Alternative materials in road construction

Funding: European (4th RTD Framework Programme)
Duration: Jan 1998 - Dec 1999
Status: Complete with results

Background & policy context:
The use of alternative materials (e.g. blast furnace slag, demolition rubble, crushed concrete, and bottom ash from municipal solid waste incinerators) in road construction reduces the consumption of scarce natural aggregates and recycles materials that would otherwise be disposed of as waste. In most European countries, use of alternative materials in road construction is relatively low at present, for several reasons, including high transport and treatment costs, uncertainties about the mechanical performance of alternative materials, and environmental concerns about potential contamination of surface and ground waters by leaching from alternative materials. There is however an increasing pressure, driven by national governments, to increase the use of alternative materials by means of taxes on material sent to landfill and on the use of natural aggregates, and by the setting of targets for increasing the amount of recycling.

Objectives:
The prime objective of the ALT-MAT project was to develop a toolkit of test methods to assess the suitability of alternative materials for use in road construction. The project had two subsidiary objectives:

- to assess the suitability of particular materials in a number of case studies,
- to consider mitigation methods which could be employed where the performance of alternative materials was not adequate to allow their unrestricted use.

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:
NA

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Key Results:
The outcome of the ALT-MAT project is a toolkit of test methods for assessing the mechanical performance, hydrodynamic properties and potential leaching of contaminants under a range of scenarios. Several national-application tables giving the mechanical test methods and limiting values for alternative materials in different road layers have been prepared, and form a useful guide to the
requirements for the use of alternative materials at the present time. A number of environmental tests (primarily leaching tests) are proposed to enable assessments of the potential or actual impact on the environment caused by alternative materials, and a model for assessing the environmental impact on groundwater quality is presented. The results can be used both in a site-specific context and in a more general way to develop a rationale for the setting of criteria for material quality and road design, which will ensure adequate protection of the environment.

Inspection and monitoring of existing roads has shown that alternative materials give as good support to the road pavement layers as natural reference materials, and sometimes better. The sites investigated ranged from northern Sweden to south-western France, and hence covered a wide range of climatic conditions. The performance in the field was often better than would have been predicted from laboratory test results. Leaching tests and groundwater sampling indicated that the alternative materials did not appear to be having any negative effect on groundwater quality.

Policy implications

Overall, the results of the ALT-MAT project are very positive and provide support for the use of alternative materials in road construction. The case studies show that the materials perform as well as natural aggregates, and often better than suggested by standard laboratory tests. A larger use of alternative materials in road construction will lead to less use of natural aggregates and reduce the amount of alternative materials sent to landfill sites. The project focused on the use of alternative materials in road construction, but its conclusions are applicable to other earth structures such as railway and canal embankments and airport runways and taxiways.

Further research is needed to study water movement into, through and out of road pavements, and the effect of water movement on the mechanical behaviour of road materials. ALT-MAT proposed a programme of laboratory and field tests, leading to the development of a hydro-geological model which can be used as a predictive tool for the environmental impact of alternative materials in road construction.

The outputs from ALT-MAT can benefit several categories of end users, including engineering contractors and highway designers, scientists and researchers, environmental regulatory bodies, standardisation bodies, regulators and the producers of alternative materials.

Related Projects:

- COURAGE: Construction with unbound road aggregates in Europe.
- POLMIT: Pollution of groundwater and soil by road and traffic sources: dispersal mechanisms, pathways and mitigation measures.

Documents:

Alternative materials in road construction (Final report)

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