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GREEN PAPER

on

The Impact of Transport on the Environment

A Community strategy for "*sustainable mobility*"

(Communication from the Commission)

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I. GENERAL INTRODUCTION

a. Preliminary comments

1. The impact of transport on the environment is coming under close scrutiny in the industrialised world and more particularly in the Community. The global nature of environmental issues - such as the "greenhouse effect" - has led to a growing awareness of the need for a world-wide approach to environmental problems.

   This global approach in turn has highlighted the need to focus on the causes of environmental problems in a different manner. It is no longer considered sufficient to assess the primary or immediate causes, but to go to the very root of the problem - human behaviour. Thus, the Bergen Declaration(1) stresses that "unsustainable patterns of production and consumption, particularly in industrialised countries, are at the root of numerous environmental problems, notably foreclosing options for future generations by depletion of the resource base".(1) It warns that "the attainment of sustainable development... requires fundamental changes in human values towards the environment and in patterns of behaviour and consumption..."(1) and in this respect highlights the need "to reduce the harmful effects of the transport sector on the environment by promoting fast, safe, and convenient urban and regional transport services and reducing urban car traffic" (1). Also noted, is the need to encourage low transport demand.

2. Hence, a number of human activities, of which transport, has come under close scrutiny. Indeed, transport is increasingly being qualified as a human activity with a negative impact on the environment. A clear illustration of this is the concern about the environmental nuisance and damage caused by the high level of traffic in sensitive geographical areas such as

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(1) Bergen Ministerial Declaration on sustainable Development in the ECE Region, 16 May 1990, p. 2, 4 and 11.

the Alps, as well as in densely populated areas, particularly large conurbations.

This view is also endorsed by the Group Transport 2000 Plus in its report "Transport in a Fast Changing Europe", which identifies transport as a major contributor to energy and environmental problems since it is one of the main consumers of fossil fuels and is responsible for considerable nuisance and damage to the environment(1).

b. Historical background

3. Following the declarations at the Paris Summit in October 1972 a decisive political impetus was given to consideration of the environment in planning the socio-economic development of the Community. As a result, the Commission adopted a first Action Programme on the Environment for the period 1973 to 1977. The main concern was to ensure the proper functioning of the Common Market by amongst others introducing harmonised standards for consumer products.

   Hence, for the transport sector this programme provided for technical improvements of noise and gaseous emissions of motor vehicles as well as for the maximum content of lead in fuel. It also provided for specific action in the area of marine pollution resulting from sea transport. The programme already drew attention to transport problems in the urban environment.

4. The second Action Programme for the period 1977 to 1981 continued the same line of action. It concentrated as far as transport was concerned on marine pollution, measures to reduce noise from motor vehicles, motor cycles and aircraft.

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(1) Group Transport 2000 Plus, Transport in a Fast Changing Europe, December, 1990.

The third Action Programme for the period 1982-1986, however, introduced a new dimension into the general philosophy. Environmental policy was to be motivated by the fact that the environment itself contains the limits to further economic and social development . This Action Programme stressed the need for a greater awareness of the environmental dimension in the area of transport. Vehicle emissions, aircraft noise and the environmental impact assessment of infrastructure projects were earmarked as priorities.

5. It is only in the fourth Action Programme for 1987-1992 that the interaction between transport and the environment is duly recognised as being of a wide-ranging nature.

   This new approach was the result of the Single Act which in Article 130 R provides that environmental protection requirements shall be a component of the Community's other policies. This approach was endorsed in the Declaration by the European Council of June 1990, which stresses the need for sustainable and environmentally sound development as advocated in the 1987 Report "Our Common Future" by the World Commission on Environment and Development (the Brundtland Report).

6. A more specific response in this direction was given by the Commission in April 1989, when it was deemed necessary to reflect on the relationship between environmental policy and other Community policies, in particular in the field of transport. The outcome of this exercise provided the guidelines for further work in this area with a view to examine the impact of transport on the environment in a global and coherent framework.

7. This Green Paper is the logical follow-up to that initial response as well as to the world-wide concern about a number of global environmental issues. The Community position on 'global warming' as reflected in the Conclusions of the Joint Energy and Environment Council of 29 October 1990 on Climate Change Policy and its commitment to the stabilisation of CO_2

emissions by the year 2000 and the possibility of reductions thereafter confirms this concern as well as the need for action.

This Green Paper is also in line with the guidelines on urban transport policy set out in the Commission Green Paper on the Urban environment[1] and takes account of the need to create new opportunities for the peripheral regions so that they may share fully in the prosperity of the Single Market as set out in the Commission Communication 'Europe 2000'.[2]

It is also a response to the Resolution adopted by the European Parliament in September 1991, which calls upon "the Commission to submit to the Council a framework programme for optimum environmental protection in the European transport market."[3]

8. This Paper is also in line with the forthcoming Fifth Action Programme on the Environment "Towards Sustainability", which outlines a new policy and strategy for the protection of the environment and natural resources and the achievement of sustainable development.

The approach adopted differs fundamentally from that of previous Environmental Action Programmes, since it focuses on the agents and activities which deplete natural resources and damage the environment. Its objective is to initiate changes in current trends and practices which are detrimental to the environment, so as to ensure socio-economic well-being and growth for present and future generations. Such changes are to be achieved through shared responsibility, involving public administrations, public as well as private enterprise and the general public, in accordance with the principle of subsidiarity.

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(1) [COM(90)218 final of 27 June 1990]
(2) [COM (91) 452 final of 7 November 1991]
(3) PE 145.075/end of September 1991

The Fifth Action Programme focuses on five main economic "target" sectors, including the transport sector, and includes actions designed for the protection of the environment as well as for the benefit and sustainable development of the sectors themselves.

This Paper converts and adapts the objectives and targets included in the Fifth Action Programme into a global and coherent strategy for the transport sector.

9. This Green Paper provides an assessment of the overall impact of transport on the environment and presents a Common strategy for *"sustainable mobility"* which should enable transport to fulfil its economic and social role while containing its harmful effects on the environment.

The purpose of the Paper is to initiate a public debate on how to achieve the objectives of such a strategy which is to be subsequently fully integrated into the forthcoming White Paper on the future development of transport policy in the Community.

The principle of subsidiarity will play an important part in ensuring that the strategy is given its full effect by appropriate national, regional and local initiatives.

Clearly, many of the areas discussed in this Paper are areas in which the Community's contribution will not be legislative - but may be in the research field, in standard setting, or in the definition of objectives. The legislative role may in such cases fall to Member States, or to local or regional authorities. The purpose of this Paper is to initiate discussion, rather than to programme a series of Community legislative acts.

II. PROBLEMS AND ISSUES

a. Current issues

10. The 1989 and 1990 Scientific Assessments of the Intergovernmental Panel on Climate Change (IPCC) has drawn world-wide attention to the causes and consequences of the "greenhouse effect". Although scientific evidence is not yet conclusive as to the scale of the problem, there is general agreement that the high atmospheric concentrations of "greenhouse gases" will have an effect on the earth's climate, causing the "warming" of the globe and the ensuing rise in the average sea levels.

Energy-generation, industry and transport have been identified as the major sources of carbon dioxide, which is the main man-made "greenhouse gas".

11. The depletion of the ozone layer, which reduces the protection of the earth against ultra-violet radiation from the sun, is caused by emissions of chlorofluorocarbons (CFCs) and halons. The direct contribution of transport to this phenomenon is due mainly to the refrigerated transport of goods and air-conditioned vehicles.

No less important but more restricted in its geographical range is the phenomenon of "acid rain", which affects animal and plant life and corrodes building materials. Transport contributes to "acid rain" through sulphur and nitrogen oxide emissions.

12. Other current issues include the build-up of ozone in the troposphere, caused by the emission of volatile organic compounds and nitrogen oxides, with harmful effects on human health and animal life. Transport contributes to this phenomenon.

13. All these current issues concern different forms of atmospheric pollution.

Another current issue is that of the damage to which the urban environment is exposed. Transport is considered to be one of the root causes of present urban degradation.

b. The role of transport

14. For the purpose of this Green Paper transport includes the carriage of goods and persons by any mode of transport - road, rail, inland waterways, sea and air -, private or public, for payment or not, irrespective of the purpose - private or commercial. Traffic represents the physical result of transport.

Transport is vital to both our economic and social well being. It is vital to the production and distribution of goods and services as well as to trade and regional development.

15. Since the beginning of the 1950's transport has made a major contribution to economic growth and has enabled the achievement of economies of scale in production and, by increasing competition in hitherto protected markets, has led to a wider range of choice for both the producer and the consumer with direct and indirect effects on the quality of life.

Transport has also contributed to the significant growth of tourism, which accounts for over 5 % of GDP and provides over 8 million jobs.

16. In the Community the transport sector contributes approximately 7% to the Gross Domestic Product and represents 7% of employment[1]. These figures go up to 10% and 9% respectively, if transport for own account of both goods and persons as well as the production of transport means and infrastructure are included[2].

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(1) Group Transport 2000 Plus, op.cit, p. 5.
(2) E. Jacobs, Le marché européen unique : un défi pour la politique des transports, 1990, p. 4-5.

According to OECD estimates the socio-economic cost - including pollution, congestion and accidents - in the case of road transport could, however, be as high as 5% of GDP[1]. This estimate does not represent the full external cost of transport since it does not cover all forms of environmental impact - namely the cost of the "greenhouse effect" - and is limited to only one transport sector.

17. Technological developments since the beginning of the 1950's have enabled people to travel more quickly, more often and over longer distances, breaking down economic, social, national, ethnic and geographical barriers.

These developments have led to the mass movement of people and have greatly affected behaviour patterns and the general way of life, particularly in industrialised countries. The advent of the motor car and its widespread availability have encouraged a way of life where people feel entitled to mobility and the absence of a private means of transport is often felt as a handicap since it reduces access to available amenities.

c. Impact of transport on the environment

18. For the purpose of this paper environment includes the quality of life, living conditions of human beings and the natural environment with suitable habitats for animals and plants. The quality of life is determined by the long-term availability in sufficient quantity and of adequate quality of resources such as water, air, land and space in general as well as raw materials. It also includes the natural and cultural heritage.

19. Apart from initiatives in the shipping sector to prevent damage to the marine environment, the impact of transport on the environment was, until recently, viewed mainly in terms of atmospheric pollution and noise emissions.

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(1) OECD (1988) : Transports et Environnement, Paris, 1988, p. 11.

Efforts to control atmospheric pollution caused by transport concentrated only on emissions of certain pollutants emitted by motor vehicles. Emission standards were introduced in industrialised countries for carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NO_x) and diesel particulates. The Community adopted legislation to reduce vehicle emissions as well as to encourage the use of unleaded petrol. Community standards have been regularly adapted to technological progress.

20. In the case of noise emissions, industrialised countries introduced limits for cars, buses, goods vehicles, motorcycles and aircraft. The Community adopted limits on noise emissions for goods and passenger vehicles, as well as for motorcycles, and introduced legislation for the phasing out of the noisiest aircraft. No limits were introduced for noise emissions from railways.

21. This approach was one-sided, since these measures were limited largely to vehicle emissions and, thus, were confined to only one aspect of the impact of a single transport sector on the environment.

However, all power-driven transport affects the environment and generates pollution. The impact is not limited to atmospheric pollution and varies in scale and range according to the mode of transport.

22. Thus, in order to ensure the widest possible assessment of the impact of transport on the environment the analysis in this Green Paper is based on a number of criteria related to the quality of the environment as defined above. These criteria include the operational impact of transport on air, water and soil as well as the quality of life, the impact of transport infrastructure on space, the consequences of congestion as

well as the risks inherent to the transport of dangerous goods. The analysis also provides an assessment of the specific problems caused by transport and traffic in the urban environment.

III. ENVIRONMENTAL IMPACT

23. Since transport has a wide-ranging impact on the environment, the present analysis is based as stated above on a number of criteria related to the quality of the environment. These include operational pollution, land-use, congestion and the risks inherent to the transport of dangerous goods.

a. Operational pollution

24. Operational pollution is caused by the actual use of the different means of transport. It affects the air, water and soil and produces noise and vibrations. The effects in many instances are long-term and cumulative, although those caused by noise and vibrations are of an immediate and transient nature.

"Air"

25. "Air pollution" is caused by the emission of chemical substances into the atmosphere which alter its composition, with harmful effects for human health, animal and plant life. The effects of some pollutants remain within the vicinity of the source, where concentrations are highest, and thus have mainly a local impact as in the case of lead emissions. The effects of other pollutants are suffered well beyond the vicinity of the source, as in the case of SO_2 emissions, which contribute to "acid rain". Pollutants can, however, also have a "global" impact as in the case of CO_2 and other greenhouse gases, which affect the climate of the whole planet.

26. Emissions from transport sources include the following air pollutants:

- . carbon dioxide (CO_2) emitted by the combustion of fossil fuel
- . carbon monoxide (CO), hydrocarbons (HC) and volatile organic compounds (VOC), resulting from incomplete combustion
- . nitrogen oxides (NO_x) generated at high combustion temperatures
- . lead (Pb), ethylene dibromide and dichloride added to gasoline to attain the desired octane rating and greater volatility of combustion by-products
- . sulphur dioxide (SO_2) due to the higher sulphur content of diesel
- . fine particles present in diesel
- . formaldehyde and other aldehydes

Carbon dioxide, methane and nitrous oxide contribute directly to the "greenhouse effect" whereas nitrogen oxides, carbon monoxide and hydrocarbons contribute indirectly.

Sulphur dioxide and nitrogen oxides contribute to the phenomenon of "acid rain".

VOCs and nitrogen oxides contribute to the build-up of ozone concentrations in the troposphere.

Hydrocarbons, VOCs, lead, aldehydes, ethylene dibromide and dichloride have potential carcinogenic effects, whereas lead, carbon monoxide and diesel particles are generally detrimental to human health.

27. Air pollution caused by the transport sector is almost exclusively related to the consumption of - mostly non-renewable - energy. According to Eurostat figures for 1988 energy consumption in the transport sector reached 211.53 MTOE [1] (= 29.8% of total final energy consumption).

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(1) Millions of tonnes of oil equivalent.

This is comparable to the energy consumption of industry which represents one third of final energy consumption in the Community.

Within the transport sector 84.4 % was used by road, 11.1% by aviation, 2.5% by railways and 2.0% by inland waterways. Therefore, it is useful to compare energy consumption for different means of transport.

28. Although the results of comparative research in this field should be interpreted with caution, they nevertheless give a clear indication of the energy "greediness" of the different means of transport as shown for passenger transport in table 1 and figure 1.

In fact in the passenger sector they reflect mainly the different basic assumptions concerning i.a. the type of vehicle/train/aircraft taken as reference, the driving circumstances in the case of road vehicles, the average speed, the average energy consumption, the total passenger capacity, the occupancy rate, the production structure of electricity for electric powered trains.

It is clear that the average occupancy rate, which varies largely from one mode to another, is one of the key variables in intermodal comparisons. Therefore, table 2 and figure 2 give a comparison of the specific energy consumption for different transport modes at different occupancy rates, namely 25%, 50%, 75% and 100%.

29. In order to make a fair comparison, the energy intensiveness - also referred to as specific energy consumption - is measured in megajoules of primary energy, taking into account losses occurring during the production and transmission process, per passenger-km.

The main conclusions on the basis of table 2 and figures 1 and 2 are that

. for the private motor vehicle there is a considerable difference between small and large vehicles;

. within each mode the energy effectiveness is commensurate with the occupancy rate;

. of all modes the specific energy consumption is the highest for airplanes;

. compared to high speed trains energy consumption is twice as high for aviation;

. at full capacity railways and buses have the lowest consumption.

30. The latter is particularly important in the case of rush-hour traffic where the occupancy rate of cars is very low (between 1 and 1.2 passenger/car), the driving circumstances and hence the real energy consumption due to congestion very unfavorable and the occupancy rate of trains and buses very high (sometimes exceeding 100% of seating capacity). Although there is no significant difference in energy consumption between railways and buses operating at full capacity, qualitative aspects such as seating comfort, speed, travel time and reliability are usually an advantage for the railways.

31. For freight transport the same considerations regarding intermodal comparisons hold as in the case of passenger transport. Nevertheless the results give an indication of the scale of energy greediness.

Moreover freight transport covers very heterogeneous activities, going from a door-to-door delivery of a refrigerator by van to the customer's home in the city centre, over long distance transport of steel coils by 40 tonnes 5-axle articulated lorry to intercontinental transport of cut flowers by air. Table 3 and figure 3 give an indication of the energy consumption for different means of inland transport under different circumstances.

32. Railways and inland waterways have the lowest energy consumption at around 0.6 MJ/tonne-km.

For 4 and 5-axle articulated heavy goods vehicles (with a full load on the return journey) the energy consumption would appear to be only slightly higher than for railways and inland waterways (0.7 MJ/tonne-km). However, the present market organization gives rise in practice to considerable empty running and a load factor between 50% and 70% would be a more realistic basis for an intermodal comparison. Under these conditions energy consumption is significantly higher for road haulage. Removal of existing restrictions on market access could greatly contribute to energy efficiency.

In the case of light goods vehicles the specific high energy consumption (between 4 and 8 MJ/tonne-km at full load) is due to the high value/high volume/low weight nature of the goods.

"The case of CO_2"

33. The total amount of CO_2 released into the atmosphere by the transport sector in 1986 reached about 577 Mtons or 22.5% of total CO_2 emissions in the Community (1).

The breakdown of this total output according to the different means of transport reflects the share of each means in the total energy consumption of the transport sector.

(1) CEC, Energy in Europe, Energy for a new century : the European perspective, special issue, July 1990, p. 228.

Means of transport	Share in total CO_2 emissions by transport sector	
1. Road: total		79.7%
- private car	55.4%	
- goods vehicles	22.7%	
- buses + coaches	1.6%	
2. Aviation		10.9%
3. Railways: total		3.9%
- passengers	2.8%	
- goods	1.1%	
4. Inland waterways		0.7%
5. Other transport		4.3%

Source: Consultant TNO[1]

The private car alone accounts for more than 55% of the total CO_2 emissions of the transport sector.

Almost three quarters of the total CO_2 emissions for both road and rail have their origin in passenger transport. (See figure 4).

"The other pollutants"

34. Within the context of the CORINAIR programme a detailed analysis on a Community-wide basis is available for NO_x, VOC and SO_2 emissions by road transport. Only partial data are available for railways and none for inland waterways, shipping and aviation.

The share of road transport in total emissions is 53.6% for NO_x, 27.1% for VOC and 2.9% for SO_2. (See table 4)

The share of private cars and light commercial vehicles for the total emissions by road transport is 55.6% for NO_x, 66.9% for VOC and 49.5% for SO_2. (See table 4)

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(1) TNO Policy Research, Possible Community Measures Aiming at Limiting CO_2 Emissions in the Transportation Sector, Delft, August 1991, p. 6-7.

The share of road transport in total CO emissions is estimated at around 74%. Data for Germany and the Netherlands show that well over 80% is attributable to the private car[1].

35. For particulates and lead, comprehensive data are not available. Data for Germany show that transport is responsible for 13% of total particulate emissions, for the Netherlands the share is as high as 22%, of which ± 30% is attributable to the private car[1].

As far as lead is concerned data for the Netherlands attribute to road transport a share of 87% of total lead emissions, of which 94% is caused by the private car[1].

36. With regard to the specific problems related to the urban environment, it is worth mentioning that of all pollutants released into the atmosphere by road transport a large part (26% for NO_x, 61% for VOC) is emitted on urban roads, as data for the Netherlands and Germany show[1]. (See table 5).

This is not surprising, since energy consumption and emissions of pollutants differ according to the driving circumstances. As shown in table 6 for the different means of road transport energy consumption and emission are significantly higher in an urban context.

37. No comprehensive Community data are available for the share of the other means of transport in the emissions of the different pollutants. However, figures for the UK show that 97% of non-methane VOC is caused by road transport, 2% by rail and 1% by shipping; 95% of NO_x is caused by road transport, 3% by rail, 1% by air and 1% by shipping[2]. For aviation it is not specified whether the NO_x emissions include tropospheric pollution, which is an area where research is still in an

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(1) Prognos, Evaluation of External Costs related to Road Transport : Heavy Goods Vehicles (HGV) of Minimum 12 Tonnes Gross Vehicle Weight (GVW), Basel, January 1991, tables.

(2) The Institution of Civil Engineers, Pollution and its Containment, London, 1990, p. 46.

early stage.

Aircraft emissions are becoming a matter of growing concern, particularly those produced in the mid to upper troposphere. It is thought that the impact of "greenhouse gases", particularly NO_x, is much greater than if produced at ground level.

38. The social costs of atmospheric pollution take into account the cost of health problems: effects on the respiratory system, toxicity due to lead accumulation, the loss of human productivity due to morbidity and mortality and the damage to buildings.

Although results vary, probably because of differences in the methods of estimation, an average cost of 0.3 to 0.4% of GDP seems to emerge. According to a German study 91% of the costs can be attributed to road, 4% to rail, 3% to inland waterways and 2% to air(1).

"Water"

39. "Water pollution" is caused by the direct or indirect discharge of chemical substances, including dangerous biological agents and genetically modified organisms and micro-organisms, into the aquatic environment resulting in the alteration of the quality or nature of the water ecosystems with detrimental effects on human health or animal and plant life.

Transport contributes indirectly to ground water pollution through vehicle emissions and aircraft emissions at take-off and landing. Transport accidents involving dangerous or polluting goods can have direct or indirect effects on the water ecosystem.

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

Transport contributes directly to surface water pollution through operational discharges from barges and other vessels as well as through accidental discharges of dangerous or polluting goods carried by inland waterways.

40. "Marine pollution" is caused by the discharge - intentional or accidental - of chemical substances, including dangerous biological agents and genetically modified organisms and micro-organisms, into the sea or estuaries with harmful effects for the marine ecosystems resulting in hazards to human health and to animal and plant life.

Sea transport affects the marine environment through operational pollution in the form of intentional and routine discharges caused by operational fall out and loading and unloading of cargo as well as through discharges of dangerous or polluting goods in the case of accidents at sea and in ports. Eighty percent of all oil pollution of the marine environment is caused by operational pollution.

"Soil"

41. "Soil pollution" consists of a change in the quality or nature of the soil or its general degradation, caused by chemical or physical interference. Since the soil acts both as a reservoir and filter for water and provides storage of primary mineral water, its contamination by harmful substances or the general degradation of its physical or chemical structure can have far-reaching direct as well as indirect effects on human life as well as plant and animal life.

The close interaction between the ecosystems of soil, air and water increases the vulnerability of the soil and widens the range of the potential effects of soil pollution.

42. Transport contributes indirectly to soil pollution through operational discharges and directly in the case of accidental discharges of dangerous or polluting goods. Transport infrastructure can affect the ecological balance of the soil with repercussions for the ecosystems of water and air.

"Noise"

43. "Noise" consists of a number of tonal components which have a harmful effect on human beings and can be more or less intolerable due to the discomfort, fatigue, disturbance and, in some cases, pain it may cause. Depending on its intensity and nature, the effects of noise can range from mere discomfort to various psychological and pathological reactions and vary according to the information imparted by the noise signal and the nervous state and activity of the receiver.

Over the last two decades noise has increased considerably due to the growing spread of urbanization, the greater mobility of goods and persons and the far-reaching mechanization of most human activities.

44. Noise emissions and their impact differ from one transport mode to another.

The overall noise level of road traffic can be broken down into engine noise, rolling noise (from tyres on the road) and other intermittent noise. Under normal traffic conditions the presence of lorries significantly increases average levels of both noise and the number and intensity of noise peaks. Psycho-sociological studies have shown that the noise of a single lorry is equivalent to that of six passenger cars in terms of perceived annoyance. On roads with intermittent traffic the equivalence can be as high as 10 to 15 cars for one lorry[1]. Depending upon traffic conditions for a single lorry the "drive-by" noise, which increases with the speed of the vehicle, is between 6 and 12d B (A) [1][2] higher than that of a single car. The annoyance is generally qualified in terms of the population exposed to noise levels exceeding a certain desirable limit value - 55 leq d B (A) [2] for new residential areas and 65 leq d B (A) in general.[3]

45. In the Community, according to OECD figures, the percentage of population exposed to road transport noise above 55 leq d B (A) varies from 34% (Denmark) to 74% (Spain) and for levels above 65 leq d B (A) from 4,1% (Netherlands) to 23% (Spain). The degree of urbanization, the population density and the structure and density of the road network are important elements which influence the annoyance level.

46. Noise emissions from trains are caused by wheel/rail contact, the engine, aerodynamics, structures along the route and ground vibrations. The noise from wheel/rail interaction increases with speed. In the case of highspeed trains another important source of noise is the contact between the overhead catenary and the train pantograph. Although only a limited number of OECD data are available on railway noise, the percentage of population exposed to railway noise above 55 leq d B (A) is 6% in the Netherlands (no figures available for other Member States) and above 65 leq d B (A) varies from

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(1) DELSEY, J., (INRETS), Nuisances from Heavy Goods Vehicles, ECMT, Paris, January 1991, p. 2.

(2) d B (A): decibel, A-weighted: unit of measurement of sound in which greater emphasis is given to medium and high frequencies to which the human ear is most sensitive. The d B (A) measure is the most usual in noise abatement and control activities.

Leq: "equivalent sound level", gives the average sound level over a given period e.g. a full day or during daytime from 8.00 to 20.00.

(3) ECMT, Transport Policy and the Environment, Paris, 1990, p. 23.