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Improvement of economic effectiveness of road highway projects

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Abstract

With regards to the strategic role of transport in a country's economic development and the large investments that are required, a thorough economic appraisal of these investments is of high importance. Therefore, it is appropriate to analyze and possibly modify existing methods for evaluating the economic efficiency of road construction at the scientific level, with the support of the real practice experience. Our research concentrates on evaluation of current methods of economic appraisal, their consecutive improvement and on incorporation of the LCCA agenda into the investment decision process. Consequently, it focuses on the possibilities to improve the effectivity of both, an investment decision process and a realization phase through the proposal of very concrete measures based on results of our research and on experience of real practice construction.

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Keywords: economic efficiency; investment appraisal; life-cycle costs; HDM-4 software; road transport infrastructure

1. Introduction

This research paper deals with the major deficiencies in the current investment decision process to the highway network and with the major problems and ineffectivities in the consecutive phase of realization. Overall approach of this research paper is to reveal the possibilities to improve effectivity of above mentioned investment decision process and realization phase through proposal of the very concrete measures. In substance it concerns the purposeful synthesis of proper asset management with more effective investment program to achieve higher infrastructure quality. Although this paper depicts the current road infrastructure situation in the Czech Republic, talks about local state offices and agencies and uses local transport infrastructure data, it also analyses global experience and its findings aspire to be of general validity and applicability.

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Current importance of this topic is also given due to the currently increasing production of the construction segment and the present situation of financing the construction of roads and highways. In terms of the volume of investments it is favorable mainly due to various European Union's funds (Cohesion Fund and European Regional Development Fund). These funds are primarily to support routes, which should become part of the Trans-European Transport Networks (TEN-T). Czech Republic has committed to complete the TEN-T routes' infrastructure until the year 2030. This is to be carried through the European Union's framework of Transport Operational Programme. This means, that until the year 2030, Czech Republic should almost double the length of its motorway and highway network - from the actual 1242 km to 2180 km. Unfortunately, availability of these European Union's resources in such extent is limited by the year 2023 [1]. To secure sustainability of the development in preset speed of the construction even after this date, when financial resources will rapidly decrease, a significant change in overall approach and resultantly a significant increase in effectiveness is needed. This can be achieved only through increased emphasis on economical, procedural and managerial aspects of both phases of road infrastructure construction - investment decision process and construction realization phase.

To achieve better understanding of the current practice of appraisal of economic effectiveness of the highway (respectively road) projects, we also analyze one such appraisal – an output of widely used HDM-4 software and the way its results are understood and interpreted.

2. Approach to economic appraisal of the investment

Based not only on vast experience of the American and Czech state highway agencies, main goals and/or areas to be considered during the highway investment's economic effectiveness appraisal are as following:

- transportation system eficiency – improvement of its reliability and efficiency;
- cargo movement and support of economic development - improvement of the road network capacity and regional interconnection;
- traffic safety – goal to significantly reduce human fatalities and injuries due to traffic on all roads;
- traffic congestion reduction - significant reduction of congestion on the road system;
- infrastructure asset development – maintainance, repair and rehabilitation strategy of all roads and structures;
- environmental impacts – To minimize the impact of transportation on nature, environment and population [2,3].

Without proper consideration of all above stated criteria, the investment decision making process cannot be complete.

The current method for evaluating the economic efficiency of road construction is carried out using the methodology of the Czech Road Assessment System (CSHS). For the actual economic assessment, CSHS methodology determines the software tool HDM-4, developed by Birmingham University (United Kingdom), with support from the World Bank [4]. Thanks to its complexity and flexibility to include high number of factors and inputs, this software is used in many European countries [5].

But there is a significant problem to this widely used assessment tool – or actually a problem of this whole assessment approach. It also has to implement data and information that are more of a qualitative and sometime even intangible nature. It is very hard to quantify the value of safety, human life or environmental impact. Of course the tool works mainly with the data of a quantitative kind, more appropriate for economical appraisal. But very often it is that small portion of mentioned soft data that can change the whole result of the analysis and the choice of the accepted variant of the projected investment. The result of the analysis is very sensitive to these data inputs and can be influenced marginally by artificial change in these qualitative indicators. Such a possibility to affect an overall result of the analysis by tweaking mentioned soft data is a major problem itself. An analyst should not have any option to willingly decide over the results of the analysis. Based on the above said, it seems that to achieve a decent