

Perceptions of the environmental impacts of heavy vehicles

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The main environmental effects of traffic, as perceived by the local urban community, are Lack of Safety, Noise/Vibration and Air Pollution. The perception is that lorries are a major factor in producing these problems. There is evidence that people's concerns regarding Lack of Safety and Noise/Vibration, are greatest with the largest lorries, while Air Pollution is a major concern where more smaller vehicles are used in replacement. Priority actions to reduce the adverse perceptions of heavy vehicles could therefore include changes in speed limits, reduction in noise levels at source, and addressing air pollution issues in lorry control areas.

1. INTRODUCTION

1.1 Aim

The aim of this paper is to examine people's perceptions of the impacts of heavy vehicles on the local urban community, and to draw out conclusions which may be of relevance to those involved in the design, use and regulation of such vehicles.

The paper brings together the findings of a variety of research projects into people's perceptions. As well as examining research carried out by others, the paper presents the findings of a project carried out by Travers Morgan (TM) for the Transport Research Laboratory (TRL).

1.2 Outline

The paper is presented in three main sections:

Section 2 : What do people consider to be the main environmental impacts of traffic?

Section 3 : What contribution do people consider heavy vehicles make to these impacts?

Section 4 : Are there changes in vehicle design, or in other factors, that could affect people's concerns about heavy vehicles?

A final section draws together conclusions and considers some possible priorities for action.

2. MAIN ENVIRONMENTAL IMPACTS

2.1 Ranking

Table 1 summarises the perceived importance of environmental problems related to traffic, as presented by the National Environment Survey (Reference 1), by two TRL research projects (References 2 and 3), and by a World Bank Study in Singapore (Reference 4).

Table 1. Ranking of Environmental Problems

	Lack of Safety	Noise	Air Pollution
English National Survey	1	2	2
Lake District Towns	1	3	2
English Towns/Villages	1	2	3
Singapore	1	3	2

Lack of safety, followed by noise and air pollution were the main concerns. Other effects have been explored in the research (specifically visual impact and severance), but few respondents identified these as major concerns (Reference 1).

The Travers Morgan study (Reference 5) examined the public response in the first stage of the London Assessment Studies (LAS) carried out in 1985/86. At this first stage the public were asked, via leaflets delivered to households in the study areas, to identify traffic problems. In total there were 4,000 responses, with nearly 6,000 environmental comments.

HEAVY VEHICLES AND ROADS

The importance of environmental problems, as suggested by the response in the three study areas investigated by Travers Morgan, are shown in Table 2.

Table 2. Proportion of Comments on Different Environmental Problems

	%
Lack of Safety	49
Noise and Vibration	28
Air Pollution	19
Severance	3
Visual Impact	2
	101

2.2 Vulnerable Groups

Safety is perceived to be of particular importance to vulnerable groups, as exhibited from the TM study, by the proportion of comments concerning children which were related to safety (83%), and similarly with the elderly (98%). Concern expressed regarding cyclists was also predominately related to safety (88% of comments on cycling).

3. CONTRIBUTION OF HEAVY VEHICLES

There is evidence that heavy vehicles are viewed by people as making a significant contribution to the major areas of environmental concern.

3.1 Lack of Safety

Pedestrians report that they are particularly intimidated, both when crossing roads and when on the footway, by the presence of heavy lorries (References 6 and 7). Research in the 1970's by Crompton (Reference 8) suggested that greater volumes of lorries, especially when combined with greater traffic speeds, were significant in explaining increased concerns expressed by interviewees at zebra crossings, pelican crossings and on one way streets.

The Travers Morgan study examined the causes of problems suggested by respondents. The presence of lorries was the second most cited cause (after volume of traffic). The study also indicated that concern for lack of safety increased as traffic speeds increased - particularly in the off peak and pm peak periods when the most vulnerable groups (elderly and children) are likely to be moving around the local area (see Figure 1).

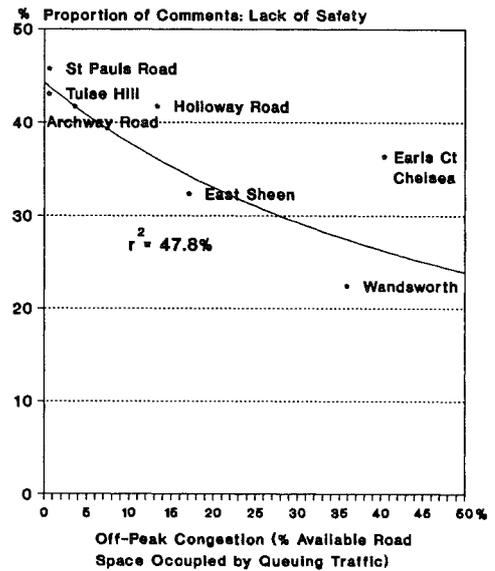


Figure 1: Lack of Safety and Off Peak Congestion

3.2 Noise and Vibration

In the National Environment Survey (Reference 1) 66% of respondents claimed to hear lorry noise when they were indoors. Nuisance from lorries is perceived to be particularly important in congested conditions (Reference 9). Research by Langdon (Reference 10) and by Gilbert et al (Reference 11) has suggested that, in non free-flow conditions, indices based on lorry flows are better predictors of disturbance from traffic noise than indices based on 18 hour dB(A) alone.

Over half those reporting experience of vibration in the National Environment Survey considered that it bothered them 'quite a lot' or 'very much' (Reference 1). Lorries are most closely associated in people's minds with vibration, and the relationship between low frequency noise from heavy vehicles and air borne vibration is well established (Reference 12).

The Travers Morgan Study underlined the importance of the perception of lorries as a cause of noise and vibration nuisance: the presence of lorries was again the second most cited cause, after volume of traffic. There were two other findings indicating the importance of heavy vehicles :

- i) Concern about noise and vibration increased as congestion increased in the off peak period - when lorries normally form a higher proportion of the traffic flow (see Figure 2).
- ii) There was no significant relationship between proportion of comment on noise/vibration and recorded noise levels (L10 18hr dB(A)) - supporting the findings of Langdon and Gilbert that noise indices alone are not sufficient to reflect concerns, especially in congested conditions.

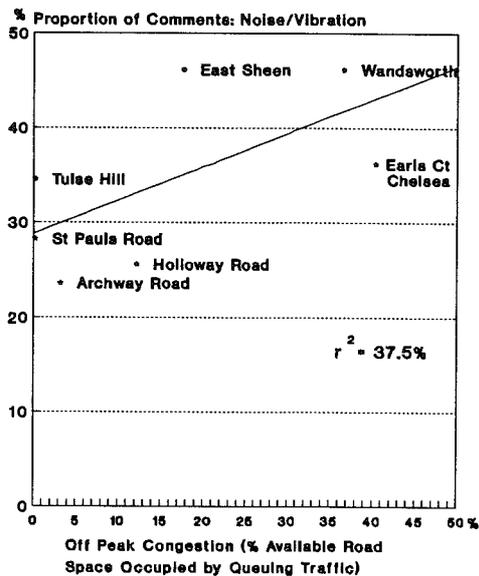


Figure 2: Noise/Vibration and Off Peak Congestion

3.3 Air Pollution

Lorries were the most frequently mentioned class of vehicle cited as causing fumes, in the National Environment Survey (37% of responses : Reference 1). Research suggests that annoyance from air pollution is related to total traffic flow - with more vehicles emitting more pollution (Reference 13). But nuisance is also related to the proportion of lorries - with the more visible/tangible aspects of air pollution particularly associated with emissions from diesel engines (Reference 6).

The Travers Morgan study again indicated that lorries are considered the second most important cause of air pollution problems, after volume of traffic.

4. POSSIBLE CHANGES

There have been a number of studies into how people's perceptions of heavy vehicles may differ in response to changes in dimensions or design.

4.1 Lorry Size

Two studies by TRL (References 14 and 15) tested people's reactions to three different ways of carrying the same weight of goods:

- i) 1 lorry with a carrying capacity of 16 tons;
- ii) 2 lorries with a carrying capacity of 8 tons each;
- iii) 4 lorries with a carrying capacity of 4 tons each.

The results, shown in Table 3, suggest that only a small proportion were unable to differentiate between the convoys, and that there was some preference for the medium size lorry combination. Other TRL research supports the finding, with medium size lorries emerging as a compromise preference (Reference 16).

Table 3. Proportion of Respondents Bothered by Different Lorry Combinations

	One Large Lorry	Two Medium Lorries	Four Small Lorries	No Choice Given
1. Demonstration				
<u>% Most Bothered:</u>				
Residents	35	16	34	14
Pedestrians	42	9	43	6
2. Photographs				
<u>% Least Bothered:</u>				
	23	45	22	9

Most interesting are the reasons given for the preferences. Again other research over a wide range of lorry sizes supports the findings (Reference 16).

- 1. For the smaller lorries in each case (ie. medium compared to large, small compared to medium), the main environmental reasons for the preference were related to the lesser impacts in relation to:

Noise : 32 mentions per 100 people
 Vibration : 22 mentions per 100 people
 Safety : 16 mentions per 100 people

These findings would suggest that where larger lorries are being designed and used, then it is the issues of noise, vibration and safety that particularly need to be addressed.

- 2. For the larger lorries in each case the main environmental reasons for preference over the smaller lorry combinations were related to lesser impacts from:

Frequency of Use : 37 mention per 100 people
 Fumes/Smoke/Dirt : 14 mention per 100 people

Where use of more smaller lorries are being considered this would suggest that air pollution considerations must be given priority if nuisance is to be minimised.

4.2 Lorry Type/Design

A recent study by TRL (Reference 17) has compared reaction to articulated and drawbar goods vehicles. The main difference between the vehicles shown to respondents was:

- i) Overall length, with the articulated vehicles 15 metres, and the drawbar 18 metres.
- ii) Manoeuvrability, with articulated vehicles having a greater rear wheel 'cut in' at junctions.
- iii) Number of axles, with the articulated vehicles having 5 axles and drawbar 4.

As Table 4 shows, a high proportion of respondents considered the vehicles' impacts to be the same. This would suggest that for many people the impact of the largest lorries will not be mitigated by design changes.

Table 4. Proportion of Respondents Selecting Vehicle considered to have greatest Nuisance or Danger

	Articulated %	Drawbar %	Both Same %
1. Nuisance to Peds Crossing	28	19	53
2. Danger to Peds on Footpaths	59	16	24
3. Danger to Cyclists	43	29	27
4. Obstruction to Views	22	36	42

However, there was a preference for the fewer axled, more manoeuvrable drawbar vehicle which would suggest that in relation to perceptions of lack of safety it is possible to make changes in design that will affect people's views of heavy vehicles. Indeed other research has suggested that perceptions of nuisance increase with the number of axles rather than particular dimensions of vehicles (Reference 18).

5. CONCLUSIONS

5.1 Summary

The Travers Morgan study has strengthened the findings of other research that Lack of Safety, Noise/Vibration, and Air Pollution are the main environmental effects of traffic perceived by local communities, and that heavy vehicles are considered an important factor in causing adverse impacts.

TRL research suggests that people are able to differentiate between different heavy vehicle dimensions in terms of their contribution to the major problem areas:

- i) There is particular concern with the largest lorries with regard to Lack of Safety and Noise/Vibration.
- ii) If smaller lorries are introduced to provide a replacement for larger lorries then the concern is for Air Pollution (dust, dirt, smoke, smells), related to greater frequency of use.

With the larger lorries there is evidence that a substantial proportion of people are unable to differentiate between changes in dimension or design, but that different types of larger vehicles (particularly with different number of axles) can affect perceptions.

5.2 Priorities for Action

- i) Lack of Safety - lorries are considered a major cause of problems especially in fast flowing traffic.

Reductions in speed limits particularly in urban areas could be helpful.

- ii) Noise/Vibration - lorries are considered to be major contributors, especially to vibration, and in congested conditions.

For larger vehicles reductions in noise levels at source are likely to make a significant difference to the perceived environment of local communities.

- iii) Air Pollution - lorries are considered to contribute substantially to the problems associated with dust, dirt and smell.

Where control of lorries is likely to lead to increase in numbers of smaller heavy vehicles the implications for air pollution need to be examined.

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