibility for the rehabilitation and extension of the M3 Chisinau-Giurgiulești road / border with Romania ”, to identify the economic sectors suitable for road improvement. Further "the study must be appropriate for presentation to the International Financing Institutions in order to attract the financing of the improvement of the road for the preparation of the loans by the International Financing Institutions" (Administraţia de stat a drumurilor, 2016; Ministerul Economiei si infrastructurii, 2012).

The M3 route connects Chisinau, the capital of Moldova, with Giurgiulești, the southern end of Moldova, for a distance of approximately 216 km and can be divided into 7 main sectors (Administraţia de stat a drumurilor, 2016; Ministerul Economiei si infrastructurii, 2012):

- The corridor starts in Chisinau as a Category I bus with four lanes at the village of Porumbrei. From there to the south, an extension of the M3 was designed to bypass the city of Cimișlia. The design, the acquisition of the land and the earthworks began during the anilo period 1985 to 1995. The rights to purchase the land may have expired since then.
- Because the bypass road Cimișlia is not completed, the corridor continues from Porumbrei towards the southwest direction on local roads, as a Category IV road, to connect with the Republican road R3. The Pigeon-R3 sector was not planned to be an integral part of the M3 corridor, but due to the cessation of the works on the Pigeon-Cimișlia sector, the corridor passes through the villages of Pigeon, Iurievca and Gradiște. The sector has load restrictions, which is often not controlled, but the alternative route through Hâncești to Chisinau is much longer and therefore the transport costs are higher.

The M3 corridor follows the R3 route to Cimișlia. The R3 road sector between Hâncești and Cimișlia will be rehabilitated by the end of 2009. From Cimișlia the road (Category III) continues as M3 towards the south, towards Comrat city (dividing the mark E 557). Comrat is the capital of the autonomous region of Gagauzia. Here M3 intersects with R35 east of Basarabeasca. The sector will be rehabilitated by the end of 2008. From the south of the city Comrat M3 continues as a Category II / III road, ensuring the connection of the villages Chirsova and Congaz to the intersection of R38.

The R38 regional road provides access to the west to the city of Cahul, with the border crossing with Romania, and to the east with the city of Taraclia.

The traffic varies between approximately 4000 vehicles / day on the northern sector of the M3 road, up to 700 vehicles per day between Vulcanesti and Slobozia Mare to the south. In the northern sectors there are distinct shipping routes. In addition, there is a significant number of traffic exchanges between Cimișlia, Comrat, Cahul and Giurgiulești. Based on the existing data, the traffic forecasts have been elaborated taking into account: the annual basis of the traffic volume and the travel characteristics of the corridor; traffic generation - new traffic attracted by the extended road options; diversion of traffic - traffic diverted from other corridors on an improved road; special traffic generators: traffic generated through new economic activities, Giurgiulești Free Port.

Most of the existing sectors of the road are in a normal to bad condition, and only locally in a very bad condition. However, the existing bituminous surface of the road, on some road sectors, is in a state in which it requires major maintenance and repair, where there have been recorded cracks, bumps, faience / crocodile skin and frequent transverse cracks (Administraţia de stat a drumurilor, 2016; Ministerul Economiei si infrastructurii, 2012).

The capital cost of major projects outside the route of the M3 corridor, varies from over 45 million Euros for the extension / bypass road Cimişlia, to over 10 million Euros for the new route / bypass road Ciumai-Burlăceni. On average, the cost per kilometer for new construction is 1.2 million Euros. The cost of the construction on the route varies widely between the necessary works, and oscillates between the rehabilitation works and the reconstruction works at Category II. The approximate cost per kilometer is 0.74 million Euro.

During the study, it became increasingly evident that the process of land acquisition and practice in Moldova will be an issue that must be considered in carrying out the technical project, as well as the implementation of the improvement projects. Especially since some sectors of the bypass roads are almost entirely private property. In addition, the property is shared by many individuals, in some cases more than 170 owners per bypass road sector (Administraţia de stat a drumurilor, 2016; Ministerul Economiei si infrastructurii, 2012).

The general conclusions of this feasibility study are that the corridor improvements M3 as a general scheme are guaranteed, and that an improved high-level road will be beneficial for the development of Moldova, especially in connecting the central part with the southern part of the country. However, as in other transition countries, traffic volumes are low, which together with the costs of construction determine the feasibility. Many sectors of the corridor show a sufficient economic rate of income and are economically feasible. While the economic analysis is a major decision criterion, in the process of selecting the project, other aspects must be considered in the development and stage of the continuous corridor M3. These are (Administraţia de stat a drumurilor, 2016; Ministerul Economiei si infrastructurii, 2012):

- The best economic use of existing investments (eg M3 km0 to km34)
- Development of a continuous corridor, without obstacles
- Connectivity of the national network

- The general benefit of the economic, as well as the environmental development of the traffic conditions, as well as the possible future conditions.

Summarizing the above, the project evaluation template was used to qualitatively evaluate the impacts of the factors mentioned above together with the economic evaluation. The following table presents the project evaluation:

Table 6 Recommendation of the project and the stage of the Chisinau - Giurgiulești road

Sector	Existing road category	Proposed category of road	Type of works	Cost per km	Economic feasibility	Economic development	Network connectivity	Social	Purchase	Ecological category	Impact on the environment	Rank	Period of time	Eligibility of the technical
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Chișinău-Porumbrei	I	I	Maintenance and repair	+	+	o	+	o	O	+	o	+++	s	da
Extension M3 the bypass road Cimișlia B1	N/A	II	New 2-lane construction on the 4-lane road mark	-	+	+	+	+	-	-	o	+	s	nu
the bypass road Cimișlia B2	N/A	II	New construction of 2 lanes	-	-	o	+	+	-	-	o	--	m	nu
Porumbrei-Valea Perjei, (R3)	IV	III/II	Rehabilitation / Reconstruction	+	++	o	-	-	O	+	-	+	m	
R3-Cimișlia intersection	III	II[1]	Rehabilitated until 2009										l	
Cimișlia urban area	III	II[1]	Currently rehabilitated										l	
Cimișlia-Comrat	III	II[1]	Currently rehabilitated										l	
Comrat urban area	III	II	Reconstruction	+	+	o	-	-	+	+	-	+	m	
the bypass road Comrat	N/A		Bypass road with 2 lanes	o	+	+	+	o	-	-	+	++	s	nu
Comrat-Balabanu (R38)	III	II	Reconstruction	+	+	o	o	o	+	+	-	+++	s	da
Balabanu(R38)-Ciumai	III	II	Reconstruction	+	+	o	o	o	+	+	-	+++	s	da
The roads around the villages Ciucur-Minjir, Chirsova, Congaz, Svetlii	N/A	II	New road to bypass	-	-	o	o	+	-	-	+	--	l	

Ciumai-Vulcănești	IV	II	Reconstruction	+	+	o	+	+	-	-	+	+++	s	nu
Vulcanesti urban sector	III	III	Reconstruction	+	+	o	o	-	+	+	-	++	s	da
the road to bypass Vulcanesti	N/A	II	Bypass road with 2 lanes	-	-	+	-	+	-	-	+	--	l	
the new route and bypass route Slobozia Mare-Giurgiulești	IV/N/A	II	Bypass road with 2 lanes	o	o	+	+	+	-	-	+	++	s	nu
Vulcănești-Slobozia Mare-Giurgiulești	IV	IV[2]	Rehabilitation	+	o	-	-	-	+	+	-	-	m	
Slobozia Mare-Giurgiulești	IV	IV[2]	Rehabilitation	+	-	-	-	-	+	+	+	o	m	

Source: Administraţia de stat a drumurilor (2016) http://files.asd.md/Tendere_locale/comunicat/Studiu.pdf Ministerul Economiei si infrastructurii (2012) Proiectul de Îmbunătățire a Drumurilor Locale Social & Mediu. https://mei.gov.md/ro/content/lucrarile-pe-drumul-national-m3-chisinau-giurgiulesti-plina-desfasurare

Four other elements contributed to the forecasting of the future traffic for the M3 corridor: traffic generation through the development of the Giurgiulesti port; generating traffic from local and regional accessibility through the corridor; divert traffic on the M3 corridor from other strategic routes, in particular R34; divert traffic from the existing M3 corridor on proposed improvements outside the route. Each of these components of future traffic on the M3 corridor is summarized in the following table:

Table 7 Traffic forecasts: generating from the Giurgiulești port in full development in 2018

Sector of corridor M3	%	Vehicles / day
Total port traffic for the M3 corridor	100	2,583
Giurgiulești - Slobozia Mare	100	2,583
Slobozia Mare – Vulcănești	36	930
Vulcănești – Comrat	24	620
Comrat – Chișinău	17	439

Source: Administraţia de stat a drumurilor (2016) http://files.asd.md/Tendere_locale/comunicat/Studiu.pdf Ministerul Economiei si infrastructurii (2012) Proiectul de Îmbunătățire a Drumurilor Locale Social & Mediu.https://mei.gov.md/ro/content/lucrarile-pe-drumul-national-m3-chisinau-giurgiulesti-plina desfasurare

4. CONCLUSIONS

The development of a resilient economy demands the development of the competitiveness of the public and private sectors of activity, regarding the attracting of the international and domestic financial resources indispensable to finance the evolution of the economic entities. The need for resources usually exceeds the possibilities of purchasing them in a modern economy. Similarly, while resources have a limited character, there is a trend of continuous increase in demand for resources. Resources include in their structure, along with human resources, materials, currency, information, and financial resources. All these constitute the totality of the financial means indispensable for the fulfillment of the economic-social objectives in a certain period of time. Given the variety of competition sectors that require financing and the limited character of public resources, it is intended to carry out a comprehensive analysis of the costs and social benefits of a project regarding the optimization of the decision-making process in order to carry out various investment projects. It is necessary, in this regard, for a technique of classifying projects in order of their economic opportunity, so that they can be adopted in the order established before the investment budget is consumed. Specifying the destinations for the allocation of public financial resources is also the investigation of the needs of the company and the classification of its priorities. Selecting the categories of investments that correspond to a great extent the local, regional or national economic-social objectives at a given time.

Cost-benefit analysis is a process of measuring, identifying and comparing the social costs and benefits of an investment project. Projects undertaken by the public and private sectors need to be estimated in order to determine whether they are an effective resource allocation. In the private sector, projects that show a productive application of resources may entail benefits and costs for many people, not just for direct beneficiaries. In order to be able to distinguish between the private costs and the monetary outputs of the project, these effects are called social benefits and costs. Due to the differences between the level of public services, the infrastructure or the quality of scientific research conducted in the country, in comparison with the other countries of the European Union, it is essential to attract public funds for the necessary investments.

The cost-benefit analysis demonstrates its necessity by representing the social effects of a project, being compared with the investment costs, so that by implementing the project, the social benefits obtained condition the opportunity and the need for its realization.

In conclusion, the coordinating principle of cost-benefit analysis is economic in nature. The efficient allocation of resources leads to the maximization of the total social benefits; therefore the effectiveness of the cost-benefit analysis is identified at the level of a guide of the public sector resources and of the efficient provision, as in the case of the programs of health, environment, and infrastructure or with reference to education and social well-being. The degree of evolution of a sustainable economy requires the increase of the competitiveness of the sectors of public activity but also of the private ones, in order to attract the internal and international financial resources so necessary to finance the growth of the economic entities. As demonstrated throughout the paper, cost-benefit analysis is a process of identifying, measuring and comparing the social benefits and costs of an investment project or program. Both public and private sector investment projects need to be evaluated to determine whether they represent an efficient allocation of resources. Throughout the paper, it was stressed the importance of developing a cost-benefit analysis regarding the decision to allocate European financial resources in order to finance a project from both the public and private sectors. Theoretically, cost-benefit analysis is a poorly explored area at the national level, with few studies and local publications addressing this topic. As a result of these aspects identified and analyzed in the paper, we can appreciate the cost-benefit analysis as a tool for evaluating the benefits of investments from the point of view of all groups of stakeholders, based on the monetary values attributed to all the positive and negative consequences of the proposed investment project.

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