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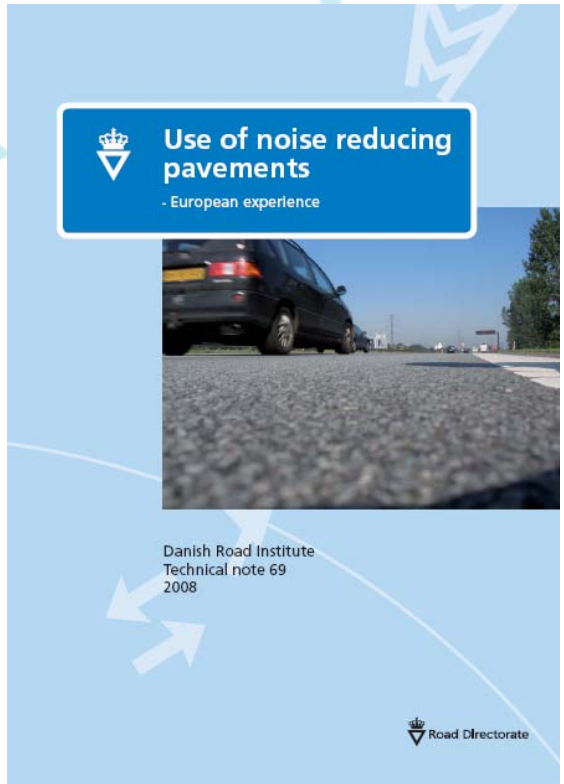
Use of noise reducing pavements European experience

A survey performed by
Danish Road Institute
Road Directorate
Denmark



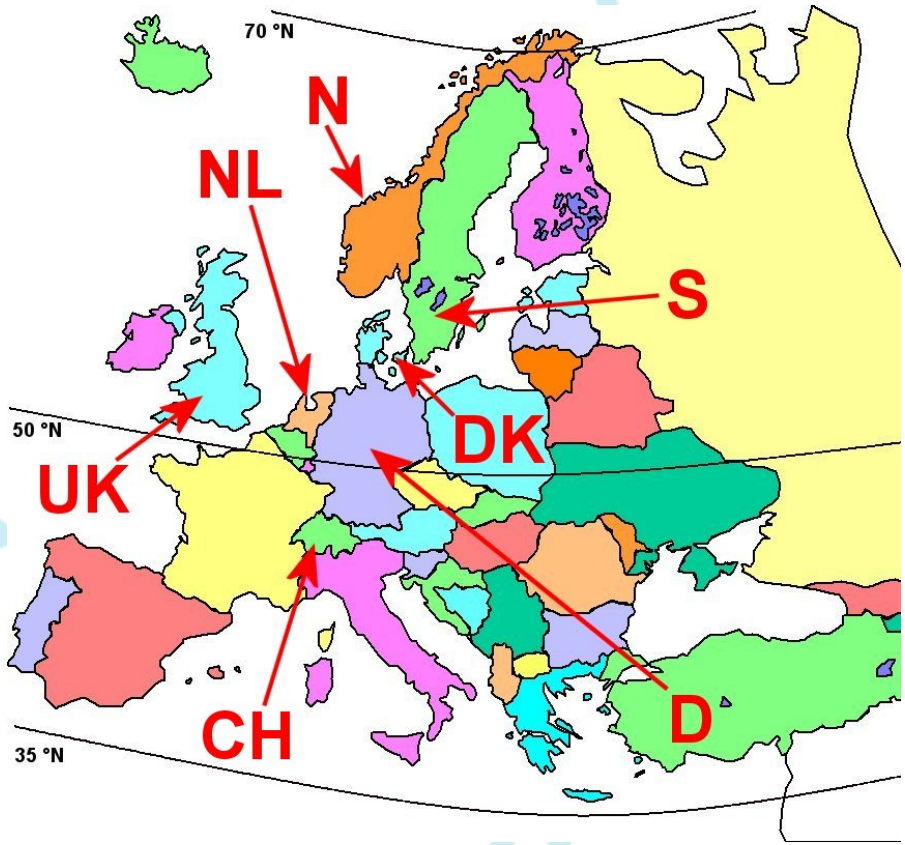
Background

- Administrative Agreement May 2007 between:
  - California Department of Transportation (Caltrans)
  - Danish Ministry of Transport, Road Directorate, Danish Road Institute (DRI-DK)
- Objective collaborative relationship for quieter pavement research and development

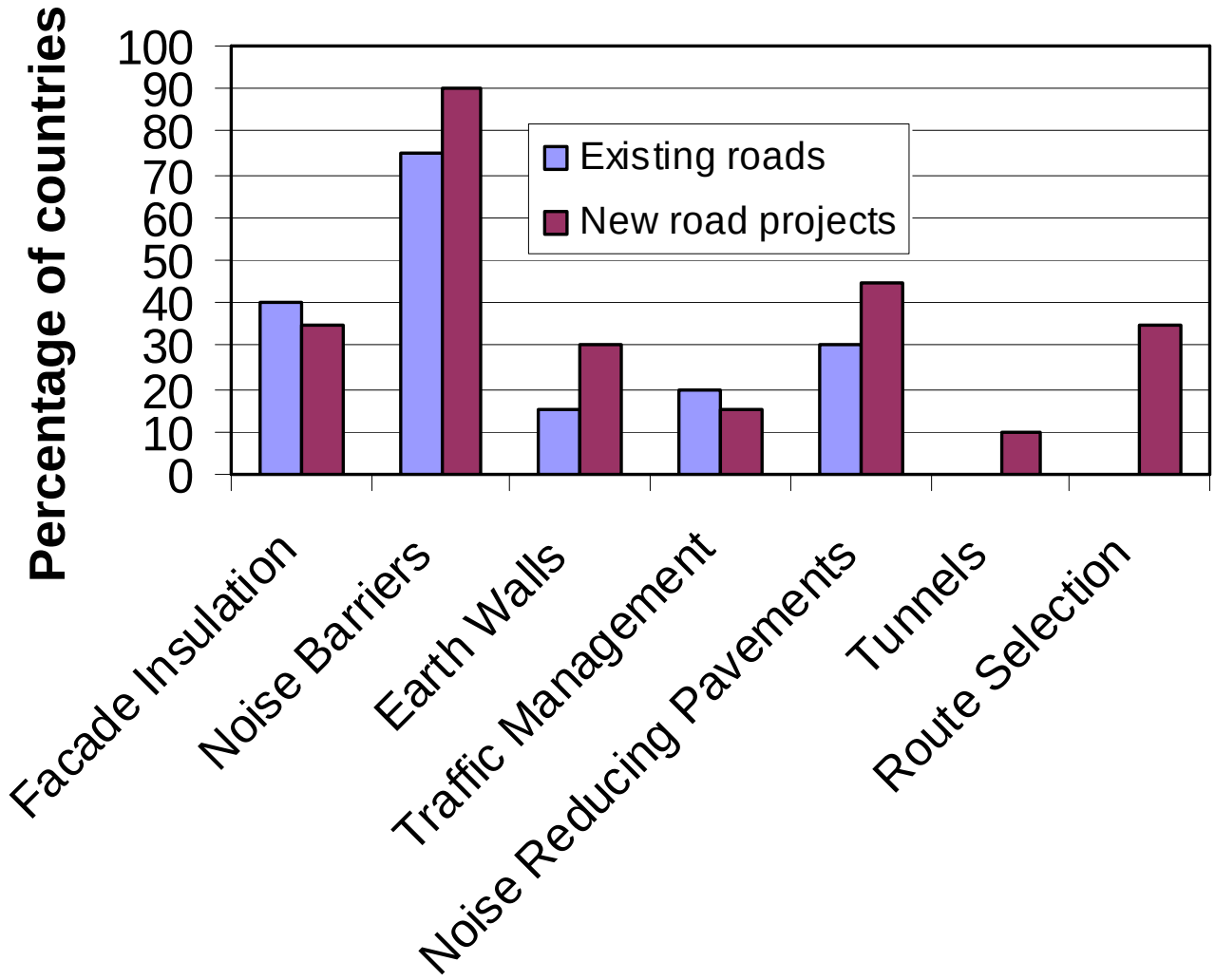
The first joint project

- Increasing focus in Europe on applying noise reducing pavements on the road networks as a cost-effective noise abatement measure

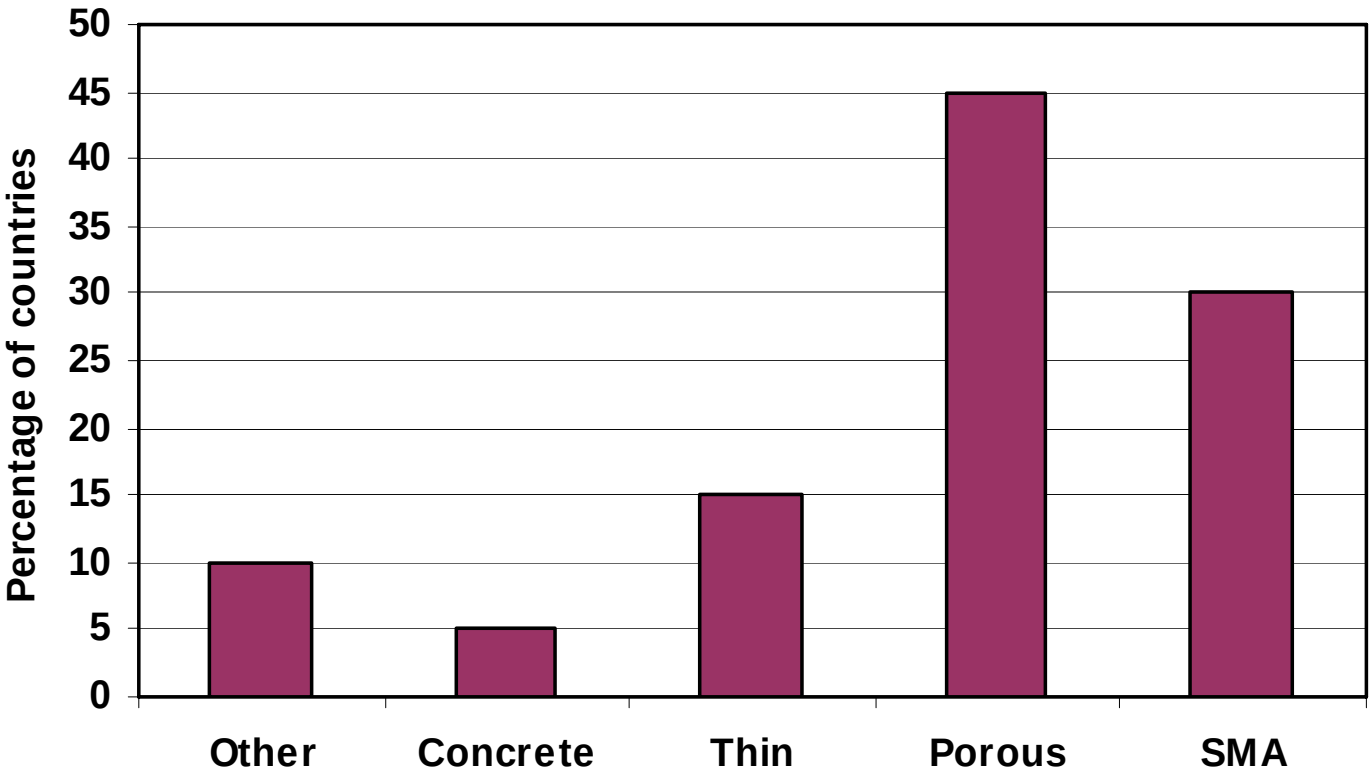
- The newest European experience on the practical use of noise reducing pavements is analyzed



Measures used for noise abatement in Europe



Types of noise reducing pavements available on European marked



1. What are the countries that have a working policy for using noise reducing pavements within Europe?

Country	Policy status
Denmark	National roads: Under development Copenhagen: Policy in place
Germany	No defined policy
The Netherlands	Policy in place
Norway	No defined policy
Sweden	No defined policy
Switzerland	No defined policy
United Kingdom	Policy in place

- The Netherlands apply porous asphalt on their entire main road network following an increase in 1987 of the permitted vehicle speed from 100 km/h to 120 km/h

- The British Highway Agency in its design manual published in 2006 prescribes that so-called “Thin Surface Course System (for highways)” shall be applied in new roadwork and when maintaining the main roads

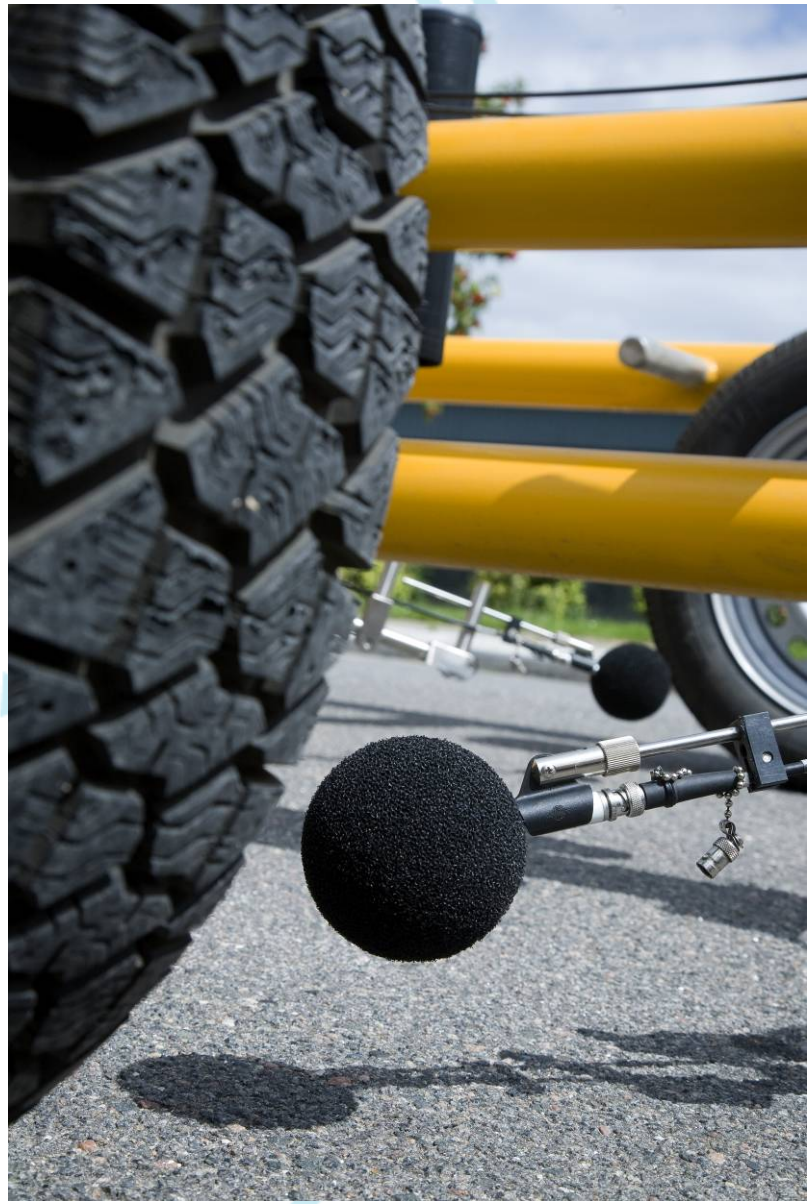
- The municipality of Copenhagen decided to apply noise reducing surfacings in its maintenance of streets with an ADT exceeding 2000 vehicles

2. What factors are considered in each of the countries' policies?

- The Netherlands apply porous asphalt on all main roads
- In Denmark noise reducing thin layers are already frequently used on new roads and when significant change is made of existing roads
- The introduction of the Danish so called SRS noise labeling system for noise reducing pavements has been a breakthrough for the use of such pavements

3. Which policies have been found effective?

- The policy in the Netherlands to use porous pavements on all main roads is very efficient from a noise abatement point of view
- The Danish SRS system brings noise reducing pavement products on the market and facilitates tendering noise reducing pavement.
- The process of having road administrations and the pavement industry develop the SRS system in consensus with consultants gave wide acceptance and has brought the knowledge of the system to many users.



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4. Is noise reducing pavements used in conjunction with other forms of noise mitigation?

- Noise reducing pavements can be used in conjunction with other measures
- Noise reducing pavements should always be the first choice because:
  - it attacks the problem at the source
  - often the most cost-effective measure of noise abatement.
- In Denmark the widening of a ring-road combines noise reducing pavements, barriers and façade insulation
- In the Netherlands, noise reducing pavements are frequently used in combination with noise barriers

5. How do the various European countries define what is a noise reducing pavement?

Country	Definition of noise reducing pavements
Denmark	≥ 3 dB reduction (reference ~8 years old DAC 11)
Germany	≥ 2 dB SMA (reference non-corrugated mastic asphalt)
The Netherlands	Porous Asphalt (by definition)
Norway	No definition (reference probably DAC 16 / SMA 16)
Sweden	2-3 dB reduction (reference DAC 16 / SMA 16)
Switzerland	4 defined mixes in specification (reference general level)
United Kingdom	Any surface ≥ 2.5 dB reduction (reference Hot Rolled Asphalt)

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6. How are the noise reducing pavements benefits or credits calculated?

- The Danish Ministry of Transport has a catalogue of unit-prices for the cost of time consumption for driving, and the unit-cost to society due to air pollution and emission of CO2, ***noise***, accidents and congestion etc. which can be used to calculate noise reducing pavements benefits.

- The noise costs consist of:
  - contributions from annoyance (based on house-prices in areas with different noise exposure)
  - health cost based on the risk of hospitalization and loss of life due to noise exposure

- Reliable data are needed on the development over time of the noise reducing properties.

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7. How do the European countries monitor noise reducing pavements over time?

- Some noise monitoring over time on noise reducing pavements has been done in the Netherlands, France and Germany to gain “overall experience”
- Not all individual pavement works are monitored
- In Denmark, several test sections have been monitored every year

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8. What is the reference pavement, and how is it chosen?

- The reference pavement in each country is typically chosen from what would have been the most probable alternative used for high capacity roads prior to the focus on noise reducing pavements
- Varies from country to country in Europe

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9. How is it assured that noise reducing pavement attributes are achieved from construction or by contractors?

- In general the tendering of a noise reducing pavement is influenced by many practicalities:
  - the noise measuring community has neither the standards (CPX is still a pre-standard)
  - Round Robin Testing between equipments to assess their accuracy is lacking
  - no capability to perform noise measurements on all individual jobs for quality control
- There is a general rational coming from the European Product Specifications using initial type testing as the description of the properties of the material.

10. Who pays for noise reducing pavements and how about warranties?

- Usually it is the road owner who pays for the noise reducing pavement
- The Municipality of Copenhagen discussed to require for a developer of a new residential area to pay for a noise reducing pavement on an existing nearby road in order to be given permission to build new dwellings
- Warranty periods for noise reducing pavements in Denmark are the same as for standard pavements (legally 5 years) but there is no established practice yet as to how the warranty covers the acoustical performance

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11. New developments on the horizon to be aware of, or that would be of use to California or Denmark?

- The ongoing development and testing of noise reducing thin layers seem to provide low cost noise reduction. Surfacings based on the design principles for such European products could be developed with the pavement construction materials available in California
- In Germany there is a trend to replace Portland Cement Concrete (PCC) with Stone Mastic Asphalt
- In Germany some Portland Cement Concrete test sections have been built which show reasonable noise levels
- Two-layer porous pavement optimized for long-term noise reduction and durability for roads with speeds above 70 km/h
- Poro-elastic surfacing might be an option

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12. How are noise reducing pavement benefits incorporated into traffic noise models?

- Several countries apply correction factors in their prediction schemes to take the influence of the road surfacing into account when analyzing traffic noise
- The Netherlands use a correction denoted Croad - the initially certified noise reduction
- The Nordic model for noise assessment, Nord 2000, has a table of corrections for road surfacings deviating from the default surface
- Denmark has no established practice to take the individual road surfacing into account, but this will probably be the case when more noise level time history data become available
- UK applies a correction of 0.7 times the initially certified noise reduction measured at the new surfacing, limited to a maximum of 3.5 dB

The end!