PROJECT

DISTANCE

Developing Innovative Solutions for TrAffic Noise Control in Europe

Funding: European
Duration: Oct 2013 - Jul 2015
Status: Complete with results

Objectives:
The objective of the DISTANCE project is to provide National Road Administrations with valuable and informative guidelines to improve the optimisation of traffic noise abatement in the future on main road networks. The guidelines will help to improve the quality of their noise maps. The project will outline which noise asset information should ideally be gathered (over and above what is already collated) and with what precision. These data can then serve as input for the CNOSSOS-EU calculation scheme that is expected to be used for future mapping under the Environmental Noise Directive. Accurate noise maps will also allow more reliable identification of areas where noise abatement is required.

The DISTANCE project will also focus on developing a vision for the future for noise abatement measures. Therefore, the traffic and road network, as it is expected to develop in the future, will be investigated, and based on factors such as the development of the traffic volumes, traffic composition, noise emission of cars and trucks, acoustic quality of tyres and low-noise pavements on the main road network.

Noise screens and pavements that are able to perform additional functions can, in terms of whole life costs, potentially be cheaper, e.g. when they also produce electricity or heat. Lots of ideas and technologies have been launched and these will be reviewed and assessed by the DISTANCE consortium. This will assist NRAs in testing and investing in promising technologies and concepts and avoid wasting money on ideas that are likely to be unsuccessful.

Methodology:

There is a constant stream of ideas for novel noise abatement techniques such as new screen top devices, noise absorbing ditches, resonators under the pavement, screens with acoustic crystals, and new pavement types or construction techniques etc. Some ideas are promising and deserve further investigation whilst other ideas do not pass a single critical scientific assessment (like “active” noise barriers). The DISTANCE consortium proposes to make a comprehensive review of these new concepts/ideas/technologies and to submit each of them to an independent and critical assessment. The DISTANCE project will help NRAs to avoid the use of technologies which have been proven not to work, despite some of these ideas being repeatedly investigated (e.g. Helmholtz resonators under a porous pavement).

One way of reducing noise nuisance is to make use of the psychological aspects related to it. Research has been done and presented in this field, but very little has been done in practice with this knowledge. The DISTANCE consortium proposes to carry out a literature review about this subject and distil measures which can be used by NRAs, not to reduce the noise level but to reduce nuisance, which would equally be very valuable. The work will also use this information and other sources to develop concepts for how public awareness, understanding and acceptance of noise mitigation measures can be improved.

A broad dissemination effort is proposed, including the set-up of a dedicated website and the organization of a workshop at the end of the project. The drafting of a non-technical policy brief will ensure that the findings can be readily understood by important target groups who are not necessarily skilled in acoustics, such as politicians and high-level policy makers.

Parent Programmes:
ERA-NET - European Research Area Net
Funding type: Public (EU)
Other programmes: CEDR
Other countries: Belgium/Flanders, Germany, Ireland, Norway, Sweden and United Kingdom

Partners:
- SINTEF, Norway
- TRL, UK
- ANAS, Italy

Organisation: BRRC
Contact country: Belgium

Key Results:
The DISTANCE project was initiated to provide NRAs with comprehensive information/guidance to assist with planning noise abatement in the future by addressing five standalone key questions, comprising the subjects of the DISTANCE project’s five work packages as follows:

- What are the data requirements for future noise mapping and action planning?
- Which secondary functions exist for pavements and noise screens and are these functions feasible/interesting?
- What are the potential noise effects of future traffic scenarios?
- What alternative “smart” noise mitigation measures exist or are under development?
- What is the possible role of perception and awareness of noise mitigation measures?

The aim was to review and assess all knowledge available in literature and additional nonpublished sources, as opposed to carrying out new research, and to provide an expert vision; summarizing the information in practical guides, for use by road administrations.

After a thorough analysis of the available data, the findings of the consortium can be summarized as follows:

1. A survey was conducted by distributing a questionnaire to responsible authorities in fifteen member state countries; twelve replies were received. The survey focused on data collection in four subject fields: road surfaces, noise barriers, traffic volumes and geospatial data (terrain profile). Positively, all responding countries were already involved in collecting such data. However, a few gaps were identified, including failure to consider the impact of ageing on the acoustic quality of road surfaces. Furthermore, there was a lack of data on the sound absorption characteristics of roadside areas; recommendations were made to fill those gaps. It would be beneficial for road administrations to exchange information in this field.

2. The concept of “secondary” functions of noise barriers was taken in a relatively broad sense. In addition to apparent possibilities such as generating electricity with photovoltaic cells integrated in noise barriers or including safety rails in noise barriers, attention was paid to added architectural values and to “greening” the environment by using plant screens for noise control. Unfortunately, the potential in this area is rather limited, as demonstrated by a number of foreign pilot projects. Photovoltaic cells in noise screens, integrated noise screens and safety barriers and green barriers are the most interesting, yet of limited use.

3. Serious consideration was given to possible developments in road infrastructure and in vehicle and tyre technologies, and their foreseeable effects on traffic noise. From the available data, it appears that the following will occur over the next few years in Europe: (1) the portion of motorways in the total road network will increase; (2) the use of ITS to improve the fluidity of traffic flows will grow; (3) the percentage of light lorries in the total vehicle fleet will increase; (4) the use of durable noise-reducing road surfaces will grow; (5) technological improvements to tyres and vehicles will have a marginal impact on overall traffic noise; (6) hybrid and electric cars will be increasingly used. None of these measures/developments will significantly reduce traffic noise. However, models have indicated that it is possible to achieve significant reductions in traffic noise if infrastructural changes are suited to developments in vehicle and tyre technologies.

4. In relation to new technologies/measure for mitigating traffic noise, all conceivable (conventional and innovative) possibilities were listed. They can all be categorised under one of the following four headings: (1) traffic control and management measures; (2) land use and road design; (3) socio-
economic actions; (4) innovative solutions. All the measures were briefly described and evaluated for effectiveness, technological development and cost-benefit ratio. A final selection of eight measures, suitable for implementation on major roads (the primary concern of national road administrations and, hence, in the DISTANCE project), was made. Significant noise reductions (exceeding 7dB(A)) are achievable in the future with poro-elastic road surfaces and “sonic crystals”. The latter comprise arrays of poles in repeated rows along the road which do not “stop” noise as a conventional barrier does but allows part of it to propagate, and eliminates part of it by destructive interference of the noise waves. The literature reports outstanding results in a number of pilot projects and it is worth investigating this further, e.g. with experimental setups. Another interesting development is the use of diffractors, i.e. a series of trenches, parallel to the road, deflecting the noise upwards so as to achieve a noise reduction of approximately 4dB(A) at roadside dwellings.

5. Finally, the project demonstrated the importance of the psychological aspects of annoyance from traffic noise. A substantial part of the annoyance perceived is “subjective” and can be significantly reduced by a correct “psychological” approach, with all the associated advantages. A number of adverse effects of noise, e.g. stress and related health problems, are due to annoyance and if this annoyance can be mitigated, the adverse effects can also be mitigated. For instance, a series of studies have shown that citizens’ participation in a new project can have a major impact. Lack of involvement can increase the nuisance. It is hence advised to involve people as early as possible when new road infrastructure is planned and public hearings, on which the project is presented from different perspectives can be a great tool to involve the public.

The findings from the project are described in five detailed, yet practical reports, which can be downloaded free of charge from the website of the DISTANCE project (www.distanceproject.eu).

Documents:
- Project Description

STRIA Roadmaps: Other specified
Transport mode: Road transport
Transport sectors: Passenger transport, Freight transport
Transport policies: Societal/Economic issues, Environmental/Emissions
Geo-spatial type: Network corridors