Rail noise reducing : the french strategy

DEUFRAKO seminary

27th october 2010

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The French rail network acoustic landscape

- **The existing network**
  - 30 000 km open to commercial traffic
  - 1 800 km high speed lines (>300 km/h)
  - 15 000 trains per day
- **The French rail network noise issue**
  - 11 000 km noisy lines
  - 60 000 building considered as hot spots (1/3 due to freight trains)
  - 7500 km of main lines concerned by the EC directive
- **Development projects for the high speed network**
- **National rail freight engagement**
  - Rail highways, freight by-pass, freight increase, …
- **New problematics**
  - New HSL dedicated to mixed traffic (passengers/freight)
  - New operating companies

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Policy : key principles

- **<u>Preventive policy</u> : no new hot spots**

  - Ceilings limiting noise emissions of new projects

  - Technical standards to limit noise reception within new building along railway lines.

- **<u>Curative policy</u> : handling hot spots**

  - Hot spots inventory in progress according to national law.

  - Action plans

  - European strategic mapping & action plans on environnemental noise in progress for main lines and cities.

- **<u>Technical innovation</u>**

  - About technical solutions

  - About indicators

  - About specific sites

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Policy : key principles

- **“Law on Noise Abatement’ 1992:**
  - **For new and upgraded lines:**

L_{Aeq} [dB(A)]	New conventional lines		New high speed lines		Upgrading lines	
Sensitivity sectors	Day	Night	Day	Night	Day	Night
Residential	63	58	60	55	no increase if existing level lower than ←these limits, else:	
Mixed	68	63	65	60		
					68	63

  - **For urban planning and noise abatement, lines are classified:**
    - <50 trains per day → no protection for new dwellings
    - >50 trains per day in interurban areas, >100 in urban areas

- **Hot spots**
  - **>73 dB Lden or >65 dB Lnight require action**
  - **Reduce noise to 68 dB Lday and 63 dB Lnight (no Lden caps)**

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Principle of french noise policy

- **The infrastructure manager is accountable for the noise generated by the traffic**

  - the IM finances noise reduction included in development and modernisation projects

  - on hot spots, the IM finances the reduction of noise along with the State and local authorities

  - the IM maps the hot spots and sets action plans

- **The norm of calculation always used :**

  - the NMPB : French norm (New Method for Noise Propagation)

- **The indicator used :**

  - for development projects : energetic average on 2 periods : day (6h-22h) and night (22h-6h)

  - for hot spots and european mapping : Lden and Ln

  - no « spot » indicator (Lmax)

- **Mandate of results :**

  - ex post control of noise level by direct measure

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RFF statement for investment projects

- **Strict regulation compliance (starting point)**
- **One noise point of view for all the network**
- **Include noise reflexion in the earlier stage of project**
- **Share information at the earliest stage and continuously**
  - **Be more pedagogic**
- **Follow R & D approach and investments**
- **Public Partnership Program : stronger requirements with legal basis as a minimum**

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Addressing hot spots

- **Estimate of the number of hot spots to handle**

  - 60 000 buildings, of which 20 000 are critical
  - Concentrated along freight lines

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Addressing hot spots

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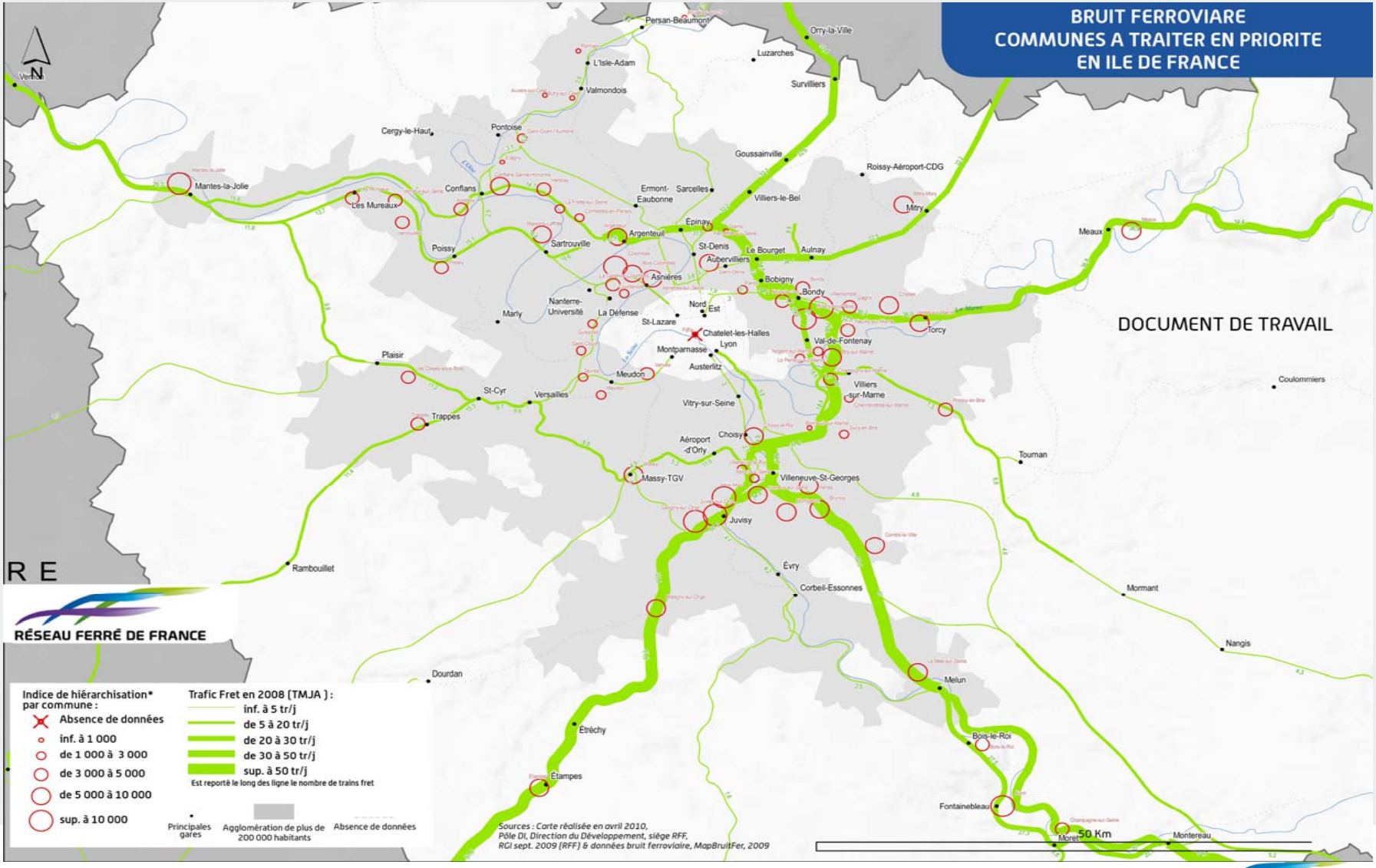
Addressing hot spots



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Noise european mapping

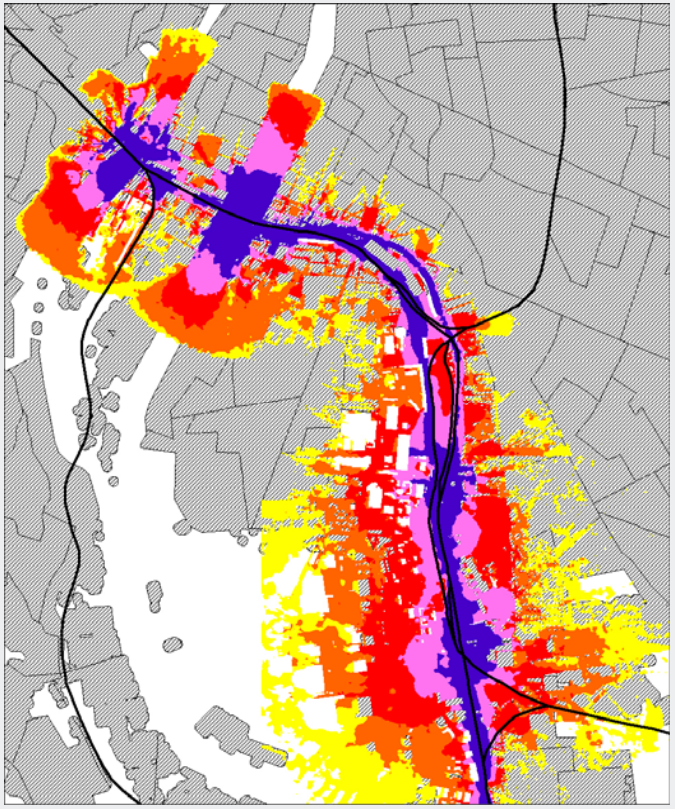
Noise european mapping

- **Main lines**
  - 7000 km of which 2500km as a first phase
  - RFF provides data
  - Competent authority : State
  - French method applied

- **Main cities**
  - 50 cities of which 24 as a first phase
  - RFF provides data
  - Competent authorities : cities
  - French method or Harmonoise

PPBE (environmental noise prevention plans)

- **Main lines : just starting**
- **Main cities : work on going for some cities**



Carte Lden sur Lyon

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Addressing hot spots

- **Estimate of financial needs**

  - Passive solutions (barriers + building protections) = 2 G€

  - Freight wagons retrofitting with LL block (30% of the total fleet) = 40 M€

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Addressing hot spots

- **Budgetary frameworks**

- Before 2009 :

— To handle hot spots within 10 years
— Cofunding scheme : 25% Etat, 25%RFF, 50 % local authorities
— 15,4 M€/year for railway lines

- Law: « Grenelle de l'environnement »

— To handle critical hot spots within 5 to 7 years
— Cofunding scheme : Etat, RFF, local authorities and creation of spécial founds to accelerate the process (ADEME Agnency)
— 90 M€/year for both roads and railway lines (a 5-year budget)
— 67 M€ from ADEME for railways 2009-11

- Performance scheme State-RFF, 2008-2012

— Target : to handle 2500 hot spots
— 7.4 M€/year of RFF financing (matched by State financing)

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Technical solutions

- **Sound Barriers**
  - less 5 to 12 dB(A)
  - height < 3 m
  - 1 500 €/ml for a barriers < 3 m for hotspots (hard conditions to build)

- **Building isolation**
  - <10 000 €HT / individual house

- **Rail dumpers**
  - less 5 dB(A)
  - 500 €/ml of track

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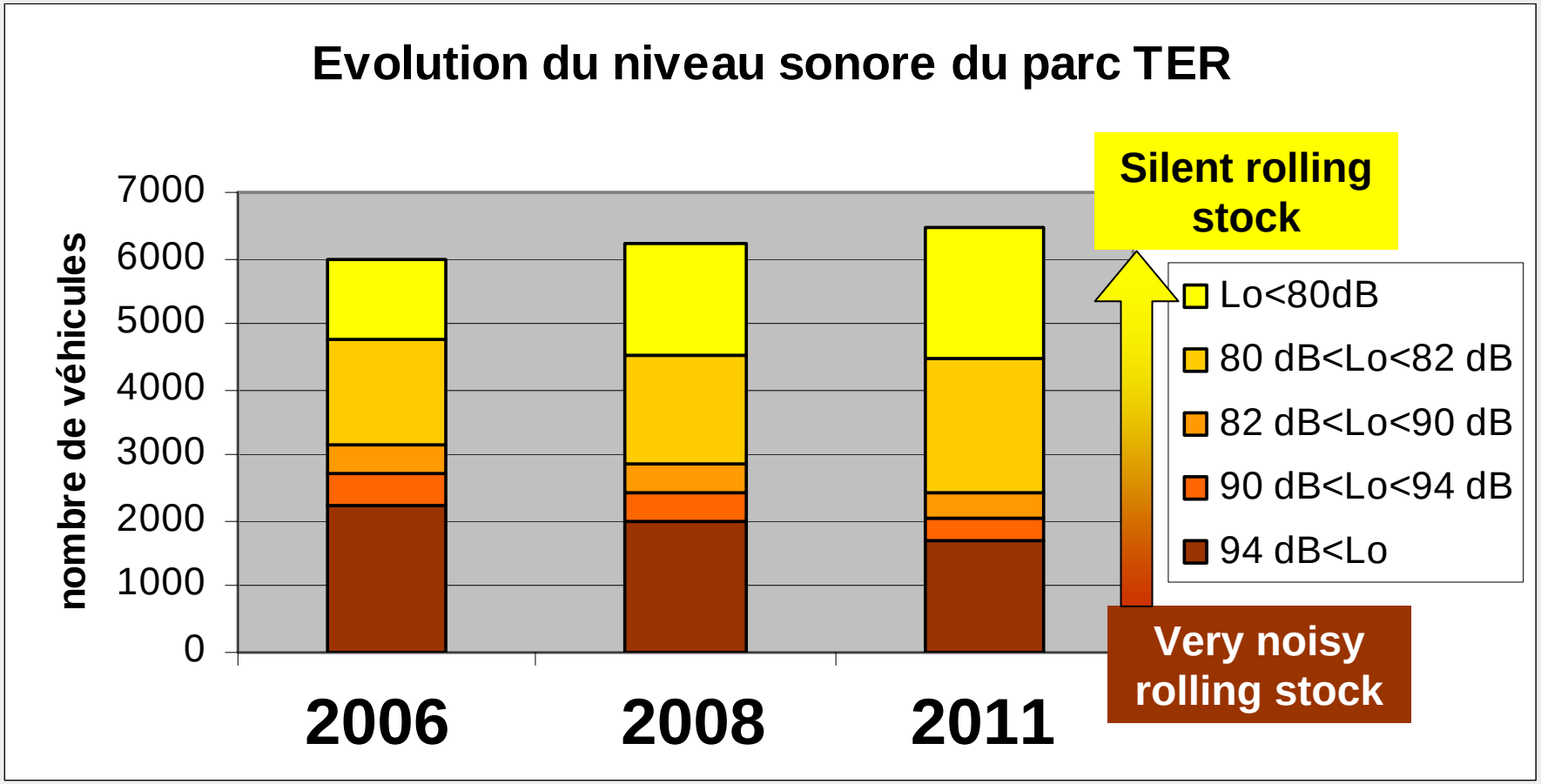
Technical solutions

- **Acoustic rail grinding (not used)**
- **Town freight bypass**
- **Oparation restrictions**
  - Low speed
  - No circulation inside high density urban zone over certain hour
  - Circulation autorization only for unnoisy rolling stock over certain hour
- **Freight wagons retrofitting with special blocks**
  - More than 5 dB(A)
  - 4500 to 7000 €/wagon
- **Impose noise emission maximum level at the homologation stage and beyond**

Rolling stock types has a direct impact on noise level

Retrofit of rolling stock regional train : impact on noise



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Financial solutions

- **How to favour wagons retrofitting**
  - **differentiated access charges for the more/the less noisy rolling stock (bonus-malus) : some consideration but no decision**
  - **An incentive to retroffiting fleets and a way to finance noise reduction investments**
  - **But the whole fleet has to be upgraded at a European level**
  - **The implementation is difficult (control or declaration, numerous stakeholders …)**

Noise economical approach : infrastructure solutions evaluation

Population density threshold to have countable anti noisy measure (according to french methodology)

Density (hab/km²)	Min	Max	Rail dumpers	Noise barriers	Covered trench
Exit of parisian stations	500	6000	397	457	1990
Far parisian belt	50	500	485	559	2441
Parisian suburbs	50	500	1553	3562	14027
Urban zone of Montpellier	100	3000	362	831	3594
Urban zone of Limoges	100	3000	481	1105	4731
HSL Paris-Lyon	20	500	924	2109	8627
Freight axe except Paris area	20	500	693	1602	6804
Freight belt around Paris	20	500	361	827	3569
Rural zone	20	100	10963	37453	
HSL Lyon-Marseille	20	500	1485	3372	13178

Measures on track are economically efficient only in urban zones. They have to be mixed with rolling stock measures

Research and Innovation

- **The Silence Research Project : expérimentation of rail dumpers**
- **Noise reduction on metal bridges**
- **Spot indicators**

  - measure and statistic analyse of several spot indicators
  - setting a relationship between traffic level, long time indicators, short and very short duration indicators
  - assessing the influence of several technical solutions (barriers, rail dumpers) on the different indicators

- **Experiment on low height barriers & multi-diffracting barriers (projet IMPACT)**
- **Noise modelisation in mountainous areas**
- **Noise reduction of squealing depots**
  - setting of stripe rails in order to break up vibrations
- **Experimentation of Durflex process :**
  - injection of polyurethane foam into the ballast

Ballast avec mousse PUR

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Conclusion

- **Noise acceptance is gatting lower and lower, and no exception for railway**
- **Concerning HSL : merely indicator problem**
- **Greatest problem are on freight lines :**
  - **New lines**
  - **Rail motorways**
  - **View of increasing freight traffic where fraeight traffic is lower for 2 decades**
  - **Hot spot noise resorption**
- **Noise reduction cost are hugely expensive and fundings are highly insufficient whereas in progress (but for how many time ?)**
  - **Increase noise monitoring**
  - **Combinated solutions**
  - **Impulse solutions on rolling stock**
  - **Be creative**
  - **Share practices and solutions and innovation between european IM**

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