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ENVIRONMENTAL EFFECTS OF TRAFFIC : CASE STUDY AT MERE, WILTSHIRE

by

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ENVIRONMENTAL EFFECTS OF TRAFFIC: CASE STUDY AT MERE, WILTSHIRE

ABSTRACT

The report gives an assessment of the degree of traffic nuisance in a small town at different levels of traffic flow, before and after the construction of a by-pass. Measurements of traffic characteristics and of public attitudes are given.

A nuisance index ranging from 0 to 6 showed a median of 1.7 when trunk road traffic passed through the town. This dropped to 0.3 when the traffic changes due to the by-pass occurred. Such environmental ill-effects as there were, were virtually eliminated by the reduction in flows following the opening of the by-pass. The main disadvantage was considered by some respondents to be a drop in commercial activity in the town.

The study is one of a series of case studies where changes in traffic flow have occurred, and from which more general conclusions will be published.

1. INTRODUCTION

The amount of nuisance caused by trunk road traffic through a small town has been assessed in this study. Comparisons have also been made with the nuisance levels after a by-pass has removed much of the traffic. The project is one of a series of studies^{1,2,3} being carried out in ten towns to investigate the detrimental effects of traffic and to assess ways of reducing them.

The report gives levels of physical characteristics of traffic and measures public attitudes to traffic nuisance. These data will be compared with those in other situations to obtain general principles for the prediction of traffic nuisance, and the change to be expected when different remedial measures are applied.

2. SITE FOR STUDY

The site chosen for this study was Mere, in Wiltshire, which is a small town with a population of about 2,000. The road through the town centre was classified as the A303 trunk road until the by-pass was built. It is narrow with a number of bends and slight gradients. Most of the buildings alongside this road are residential, comprising mainly small terraced houses with a building line alongside the footpath. There are also a small number of shops and other business premises.

Altogether about 350 people are exposed, as residents, to the effects of traffic along this route.

3. METHOD OF STUDY

A 'before' and 'after' study was made. The 'before' part was carried out in May 1976 before the by-pass was opened and the 'after' part in September 1976 about 2 months after the by-pass had been opened for use. The purpose of the 'before' study was to measure the disturbance or bother caused to people living alongside the A303 while it was carrying both through and local traffic. The environmental ill-effects were assessed by physical measurements of traffic characteristics and noise and by public attitude surveys.

The traffic studies included measurements of total daily flow, the proportions of different classes of vehicle and speed.

Noise was measured in the town centre out of doors at a receiver height of 1.5 m and at a distance of 1 m from the nearside kerb. Sample measurements were made of noise and speed for each vehicle category. These were used as input to the computer model of traffic noise⁴ to calculate the noise level for the measured traffic flow and composition. From these values the 18 hour L_{10} indices were calculated.

Public attitudes to the environmental ill-effects of traffic were measured by means of home interview surveys amongst residents. The electoral register was used for selecting the sample to be interviewed. One person from each household was included in the sample. Altogether 137 people were interviewed in the 'before' study and 123 in the 'after'.

The purpose of this 'after' study was to assess the amount of improvement in environmental conditions in the town as a direct result of the reduction in traffic flow when the by-pass was opened.

4. RESULTS

4.1 *Traffic*

Since Mere straddles one of the main holiday routes between the Home Counties and the South West, there is a great variation in the daily traffic flow between days of the week and a difference between the summer holiday period and non-summer flows (Figure 1).

Before the by-pass was opened the average daily flow in the summer holiday period was 12,457, and varied from about 11,000 vehicles per day in mid-week to nearly 25,000 vehicles per day on Saturdays. In the non-summer period this average was 9,509, with about 3,000 more vehicles on Saturdays than on weekdays.

After the by-pass was opened about 3,500 vehicles per day passed through the town with little variation between days and only a small difference between the summer holiday period and non-summer flows (Table 1).

Goods vehicles showed a greater decrease from around 750 medium and 500 heavy vehicles before the by-pass was opened to about 200 and 70 respectively after the by-pass opened. The amount of traffic that remains in this sort of situation, ie the local traffic, depends to a very large extent on the size of the town⁵ and it is only in by-passing small towns, such as Mere, that such dramatic decreases in volumes occur.

Speed surveys showed that through traffic took about half the time on the by-pass that it had previously taken on the through town route, thus saving for each vehicle an average of two minutes (Table 2).

4.2 *Noise*

The values of L_{10} obtained using the computer model⁴ for each hour are listed in Table 3. Validation studies indicate that the results are accurate to within 1.0 dB(A). Values of the 18 hour L_{10} , also shown in Table 3, show a reduction of approximately 8 dB(A) in the town centre for both the summer and non-summer periods.

4.3 *Public attitudes to traffic nuisance*

4.3.1 General disturbance: Overall, 53 per cent of respondents said that they suffered traffic nuisance before the by-pass was opened. After the by-pass was opened this figure fell to 15 per cent (Table 4).

The principal aspects of traffic which bothered residents are shown in Table 5. Virtually all of these were eliminated by the reduction in flow.

4.3.2 Degree of nuisance: As well as measuring the incidence of traffic nuisance amongst the population it was obviously also important to make some assessment of the degree of nuisance suffered. This was done by means of a seven point dissatisfaction scale ranging from 0 to 6, and gave a median rating of 1.7 in the 'before' period, dropping to 0.3 after the by-pass was opened (Table 6).

4.3.3 Specific pollutants: Four aspects of traffic nuisance which other studies had shown to be relevant were selected for more detailed rating. They were noise, vibration, dust and dirt, and smoke and fumes. The ratings for these are shown in Tables 7 to 10 together with median values calculated from the four point scales. The four points ranged from 0 for the lowest point on the scale – "Does not bother at all" – to the value 3 for the maximum rating – "Bothers very much". The median values from these scales permit an assessment of the degree of shift that has occurred and also facilitate comparisons with conditions at other sites.

Dust and dirt were rated as the worst nuisance factor, then vibration, then noise. Smoke and fumes were generally not considered to be a serious nuisance.

In the 'after' study nuisance ratings showed large decreases and, at these low flow levels, noise became the main nuisance amongst the few respondents who still felt that traffic bothered them.

4.3.4 Disturbance of activities: The study also examined how traffic nuisance affected people's daily lives. A 'check list' of unpleasant effects was drawn up and respondents were asked which of them occurred and also the frequency of occurrence. The percentages affected for the two levels of vehicle flow are shown in Table 11.

4.3.5 Opinions of the advantages and disadvantages of the traffic changes: Quieter, safer and cleaner (in that order) were considered to be the main advantages to the town. Disadvantages were considered to be a serious decrease in trade and a feeling of isolation in the town. Some traders claimed that their businesses were no longer viable – some shops had in fact closed.

Apart from this dissatisfaction amongst the shops and businesses, the general view of the effect of the by-pass is a strongly favourable one (Table 12). The improvement in the town centre environment is considered to be even greater than residents had predicted it would be.

5. CONCLUSIONS

This report has given an assessment of the degree of traffic nuisance at two different levels of flow – 53 per cent claiming to suffer nuisance at about 10,000 vehicles per day and 15 per cent at about 3,500 vehicles per day.

Degree of nuisance as measured on a seven point 0–6 dissatisfaction scale was 1.7. This decreased to 0.3 in the 'after' study showing that the residual flow of about 3,500 vehicles per day caused virtually no environmental disturbance.

6. ACKNOWLEDGEMENTS

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Mrs M Pattinson and her team carried out the interviewing.

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TABLE 1

Daily traffic flows – 24 hours

Time	Flow		% change	% medium goods		% heavy goods	
	before	after		before	after	before	after
Summer holiday period	12,457	3,579	- 71	6	6	4	2
Non summer	9,509	3,330	- 65	8	6	5	2

TABLE 2

Journey times

Route	Time
Before – Old Road	240s
After – By-pass	120s

TABLE 3

Noise measurements. Values of L₁₀ (dB(A))

Time ending	Summer		September	
	before	after	before	after
0700	72.1	57.0	70.6	57.8
0800	76.4	68.4	76.0	69.3
0900	77.6	71.0	77.3	71.5
1000	78.4	71.6	77.5	70.8
1100	79.3	72.4	78.6	72.0
1200	80.0	74.9	79.2	72.2
1300	79.9	72.4	79.2	72.1
1400	79.9	72.2	79.2	72.0
1500	80.4	72.9	79.6	72.4
1600	80.3	72.8	79.6	72.3
1700	80.3	73.1	79.6	73.0
1800	80.4	73.8	79.8	73.7
1900	79.3	71.8	78.4	71.3
2000	79.3	70.8	76.7	69.1
2100	77.3	69.1	74.8	66.8
2200	76.3	67.0	72.8	63.7
2300	73.9	63.7	70.2	61.3
2400	72.0	57.6	67.2	57.0
18hr L ₁₀	78.0	69.6	76.5	68.8

TABLE 4
Percentage of people bothered by traffic

	Before	After
Bothered	53	15
Not bothered	47	85

TABLE 5
Aspects of traffic which bothered people – per cent bothered

	Before	After
Noise	32	3
Vibration	27	0
Dust/Dirt	14	0
Danger	13	0
Damage by traffic	7	0

TABLE 6
Degree to which people were bothered by traffic –
percentage distribution

	Before	After
Not at all bothered 0	47	86
1	3	7
2	2	4
3	14	1
4	13	2
5	8	—
Extremely bothered 6	13	1
Median rating	1.7	0.3

TABLE 7
Degree to which noise bothered people – percentage bothered

	Before	After
Bothers very much	14	0
Bothers quite a lot	29	7
Bothers not very much	31	69
Bothers not at all	26	24
Median score	1.3	0.8

TABLE 8

Degree to which dust and dirt bothered people –
percentage bothered

	Before	After
Bothers very much	36	2
Bothers quite a lot	26	8
Bothers not very much	12	48
Bothers not at all	26	42
Median score	2.0	0.7

TABLE 9

Degree to which smoke and fumes bothered people –
percentage bothered

	Before	After
Bothers very much	9	0
Bothers quite a lot	7	1
Bothers not very much	15	13
Bothers not at all	70	86
Median score	0.4	0.3

TABLE 10

Degree to which vibration bothered people –
percentage bothered

	Before	After
Bothers very much	20	–
Bothers quite a lot	32	5
Bothers not very much	26	40
Bothers not at all	22	55
Median score	1.6	0.5

TABLE 11

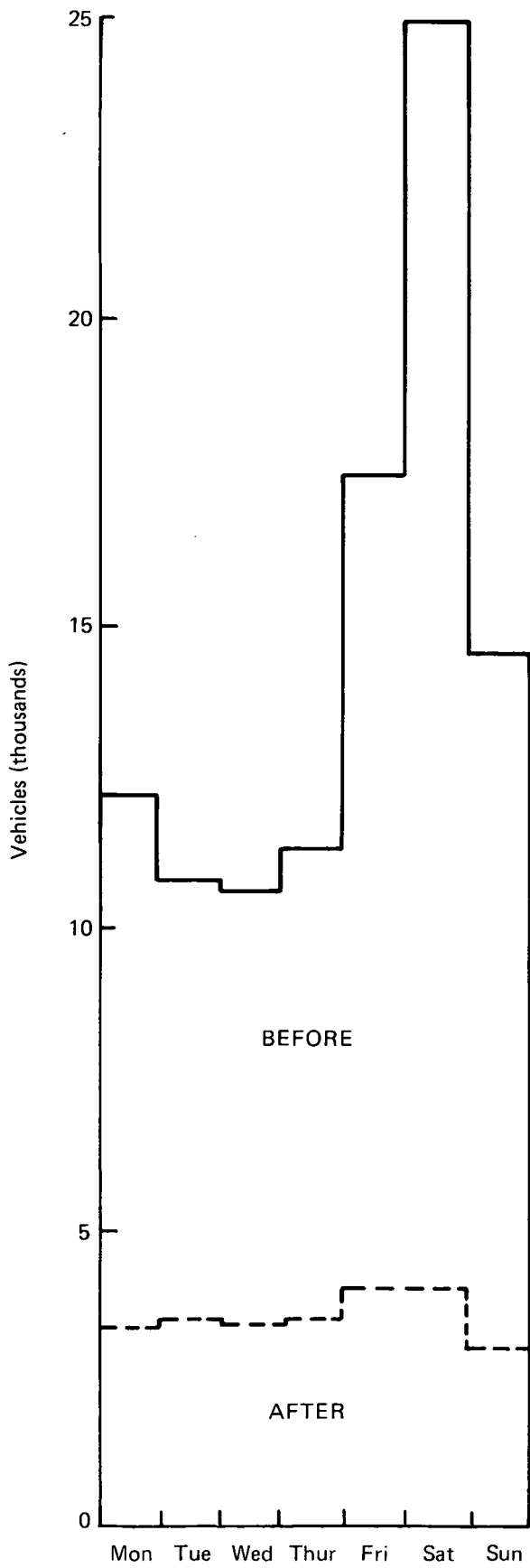
Effects of traffic whilst indoors – percentage affected

Where indoors does traffic ever	Before	After
Startle you?	37	8
Stop you going to sleep?	29	5
Wake you up?	44	11
Interfere with TV?	54	25
Interfere with radio?	28	13
Interfere with conversation?	31	8
Interfere with telephone?	15	9
Interfere with concentration?	16	2
Cause you to have windows shut?	72	20

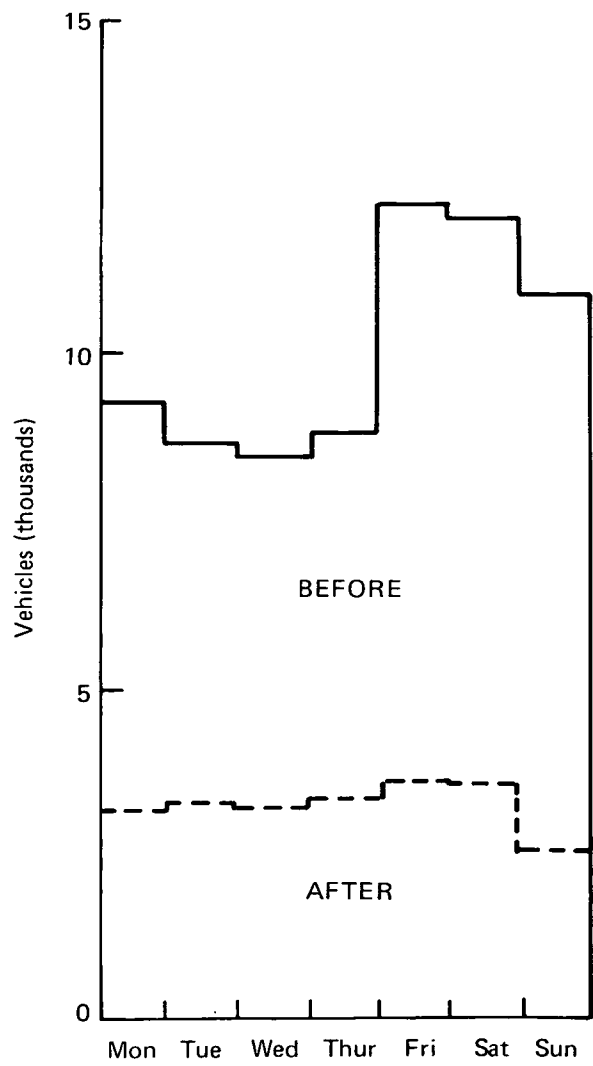
TABLE 12

Overall effect of by-pass – percentage distribution

	Before	After
A lot better	81	84
A little better	14	10
No difference	5	3
A little worse	–	2
A lot worse	–	1



AVERAGE DAILY FLOW IN THE
SUMMER HOLIDAY PERIOD



AVERAGE DAILY FLOW IN
NON-SUMMER PERIOD

Fig. 1 AVERAGE TOTAL DAILY FLOW THROUGH MERE BEFORE AND AFTER OPENING OF BYPASS

ABSTRACT

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