# The European High Speed Rail Network - Environmental Impact Assessment and Noise including the UK Experience

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## 1.0 INTRODUCTION

The arrival of the single European market in 1992 and the opening of the Channel Tunnel in 1993 will result in the linking of rail networks across the whole of Europe. This joining together of the Community in a physical way will result in parallels being drawn in respect of the various planning methods used in the different countries for the consideration of new rail links.

In particular the differences in types of train specification, noise standards and compensation issues will come forward. The paper examines the different methods of impact assessment used in the different countries with particular respect to those methods employed for the assessment of the Channel Tunnel High Speed Rail Link.

Additionally, the paper will consider the various railway noise prediction methodologies used in some of the countries.

## 2.0 LEGISLATION AND CURRENT PRACTICE

At present there is no single agreed method for determining the impact of new or the substantially intensified use of railways within the EC. Within the European Community the recent Green Paper 'Transport and the Environment' (Ref. 1) notes four courses of action which should be explored for attaining the objective of 'sustainable mobility'. The first and most obvious one is based on reducing air and noise pollution caused by transport. However within the Community there is only limited data available in respect of those people affected by railway noise. For the Netherlands it is estimated that 6% of people are exposed to railway noise above 55 $L_{Aeq}$ and above 65 $L_{Aeq}$, 0.3% (UK) to 1.7% (Germany). It should be noted that this does not necessarily imply any differences in people's response to railway noise more the importance of railways in relation to other modes of transport. In calculating the social cost of noise for inland transport, loss of productivity, health care, effects on property values and loss of psychological wellbeing are taken into account. Estimates for the total social cost hover around 0.1% of GDP, of which 10% is attributable to rail, 65% road traffic and 26% aviation (Ref. 2).

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Within the Community a large number of standardisation measures have already been adopted in order to ensure a better environmental performance of the different transport means and those include noise standards for aircraft, motor vehicles and motor cycles. The notable exception is railways and rail vehicles. The Green Paper proposes a new framework for a coherent and global approach to the impact of transport on the environment. This is clearly required for railways where a wide range of approaches to railway noise occur across the Community.

If we examine the noise insulation standards for railways used or recommended in Europe we come across a variety of noise levels as shown in Figure 1 which is derived from the work of Walker (Ref. 3).

The provision of sound insulation to properties can necessarily only be a last resort to the problem of noise and it is more usual to reduce noise by the use of barriers, earth bunds or tunnel sections where appropriate. Here the standards change across the Community. Within the United Kingdom the proposed provision and specification for noise barriers is likely to be a timber fence or concrete wall with very little architectural feature, whereas in France and Germany the designs are more elaborate and therefore more costly.

However, the need for a single Community-wide method of determining the impact of new or upgraded railways and the specification standards for locomotives and new rolling stock becomes clear when we look at the plans unveiled at a conference held in Brussels in April of this year which considered the plans for an enhanced high speed network across Europe and extending across Eastern Europe. The blueprint envisages 3000 km of line by 1996 and 7400 km by the end of the century with an eventual 20,000 km of new lines and 15,000 km of old lines upgraded for high speed trains.

One defect in the pan-European vision is the lack of a truly European train.

Channel Tunnel trains will scarcely fit the bill - they incorporate fire safety features needed for running through the tunnel, which makes them expensive to buy for use on other routes. The axle weight of the German intercity train is too heavy for French rails, while the Italian ETR 500 is a relative latecomer. The TGV comes the closest. France is already involved in no less than five of the international high-speed lines and is set to become the hub of the network. One straw in the wind is the announcement by French Railways that all future TGV designs will be pressure-sealed and thus will be able to run in Germany. Or as the French president François Mitterrand put it: "Le TGV, une façon de faire l'Europe."

It is however noticeable that for the Spanish Madrid to Seville high speed line a TGV derivative has been used although this is the only line on which it can run in Spain due to the difference in gauge.

*Environmental Impact in the UK*

Within the UK and Europe there is no standard method of predicting railway noise or a single method to define the impact of a new railway line. With the proposed construction of the Channel Tunnel Rail Link from London to Folkestone there was an immediate requirement for a prediction method and impact assessment methodology. Whilst agreement was reached as to a prediction technology based on work carried out by British Rail and Kent County Council's noise consultants (Ref. 4) it has proved impossible to agree an impact assessment method. The two preferred methods have considered $L_{Aeq}$ v $L_{Aeq}$ and $L_{Aeq}$ v $L_{A90}$ with properties grouped into bands for specified changes of noise level.

The results of the differing assessment method can be seen below in Figure 2.

**Figure 2 - Comparison of Impact Methodologies**

| Impact | No. of Properties Affected | |
|---|---|---|
| | KCC Standard | BR Standard |
| Requires Sound Insulation | 160 | 1 |
| Minor/Slight | 643 | 160 |
| Moderate | 265 | 41 |
| Major/Substantial | 92 | 11 |

There is some light at the end of the tunnel within the UK where the Mitchell Committee has reconvened with one of its tasks being to determine a prediction technique for all railways and elsewhere in Norway the Nordic Railway Noise Model is being re-evaluated in order to ensure that it accurately validates with actual measurements.

## CONCLUSIONS

1. The European Railways are expanding rapidly and with privatisation in the UK and Germany in the near future may expand faster than expected.

2. There is a need for harmonisation of trains and gauge in order to ensure that the high speed rail network is truly pan-European.

3. A single prediction methodology should be validated and this should form the basis of EC research work.

4. An agreed impact methodology should form the basis for all EIA's of new railways.

## REFERENCES

(1) Europe Environment No. 382 - March 3, 1992.

(2) Group Transport 2000 Plus op.cit., figure 16, quoting Frauenhofer Institute Karlsruhe.

(3) J Walker. A review of standards for railway noise in different countries. Acoustics Bulletin Vol. 17, No.3, 1992.

(4) P R Williams, R A Hood and K M Collins 'Calculation of Train Noise' IOA Autumn Conference 1991.

Figure 1

| Country | Standard Guideline or Recommendation | Railway [level given in $L_{Aeq}$ unless stated] [Facade F; Freefield FF] | Time of day | Note |
|---|---|---|---|---|
| Denmark | G | 63(F) | 24h | |
| | | 88$L_{max}$ | 24h | |
| Norway | R | 60(F) | 24h | |
| Sweden | S | 63(F) | 24h | |
| | | 30 (indoor, living) | 24h | |
| | | 50$L_{max}$ (indoor, bed) | 2200-0600 | |
| France | R | 65 - 70(F) | 0800-2000 | 1 |
| Germany | S | 59 - 64(FF) | 0600-2200 | 1 |
| | | 49 - 54(FF) | 2200-0600 | 1 |
| Netherlands | S | 60(F) | 24h | 1,2 |
| | | 60(F) | 0700-1900 | 1,2 |
| | | 55(F) | 1900-2300 | 1 |
| | | 50(F) | 2300-0700 | 1 |
| Switzerland | S | 60(FF) | 0600-2200 | 1 |
| | | 50(FF) | 2200-0600 | 1 |
| United Kingdom | R | 68(F) | 24h | 1 |
| | | 63(F) | 0000-0600 | 1 |

Table 1. Noise standards or recommendations for new railways in a number of countries

Notes: (1) Insulation to property provided when these levels are exceeded

(2) These limits to be reduced to 57 dB(A) on 1 January 2000