PAV-ECO

Pavement Maintenance

Funding: European (4th RTD Framework Programme)  
Duration: Oct 1997 - Oct 1999  
Status: Complete with results

Background & policy context:

The single highest cost in road management is the cost associated with road pavement maintenance. For this reason, most EU countries are currently developing road pavement maintenance management systems to minimise the associated costs. Such systems must include performance models for forecasting road pavement conditions and social and financial costs.

Objectives:

The objectives of the project are to establish financial and economic models for the evaluation based on life cycle costs, for:

- optional application of different maintenance measures;
- impact of changed traffic flow on maintenance need;
- allocation of funds for different components of the road infrastructure;
- social economic effects from maintenance of the infrastructure;
- vehicle operating costs appropriate to European conditions.

Methodology:

The project will involve:

- development of an analysis system for the economic evaluation of alternative road pavement maintenance and rehabilitation strategies on individual road projects;
- preparing a description of the linkage between forecast changes in the traffic flow on road network and the analysis of maintenance management activities;
- providing social economic evaluation models for inclusion in maintenance management procedures;
- development of models for the society rate of return on maintenance investments;
- development of models for the interaction of budgets for the maintenance of public roads, private roads and bridges;
- consideration of criteria for the regional distribution of the budget;
- identifying further work necessary to modify the vehicle operating cost model, to increase the suitability for use throughout Europe.

Related Projects:

- ARROWS: Advanced research on road workzone safety standards in Europe
- ART: Automated and robotics-based techniques. New solutions for road construction and maintenance
- BRIME: Bridge management in Europe
- PARIS: Performance analysis of road infrastructure
- SMARTEST: Simulation modelling applied to road transport European scheme tests
Parent Programmes:
FP4-TRANSPORT - Specific research, technological development and demonstration programme in the field of transport, 1994-1998

Institute type: Public institution
Institute name: European Commission; Directorate-General for Energy and Transport (DG TREN; formerly DG VII)
Funding type: Public (EU)

Partners:
Danish Road Institute/Vejteknisk Institut (DK); Anders Nyvig A/S (DK); VTT Yhdyskuntatekniikka (FI); Laboratoire central des Ponts et Chaussées (F); Institut für Verkehrswissenschaft and der Universität von Köln (D); LAVOC, Ecole Polytechnique Fédérale de Lausanne; Viaconsult S.A. (CH); Transport Research Laboratory (UK).

Organisation: Danish Road Directorate
Address: Niels Juels Gade,
Zipcode: 1020
City: Copenhagen
Contact country: Denmark
Telephone: + 45 46 30 01 15
Fax Number: + 45 46 30 01 05

Key Results:
The innovation of PAV-ECO lies in the assessment of the social costs and the additional costs to the users due to maintenance works such as lost time, vehicle operation costs, accidents, air pollution, and CO2 emissions. The project has developed a framework for comparison of life-cycle costs of different maintenance strategies, which involves calculation of road owner and road user costs over the length of the selected analysis period.

Origin-destination (OD) based models are the most effective for traffic forecasts, both at network and project level. However, their application depends on the extent of available statistical data. To deal with the limited data input, a simplified method at network level has been implemented on the basis of traffic growth and traffic loads in German motorways. If properly calibrated, the model is very useful for planning of long-term investments, providing information about the route choice of road users, especially when an OD model is not available. In addition, at project level, the proposed simple, route-based, model can be used, in combination with pavement management systems, when road works have to be planned and data about traffic redistribution are essential. The models have been developed with capacity restraints which have to be properly defined, for they allow to detect the bottlenecks that may occur due to traffic growth or maintenance works.

Cost-benefit analysis has included the monetary evaluation of social costs such as accidents, noise, loss of time, emissions of pollutants. Both the static, i.e. the evaluation of a single measure, and the dynamic condition, which considers a succession of maintenance measures, have been assessed using different maintenance strategies in Denmark, Germany and France. Static analysis is not suitable to give realistic information, for it neglects the time between the maintenance measures. Conversely, the proposed dynamic strategy analysis allows to take into account the changed serviceability of the road in the long term. The final result shows that maintenance strategies with more intensive measures at longer intervals are more efficient. This is due to the investment cost decrease, in the long-term, with the increase of intervals between the measures, whereas the benefits vary only slightly between the strategies.

Life-cycle cost analysis is the most suitable method for funds allocation, as it takes into account conditions of pavements and bridges, traffic and traffic delay costs. The lack of mon

Policy implications
PAV-ECO has provided a tool suitable to plan and evaluate long-term policies and strategies of
pavement and bridge maintenance management. The lack of funds generally assigned to maintenance leads to the need for optimisation of the financial resources. With this aim, the life-cycle costs approach provides the policy makers with a methodology to distribute funds between regions, pavement and bridge types, and to assist in the decision making regarding the use of public or private funds to finance part of the network.

In addition, PAV-ECO has acquired data from different European countries with the aim of harmonising the decision making process and the approach to the pavement management system. The project has underlined the need of more and more updated and detailed data, especially with regard to origin-destination matrices, in order to forecast the behaviour of road users when road works are on.

Documents:

- pavecofrep.pdf (Final report)

**STRIA Roadmaps:** Infrastructure  
**Transport mode:** Road transport  
**Transport policies:** Decarbonisation, Societal/Economic issues