

IMAGINE – RAIL NOISE SOURCES

End-user Workshop

Brussels 1 December 2005





Welcome to the Workshop!

**An opportunity for potential end-users of HARMONOISE / IMAGINE
and other interested parties to understand the proposed approach to
rail-specific elements and to influence the final deliverable**

**Set up in collaboration with EC Working Group “Assessment of Exposure to Noise”
and the European Commission, and kindly hosted by IBGE/BIM**



Programme



Time	Item	Speaker
13.15	Welcome Opening comments	Rick Jones AEAT UK David Delcampe EC
13.30	Introduction to HARMONOISE / IMAGINE	Rick Jones
13.45	Technical approach to railway sources Default data and measurement methods	Michael Dittrich TNO
14.05	The database and its structure Practical application of the database	Paul van der Stap AEAT NL
14.25	Summary of presentations	Rick Jones
14.30 – 14.45	Coffee	
14.45	Questions and discussion	IMAGINE partners and all guests
16.45 – 17.00	Conclusions	Rick Jones



Background to HARMONOISE / IMAGINE



- EC Green Paper on Noise Policy 1996
 - To stimulate public discussion
 - No person should be exposed to noise levels which endanger health and quality of life
 - Noise abatement programmes and research
 - Noise emission limits
 - Harmonised standards and rating methods



The Environmental Noise Directive (END)



- Directive 2002/49/EC, 25 June 2002 – Assessment and management of environmental noise
 - Determine the noise exposure of the population through noise mapping
 - Make information available on environmental noise to the public
 - Establish action plans based on the mapping results to reduce levels where necessary and to preserve environmental noise quality where it is good

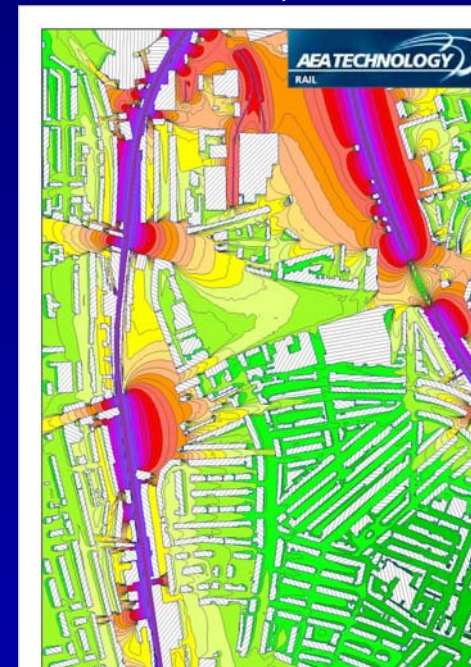
Mapping

- Indicators:

$$L_{\text{den}} = L_{\text{Aeq}}, \text{ day, evening (+5), night (+10)}$$

$$L_{\text{night}} = \text{Night time } L_{\text{Aeq}}$$

- Normally calculated, not measured, over a year
- 4m above the ground
- Strategic maps to be produced for agglomerations, road, rail, air and industry separately



Timetable



Year	Action
2007	Produce maps for preceding year, for agglomerations of 250000+ and railways 60000+
2008	“Competent Authority” to draw up Action Plans to manage noise issues and effects, including noise reduction where necessary
2012, 2017..	Produce maps for preceding year, for agglomerations of 100000+ and railways 30000+
2013, 2018..	Action Plans

Reporting



- 6 months after mapping and production of action plans, information must be passed to the Commission
- This includes noise control programmes, number of people exposed to various noise bands, summary of action plans



- From Directive 2002/49/EC:
 - “Common assessment methods for the determination of L_{den} and L_{night} shall be established by the Commission...”
- In the absence of a common method, especially for the 2007 mapping round, EC-recommended “interim methods” are available
- For railways: “Reken- en Meetvoorschrift Railverkeerslawaaï ’96” (Netherlands)
- Alternatively, Member States may use techniques based upon the methods laid down in their own legislation (provided equivalent results to “interim methods” are produced)

HARMONOISE / IMAGINE



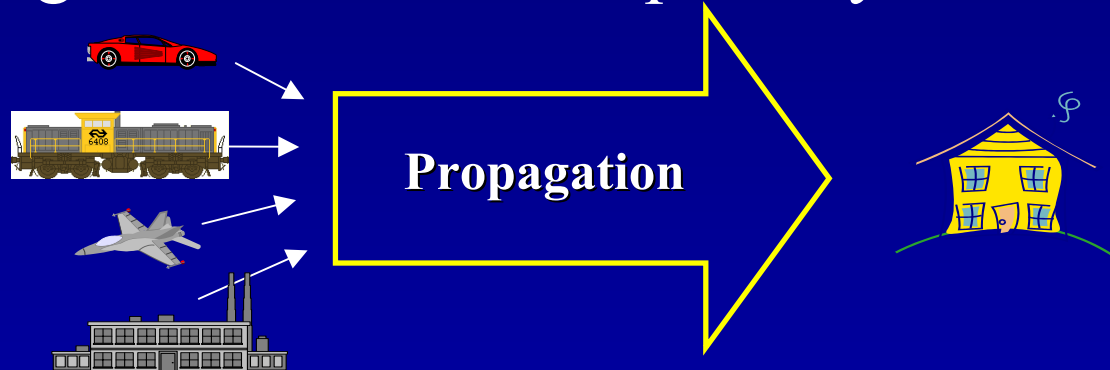
- To fulfil the Directive's requirement for common assessment methods, EC funding has been provided for two research projects:
 - HARMONOISE under the 5th Framework
 - 2001 to 2004
 - IMAGINE under the 6th Framework
 - 2003 to 2006



HARMONOISE



- Characterisation of road and rail sources
- Propagation of sound taking into account meteorological conditions
- Sources and propagation considered separately to ensure flexibility



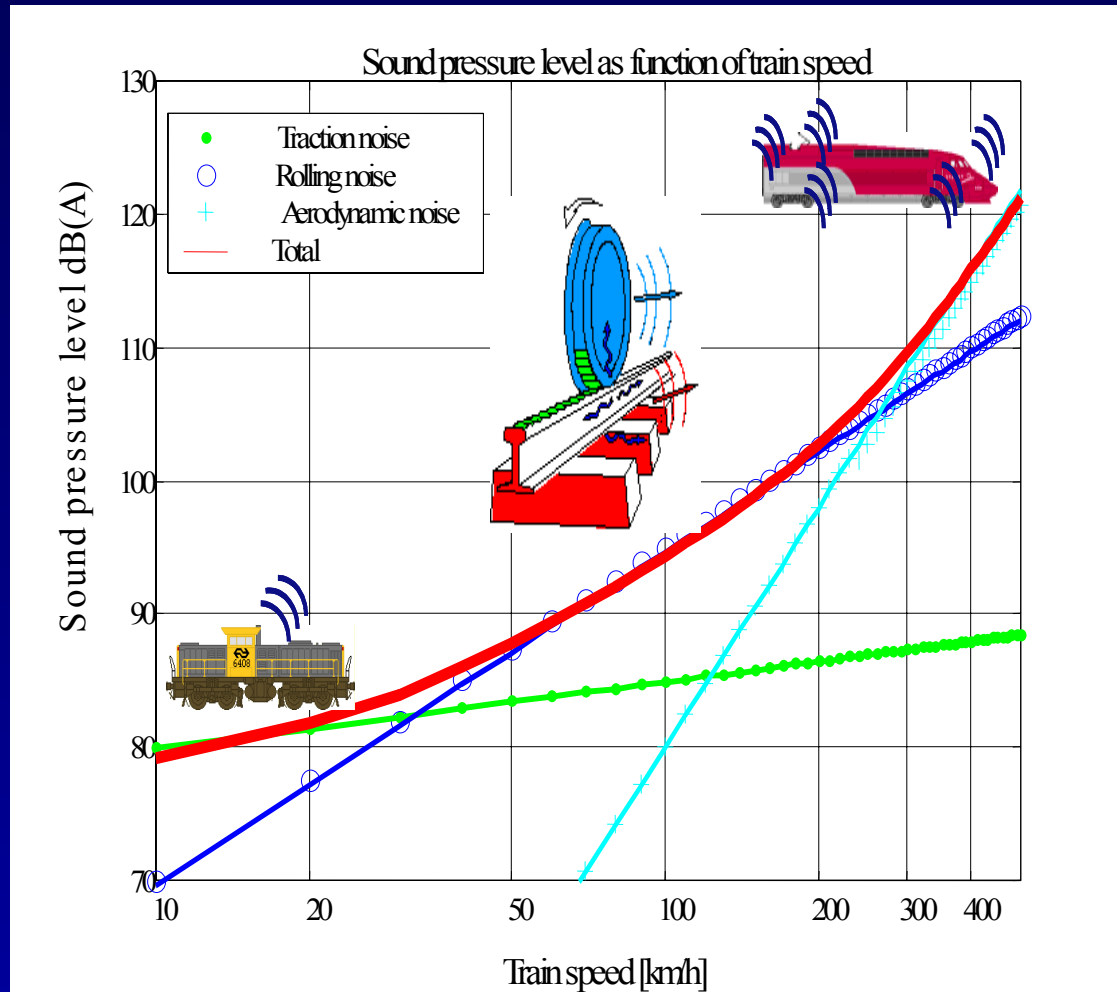
IMAGINE



- Extends HARMONOISE to industry and aviation
- Designed to provide guidelines, examples, and databases for implementation of the harmonised noise computation method
- It is not intended to deliver a linked suite of programs – it is required to provide a set of methodologies and databases formulated on a coherent basis, for implementation by software designers

Railway environmental noise

(source: EC Working Group 6, Railway Noise)



Quantification of a railway vehicle and track as an acoustic source



- A variety of sub-sources, each with different characteristics, and locations eg:
 - Wheel component of rolling noise
 - Track component of rolling noise
 - Exhaust noise
 - Fan noise
 - Aerodynamic noise



Railway Source Term Activity

HARMONOISE



- Objective: to deliver a harmonised source description method and propose a database structure



Continuation through IMAGINE



- Task:
 - Take forward HARMONOISE recommendations to practical implementation
- Stated Objectives:
 - Provide default databases for source description of railway noise for an exemplary sample of the European rail traffic fleet
 - Provide guidelines on how to deal with situations deviating from the typical



IMAGINE Rail Sources

Project Elements

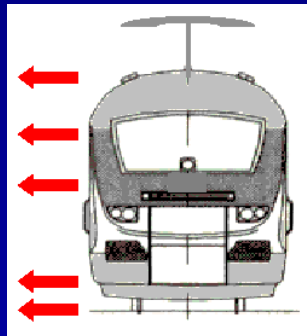


- Review measurement methods
- Optimise HARMONOISE data-gathering techniques
- Validate and enhance HARMONOISE traction noise model
- Acquire example noise data from in-service European trains
- Create a database and provide initial example dataset and default data
- Produce guidelines for atypical situations

Flow chart for rail noise modelling

Vehicle on track

Individual source on vehicle / track type
1/3 octave sound power level
Directivity
Location (height)



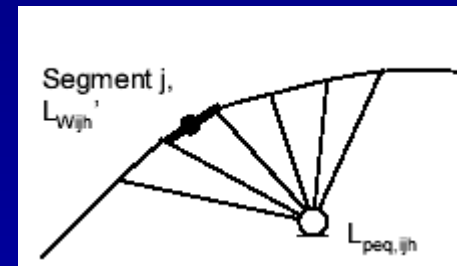
Traffic model

Operating conditions
Traffic flow
Traffic mix
Speed
Geometry ... etc, etc

Engineering method

Propagation

Receiver



Flow chart for rail noise modelling

Vehicle on track

Traffic model

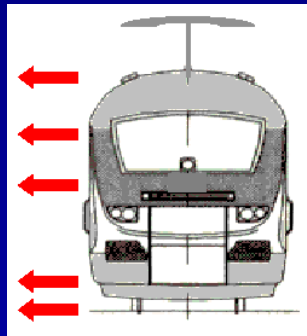
Engineering method

Individual source on vehicle / track type
1/3 octave sound power level
Directivity
Location (height)

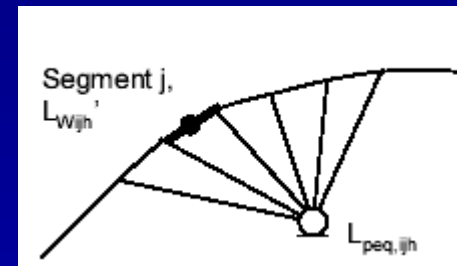
Operating conditions
Traffic flow
Traffic mix
Speed
Geometry ... etc, etc

Propagation

Receiver



From database



Flow chart for rail noise modelling

Vehicle on track

Traffic model

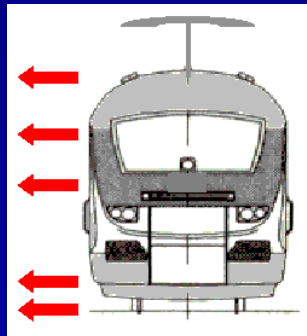
Engineering method

Individual source on vehicle / track type
1/3 octave sound power level
Directivity
Location (height)

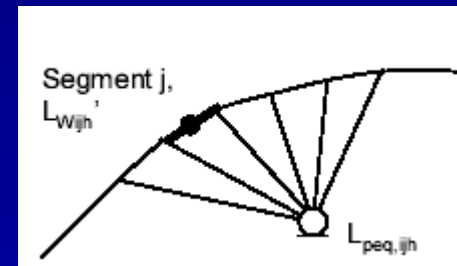
Operating conditions
Traffic flow
Traffic mix
Speed
Geometry ... etc, etc

Propagation

Receiver



From timetable,
operator,
government etc



Requirements of end-users for railway elements



- Acquire data for the source term database, or choose example or default data as appropriate
- Segment railway into homogeneous sections
- Characterise each segment in terms of:
 - Geometry
 - Vehicle types, speeds, flows (annual average over day, evening and night)
 - Accelerating, braking, constant speed
 - Track and supporting structure type (including joints, switches, crossings)
 - Likelihood of squeal on curves
 - Track roughness

Detail to follow....



- Michael Dittrich (TNO):
 - The approach that has been developed for the quantification of the sources
 - The default data that has been developed for application in the absence of appropriate measured data
 - Measurement methods for the acquisition of appropriate data
- Paul van der Stap (AEAT NL):
 - The database and its structure
 - Practical application of the database

