

# Road Infrastructure Asset Management Performance

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## Introduction

The evaluation of the effectiveness of a design for a road utility is a rather recent subject. Like any other Economic Science, this one stemmed out from the ever-growing gap between demand and scarce supply to fulfil this very demand due to progressive exploitation of resources. Therefore, reasoned choices must each time result from general and homogeneous criteria able to supply best results at lowest cost for the examined sector.

In the road sector, as for any other Public Work, these aspects are apparent at every stage of the asset-building procedure: planning, selection of the funding system, designing, construction phase and strategy of maintenance Planning for clear reasons of general choices and priorities. The selection of the funding system, either by an annual or multi -annual budgeting or with a deferred payment or franchising, for reasons of depreciation to be included in the cost-benefit balance account. Technical designing for the reasons and criteria to be detailed hereafter. Management strategy in order to determine the actual costs of future operations necessary to preserve road operational and geometrical characteristics.

There are no phases of greater or lesser importance that would require a greater or lesser commitment from the operator. Of course, upstream choices will carry out an effect downstream. Very often, unsatisfactorily results of subsequent sub-phases may involve, at the moment of general planning, a thorough re-evaluation of the previous procedures and choices. Additionally, the skipping or the breakdown of specific stages in the procedure may thwart initial forecasts and lead to objective fall off.

## 1 Pavement Design Performance

Technical and microeconomic but also macroeconomic criteria are being used in design evaluation. Therefore, such criteria

require a cost-benefit analysis to be performed over a range of specification covering a much wider area than issues related to the road itself: social costs for investments and environmental fall out, political and economic benefits for the Society as a whole such as production growth, protection of social classes, income redistribution etc... These are all very interesting and topical issues, based on the principle of optimisation of a community welfare and concerning mainly the stage when investments are to be planned. The analysis of criteria allowing to appreciate a design effectiveness for a road construction project, at a moment where "macro" aspects have already been set for and subsequent decisions for the technical and economic aspects have to be made yet leads prior to the examination of different hypotheses for action. This approach is used as well to evaluate the pavement only.

### 1.1 Design Criteria and Methods: Present Situation and Developments

At present, a useful reference for road design is "the Catalogue for Road Pavements", (Commissione "Strade" CNR, 1995). The type of pavement selected according to the type of road, of subgrade and of forecasted circulation during the road useful life; besides any possible combination of parameters as an input, a range of possible solutions to be considered as equivalent as for the resistance to fatigue are given as output. However, a limited amount of maintenance operations should always be budgeted to restore surface characteristics of pavement (Giannattasio, Domenichini, Marchionna et altri, 1993).

A correct design prevents therefore early pavement deterioration. This latter is divided into early deterioration and deterioration deferred in time.

The former refers to mechanisms of subsidence when applying the first loads, the resistance threshold of material is overcome. This occurs to rigid pavements under the action of

*The effectiveness of a road design is based on economic choices supplying the maximum highest benefit at the minimum cost.*

*In the road sector these requirements are visible at any stage of the project execution: general planning, funding, design and management.*

*Criteria for a project evaluation are based on cost-benefit analyses and choices may also involve social and environmental aspects. This analysis envisages the evaluation of different alternatives; this is also used to identify the most viable solution for a road pavement.*

*The criteria for economic and performance choices has been implemented in order to identify the most efficient pavement design based upon initial and differed cost analysis necessary to supply a suitable level of performance during the pavement useful life.*

*The concept of total quality in a road has been implemented at the moment of motorway concession renewal. Four weighed partial indicators were used. The process for formulating maintenance plans has been revised and a new procedure allowing to consider several indicators at the same moment (Markov - type aggregate optimisation model) are presented.*

*Finally, the several technical innovations are reported in the field of earthworks, pavements, bridges and tunnels.*