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CLASSIFICATION AND REGULATION FOR RAIL TRANSPORT

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ABSTRACT
An active policy is required to regulate on a reasonable time scale the process of reducing railway noise at the source. The reduction is necessary because of the conflicting policies of growing demand of transport on the one hand and community noise control on the other. International research of the last decade has led to the understanding that rolling noise is the predominant source in railway noise and should therefore be reduced. Studies of costs and benefits of different measures, carried out in The Netherlands, show that reduction of rolling noise is preferable to measures like sound barriers. The policy focuses on the stimulation of measures on rolling stock by using a mix of instruments for future legislation and corresponding temporary provisions. The lack of a European system of noise generation limits for rail vehicles makes a system of classification of vehicles necessary.

1 - INTRODUCTION

Most railway noise prediction models in Europe are developed by either the national railway company, a local research institute or the national Ministry of Environment or Transport. All these institutions had their own points of view about acoustical matters, which did not necessarily match those of the neighbouring countries.
When the model was set up, most countries took their own measurement data as a starting point. The variation of the noise emission of comparable trains on a comparable track gives information about the accuracy of the measurements and the accuracy of making a noise prediction [1].
With the coming of the European Union and its regulations [2,3], the question arises if a single, uniform model should be introduced. Currently specified methods for measuring the noise from individual trains or vehicles are limited in their ability to produce repeatable and reproducible data for the Cost Benefit Analyses, legislative guidelines or for checking compliance. It is possible that in the future, financial bonus/penalty systems will be introduced for the use of quiet/noisy rolling stock and track types, thus vehicle types and track superstructure types will have to be classified.

2 - OBJECTIVES ON CLASSIFICATION METHODOLOGIES

Before discussing classification methodologies it is necessary to define some vocabulary used in this paper.

- **Category**: The line in graph that represents the noise emission of a type of rolling stock as a function of the train speed.
- **Class**: A bandwidth in graph that contains the noise emission of different types of rolling stock (different categories).

Classification can be made on several levels.
In the Netherlands the national prediction model (SRM2) give an emission value for each category of trains. This emission value is based on measurement data (figure 1).
Depending on the application of the data you can have several levels of accuracy.
For instance for detailed noise calculations it is important to have detailed information of the source and the track. For mapping and access charges a classification on a less detailed scale would be sufficient for this purpose. Table 1 shows the several uses of categories and classification.

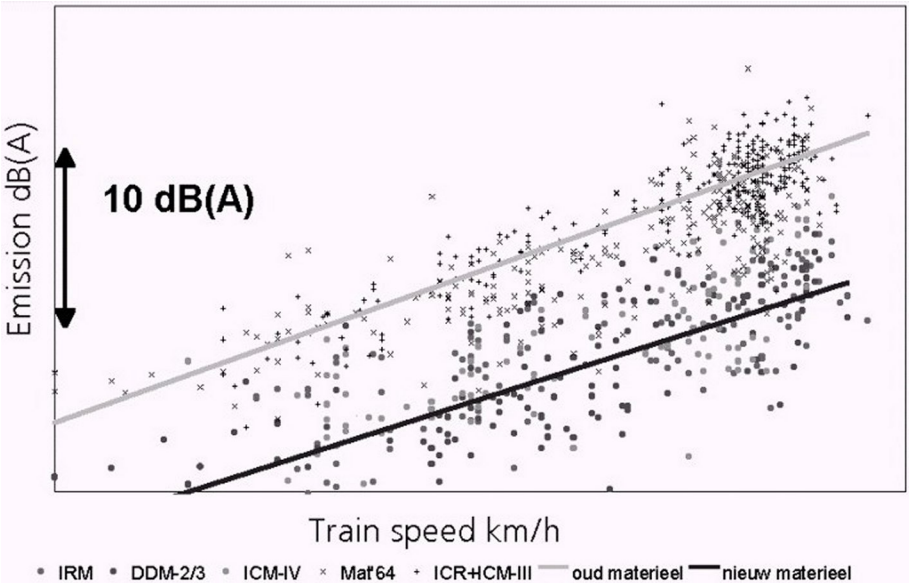

Figure 1: Measurement data.

	Classes	Categories
Monitoring	X	X
Prediction for infra projects	?	X
Mapping	X	?
Admission	X	
Allocation	X	
Access charges	X	

Table 1: Uses of classes and categories.

How detailed must a classification be?
The number of classes should in any case be manageable and the system must be logical. Schematically a solution could look like this:

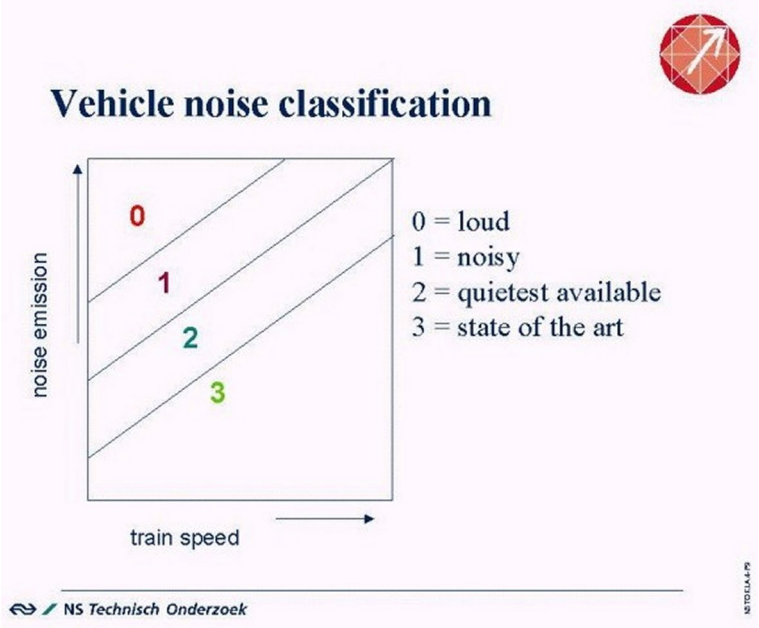

Figure 2: Vehicle noise classification.

In the Netherlands a study on classification recently has been carried out presenting a possible approach and solution [4].
The two Dutch Ministries of Environment and of Transport where involved and have launched a new approach. An active policy is required to regulate on a reasonable time scale the process of reducing railway noise at the source. The reduction is necessary because of the conflicting policies of growing demand of transport on the one hand and community noise control on the other. International research of the last decade has led to the understanding that rolling noise is the predominant source in railway noise and should therefore be reduced. Studies of costs and benefits of different measures, carried out in The Netherlands, show that reduction of rolling noise is preferable to measures like sound barriers. For Europe the time is right for a new noise policy, since the Commission prepares a Noise Directive. The policy of the two Ministries in The Netherlands focuses on the stimulation of measures on rolling stock by using a mix of instruments for future legislation and corresponding temporary provisions. The main elements of the new policy are: technology available, noise generation standards for rolling stock, national limits for noise generation rather than for noise reception. A system of classification of rolling stock is necessary as an instrument for track admission and capacity allocation. Other instruments may follow, which are aimed at optimization of the balance between traffic intensity, track capacity and noise production. Such instruments are for example: variable track access charges, subsidies for quiet technology, accelerated depreciation of rolling stock etc. The lack of a European system of noise generation limits for rail vehicles makes a system of classification of vehicles necessary. In the future Dutch legislation there will be a fixed limit value for the total noise output per railway line segment. The limits will be set on the basis of the actual rail traffic intensity over the past years with a certain margin for future growth. Once the system is implemented, there will be an automatic, economic drive to implement noise reduction at source rather than to build noise barriers.

3 - PROPOSAL FOR CLASSIFICATION

The classification is based on two features of each rolling stock type which are responsible for the sound-emission:

- the braking system; tread braked rolling stock is noisier than disc-braked;
- engine: diesel engine is noisier than electric engine.

Using this features, one could distinguish the following classes:

- tread braked and diesel
  - *cast iron blocks and diesel engine*
- tread braked
  - *cast iron blocks*
- non tread braked
  - *disc brakes, drum brakes*
- non tread braked + additional measures,
  - *'skirts' and wheel dampers*

In figure 3 a possible division into classes is shown for the emissions and categories of rolling stock.
The bandwidth of the proposed classes is 5 dB. The emissions are compared at a speed of 100 km/h.
The influence of the track is not taken into account in this comparison because the noise emission in the Netherlands is based on many measurements on one track-type.
In the STAIRRS-project a European classification proposal based on the Dutch study will be set up for track and rolling stock.

ACKNOWLEDGEMENTS

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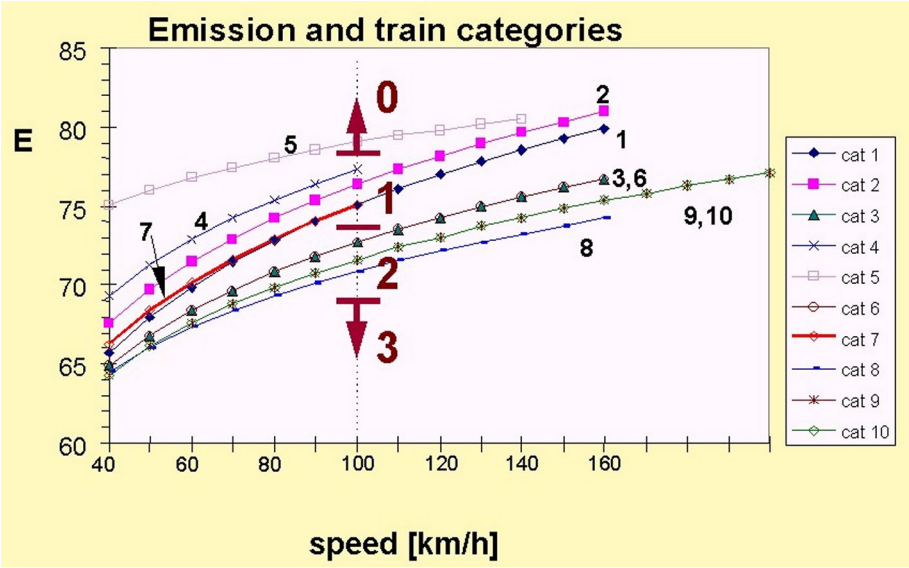

Figure 3: SRM2 categories and classes.

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