A Travel Plan for the Rotary Club of Pudsey

Background

The work of Rotary in service to the community takes many forms including the promotion and introduction of environmental initiatives of value to all. Environmental projects have often taken the form of visual improvements to our surroundings: landscaping, land clearance and maintenance of public areas are the norm. Such projects, although of great value to the community, do not address an environmental problem which now threatens us all, that of air pollution and, in particular, traffic related air pollution.

Public awareness of the harmful effects of traffic emissions on the environment and on our health is increasing. There is growing acknowledgement that our individual travel behaviour makes a significant contribution to air pollution.

The Rotary Club of Pudsey decided to respond to the threat and to test whether we can make a difference by developing and introducing our own, tailor-made, Travel Plan as the Club's current environmental project. The objective is to demonstrate that the introduction of modest changes to our travel behaviour can produce a meaningful reduction in the travel related air pollution which we produce.

We are indebted to Dr Margaret Bell, Professor of Traffic and Environmental Pollution, Institute for Transport Studies, University of Leeds for spurring us into action by her presentation to the Club at a meeting in September 2002. She made us acutely aware of the serious effects of traffic emissions on the environment and on our health and emphasised that we as individuals could make a real contribution to solving the problem. Professor Bell and her colleague Dr Anil Namdeo gave valued comment as the project was being developed and provided essential assistance in the analysis of data and estimation of pollutants.

The Travel Plan

The Travel Plan has now been introduced: it was simple to develop and cost nothing. Ninety four per cent of our members participated by completing a travel diary for selected test weeks.

Six steps were involved in developing the Travel Plan.

1. Recording our current travel behaviour in diary form (test week 1).
2. Analysing our current travel behaviour.
3. Individually, identifying and introducing modest changes to our travel behaviour aimed at reducing air pollution.
4. Recording our modified travel behaviour in diary form (test week 2).
5. Quantifying what we have achieved.
6. Publicising what we had achieved and encouraging others to follow our lead.

Perhaps the most encouraging finding was that some two thirds of participants were able to identify and implement modest changes to their travel behaviour (step 3) in order to reduce their use of cars. The simple changes included:

- leaving the car at home and walking instead,
- sharing a car for particular journeys,
- travelling at less congested times,
- combining two destinations in one round trip and
- travelling to an alternative, closer destination for lunch.

What We Achieved

Analysis showed that our current travel behaviour led to the production of at least 12.7 kg of harmful air pollutants during the first test week but, following our introduction of voluntary changes to our travel behaviour, we produced 2.5 kg less. Perhaps not all of this reduction is certain to have come about because of our voluntary action. Nevertheless, the analysis shows that our voluntary actions alone reduced our emissions by at least 6 per cent for nitrous oxides, at least 7 per cent for carbon monoxide and at least 11 per cent for particulates.

The Travel Plan has been successfully implemented and has achieved its objectives. It has:-

- made members aware of the seriousness traffic related air pollution problems,
- made members aware that reductions can be achieved most effectively by changing their own travel behaviour,
- has demonstrated how only modest changes in travel behaviour can have a significant effect,
- resulted in significant reductions in traffic related air pollution produced by members,
- allowed the Rotary Club of Pudsey to be seen to act positively towards reducing traffic related air pollution, and
- enabled others to follow by producing detailed documentation on the methodology and the preliminary analysis procedures.

What Next?

Importantly, our project has supported the personal quest of Professor Bell to convince the public that they can contribute and make a difference. The Institute for Transport Studies now intends to apply for a research grant to develop this quest and to refine the analysis and estimating procedures so that a common and uncomplicated methodology can be available for all to follow. Our project will support the grant application and the University will shortly seek the collaboration of Rotary at District Level in the research grant application and, if awarded, participation in project.

1. Background

During his visit to the Rotary Club of Pudsey on 12 September 2002, the District Governor challenged the Club to implement an environmental project during the current Rotary year. If successfully implemented by May 2003, the project would attract the District Governor's personal Environmental Award.

Perhaps by good fortune, the following week Dr Margaret Bell, Professor of Traffic and Environmental Pollution, Institute for Transport Studies, University of Leeds, made a presentation to the Club on the adverse and serious effects of traffic emissions on the environment and on our health. Although there are many harmful emissions from combustion engines, she concentrated on the three most commonly monitored pollutants, nitrous oxides, carbon monoxide and particulates, describing their chemical reaction and their main effects on health.

1.1 Pollutants

Pollutant		Effect on health
Nitrous Oxides (NO_x)	NO (nitrous oxide) with moisture and oxygen produces NO_2 (nitrogen dioxide) and HNO_2, HNO_3 (nitrous and nitric acid) Reddish, pungent, bitter	• Irritates lungs • 30/60 minutes at 100/150ppm is fatal
Carbon Monoxide	CO (carbon monoxide) with oxygen produces CO_2 (carbon dioxide) and carboxyhaemoglobin Colourless, odourless	• Reduced productivity • 0.3% by volume for 30 minutes is fatal • CO_2 is a greenhouse gas
Particulates	PM10 Invisible	• Can cause respiratory problems and some are carcinogenic

Even very small concentrations of these pollutants in the air can be harmful.
For this reason the limiting standards set by the European Community are low.

1.2 Standards

Nitrogen Dioxide (NO_2)	0.2 mg/m3 (105ppb) < 18 times/year 0.04mg/m3 (21ppb) annual average
Carbon Monoxide (CO)	11.6mg/m3 (10ppm) running 8hour mean
Particulates (PM10)	0.05mg/m3 <35 times/year 0.04mg/m3 annual average

1.3 Making a Difference

Importantly, Professor Bell emphasised the significant contribution which individual action can make towards reducing the unwanted and self-inflicted outcomes of our travel behaviour. Being aware of our personal travel characteristics, analysing them and subsequently implementing simple changes leading to fewer short journeys by car, would make a difference.

Such personalized travel planning, when co-ordinated and planned throughout an organization, is defined by the Government as a Travel Plan. The Department for Transport is vigorously encouraging the development and implementation of Travel Plans by employers, schools and other organizations and has taken a lead by promoting plans for every Government establishment throughout the UK. Local governments, local education authorities and many private sector organizations are following suit.

Making a Difference

2. The Decision

The impact of the facts presented spurred the Rotary Club of Pudsey to take action. The Club decided to test the hypothesis that the introduction of modest, voluntary changes to our travel behaviour could produce a significant reduction in the travel related air pollution which we produce. The Club determined to develop and introduce its own, tailor-made, Travel Plan and set out the following objectives.

2.1 Objectives

- To promote awareness of the role which traffic plays in producing air pollution.
- To promote awareness that reductions in traffic related air pollution can be achieved most effectively by changing our own travel behaviour. Furthermore, to demonstrate that only modest changes in travel behaviour can result in significant reductions.
- To allow Club members to do their bit, that is, to act and be seen to act positively towards reducing traffic related air pollution.
- To enable the Rotary Club of Pudsey to take the lead locally on this issue by publicising the initiative, by producing detailed documentation on the methodology and preliminary analysis procedures.
- To raise the profile of the Club in particular and Rotary in general.
- To support the personal quest of Professor Bell to convince the public that they can contribute and make a difference.

2.2 Concept of the Plan

It was envisaged that development of the Travel Plan would involve us in six tasks.

- Recording our current travel behaviour.
- Analysing our current travel behaviour.
- Individually, identifying and introducing modest changes to our travel behaviour aimed at reducing air pollution.
- Recording our modified travel behaviour.
- Quantifying what we have achieved.
- Publicising what we have achieved and encouraging others to follow our lead.

3. Our Approach

Details of our methodology are contained in Annex 1 to this report but an outline is given here.

3.1 Current travel behaviour

A form was produced for recording a diary of travel behaviour. Members were asked to complete their travel diary for a complete week which we defined as the "before" week: it was agreed that this week would be 2nd to 8th December 2002 inclusive. Notes were produced to assist in completing the diaries. Each member recorded for every journey (except those made on foot for purely leisure purposes) the day, starting time, starting address, finishing time, finishing address, mode of transport and, for cars only, the number of people in the vehicle. A journey was defined as one-way, that is, a round trip from home to a supermarket and back was two journeys: a trip from the office to a client's premises then on to an office supplier and back to the office was three journeys.

The form also asked for the member's name and the engine size, capacity and year of manufacture of their cars.

3.2 Analysis of current travel behaviour

The diaries were collated and analysed to determine, for individuals and for the Club as a whole, the total number of trips made, the modes of transport used, the number of cold engine starts made and the time spent travelling in urban conditions separately from the time spent travelling in rural conditions. Through collaboration with Professor Bell and the University of Leeds, broad estimates of the contribution made to air pollution were produced in terms of kilogrammes of each of the three pollutants considered. These estimates were produced by spreadsheet analysis using pollution factors developed by Dr Anil Namdeo, a colleague of Professor Bell. The pollution factors relate to engine type, size, age of car, cold starts and distance travelled in urban and rural conditions.

These preliminary findings were distributed to members to promote awareness of their travel behaviour and their consequent individual contribution to air pollution.

3.3 Introducing changes

Members were then encouraged to study their travel diaries and identify any changes which could reduce their use of the private car and which would be acceptable to them. Typical measures could include car sharing on trips to Rotary functions and on shopping trips, linking trips together, perhaps leaving the car in the garage and walking or travelling during less congested periods.

Members were asked to implement such changes immediately to test their practicality.

3.4 Modified travel behaviour

Having implemented acceptable changes, members were asked to complete travel diaries again for the week 3rd to 9th February 2003, the "after" week. The form used for this week differed from the form used earlier in that it asked whether the journey details were a reflection of modified travel behaviour to reduce air pollution.

3.5 Quantifying what we had achieved

Analyses of the February diaries were identical to those of the December diaries.

However, it was now possible to carry out comparative analyses, of the raw data and by manipulation and extension of the spreadsheets. Key analyses include the following.

- Participation in the Travel Plan
- Travel behaviour
- Vehicle characteristics
- Contribution to air pollution

Most importantly we were able to quantify what we had achieved in terms of reduced car use and the consequent reduction in vehicle emissions.

4. Programme and Costs

4.1 Programme

A fairly leisurely programme was adopted to time for dissemination of information, consideration of individual action to reduce use of the car and presentation of progress and interim results at appropriate stages.

*Presentation to members	19 September 2002
Distribute travel diary forms	28 November 2002
*Record current travel behaviour	2 to 8 December inclusive
Analyse data for current situation	By end year
*Decide on individual actions	By middle January 2003
*Implement individual actions	By end January (and continue)
*Record modified travel behaviour	First week March
Analyse data for modified situation	Third week March
Define our achieved contribution	By end March
Report	By May
Publicize	By May

** means involvement of all Club members*

4.2 Costs

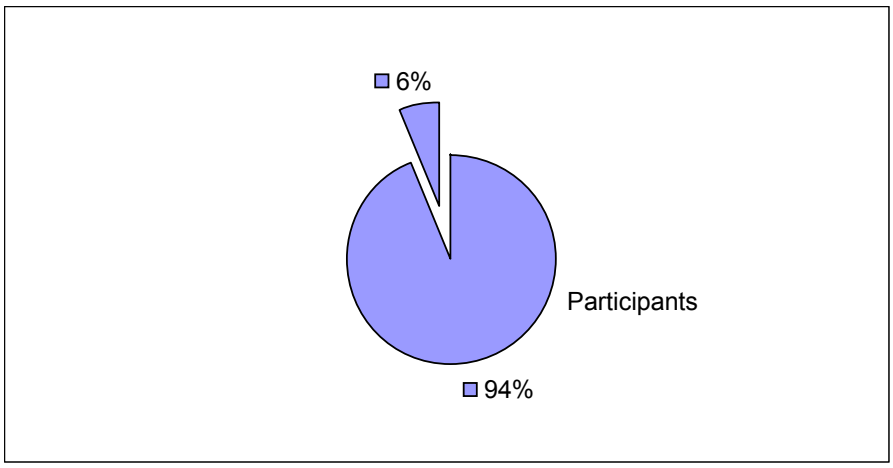
The Club incurred no expenditure in the development and introduction of its Travel Plan. The majority of individual participants saved on fuel and maintenance costs. Individuals felt good about their personal contribution and achievement.

5. Results

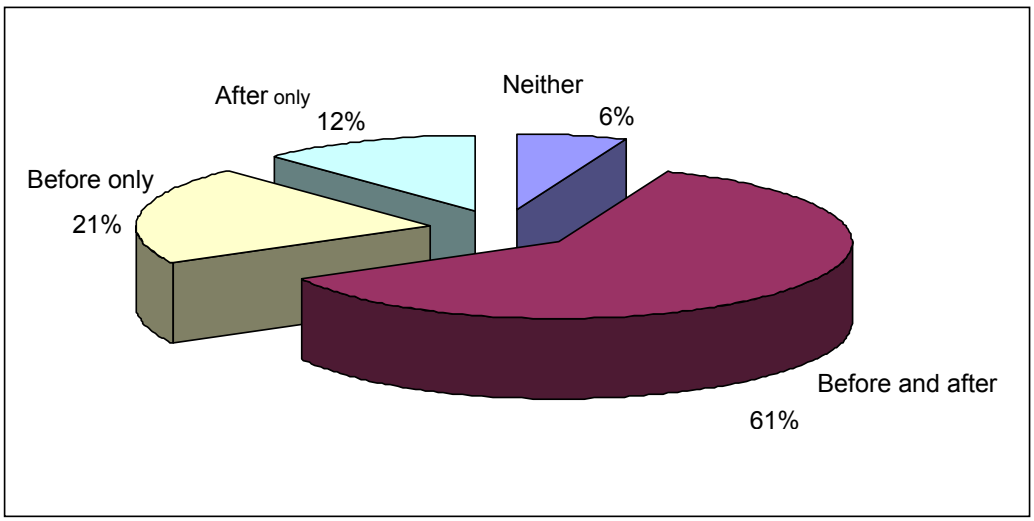
The findings are summarised below. Participation in the Travel Plan, our car characteristics, our travel behaviour and our achievement in reducing traffic pollution are covered.

5.1 Participation

Ninety four per cent of members participated in developing the Plan by completing a travel diary for at least one of the test weeks (32 out of 34 members).



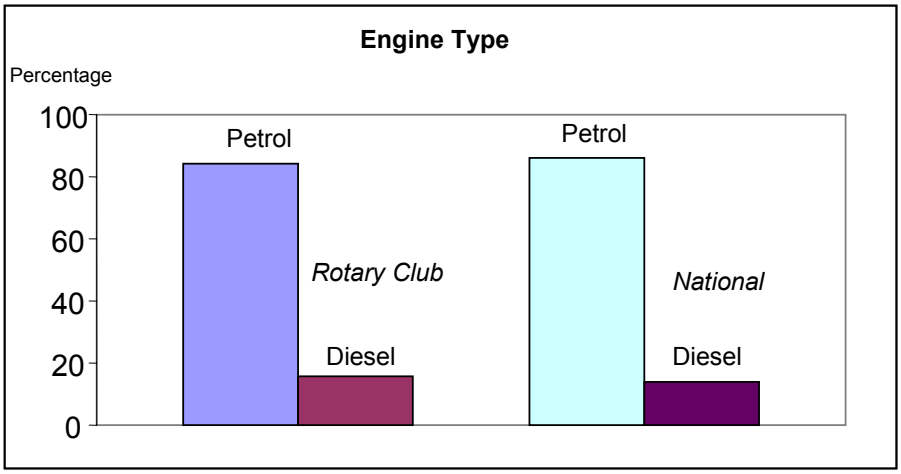
However, not unexpectedly, participation in the "before" part of the Travel Plan's development was different from participation in the "after" part. Sixty one per cent of members completed travel diaries for both the December and February test weeks. February returns were fewer than December returns largely because of illness and holidays. Nevertheless, all diaries returned were of value in assessing the impact of the Plan.



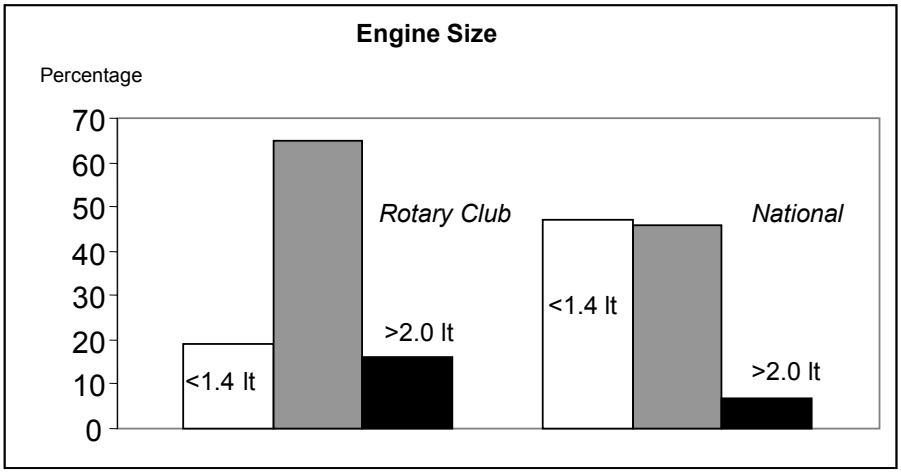
5.2 Car engine

Knowledge of the characteristics of the car engine is important in order to allocate correct factors when estimating levels of emissions. Factors taken into account include engine size, fuel type and year of manufacture (proxy for Euro type classification).

The percentages of petrol and diesel engines in the members' "car fleet" were almost exactly the same as those in the national "car fleet".



However, members' cars have larger engines than the national average. This is perhaps consistent with the higher than average age, prosperity and professional background of the members.



Members' cars fall into the following emissions factor classes. The higher the Euro class, the lower the emissions. European legislation has tasked the car manufacturing industry to reduce emissions progressively over the past decade.

Fuel	ECE 1504 (1985-1991)	Euro I (1992-1996)	Euro II (1997-2000)	Euro III (2001-2005)
Petrol	0	3	18	3
Diesel	0	2	1	2

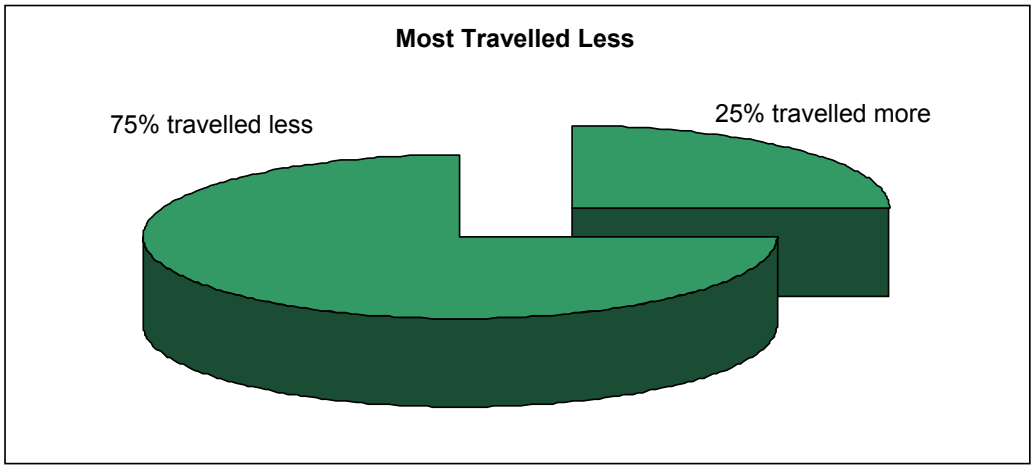
5.3 Travel characteristics

During the December test week some 85 per cent of our journeys were conducted by car. Little use was made of other modes except walking, some 6 per cent. We also collectively travelled 12,400 km (375km each on average) as a car driver.

Total journeys made	725	
As car driver	613	84.6%
By bus	7	1.0%
By train	2	0.3%
By bicycle	9	1.2%
By taxi	11	1.5%
On foot	46	6.3%
Distance travelled as car driver, total	12,400 km	
with cold engine	1,200 km	9.7%
with warm engine		
urban	4,800 km	38.7%
rural	6,400 km	51.6%
Number of cold starts	Over 600	

Detailed analyses were also carried out for each participant and were used to identify modifications which could be made to their travel behaviour.

Analysis of the February diaries and subsequent comparison showed that about 75 per cent of participants travelled less by car although, as would be expected, some travelled more as a result of normal fluctuations in travel requirements, particularly business travel.

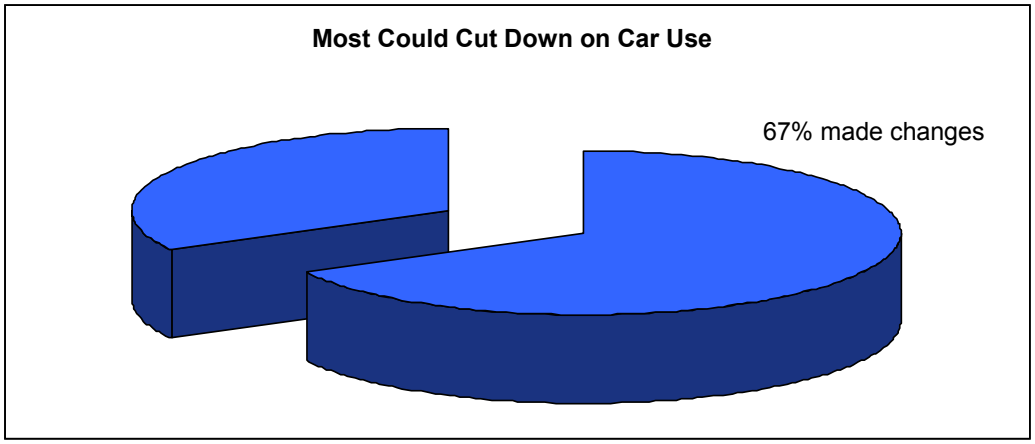


After data adjustment to ignore four unique, long distance journeys recorded in the diaries for December, of which there were no similar journeys recorded in the February diaries, our overall travel by car reduced by 22 per cent.

5.4 Modified travel behaviour

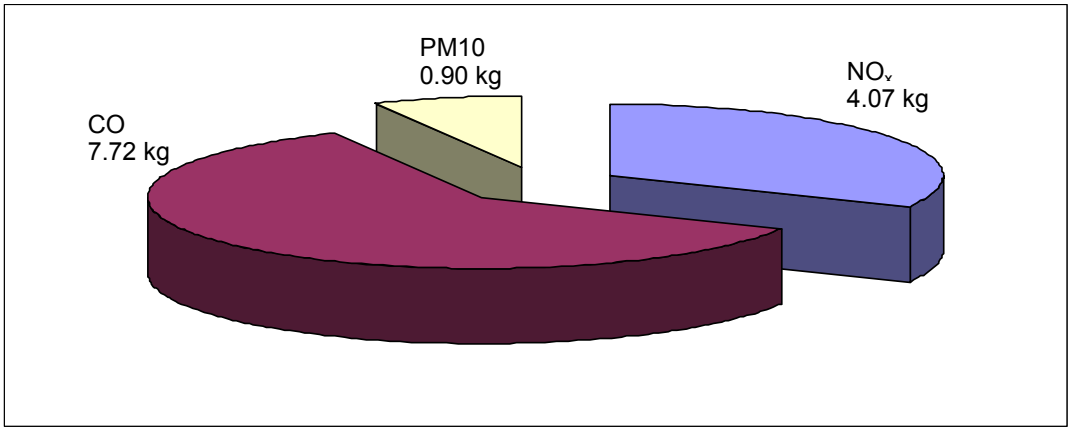
Perhaps the most encouraging finding was that 67 per cent of participants were able to identify and implement modest changes to their travel behaviour in order to reduce their use of cars. Actions included:

- leaving the car at home and walking instead,
- sharing a car for particular journeys,
- travelling at less congested times,
- combining two destinations in one round trip and
- travelling to an alternative, closer destination for lunch.



5.5 Air pollution, before modified behaviour

During the December test week, members produced at least 12.7 kg of the three pollutants considered.

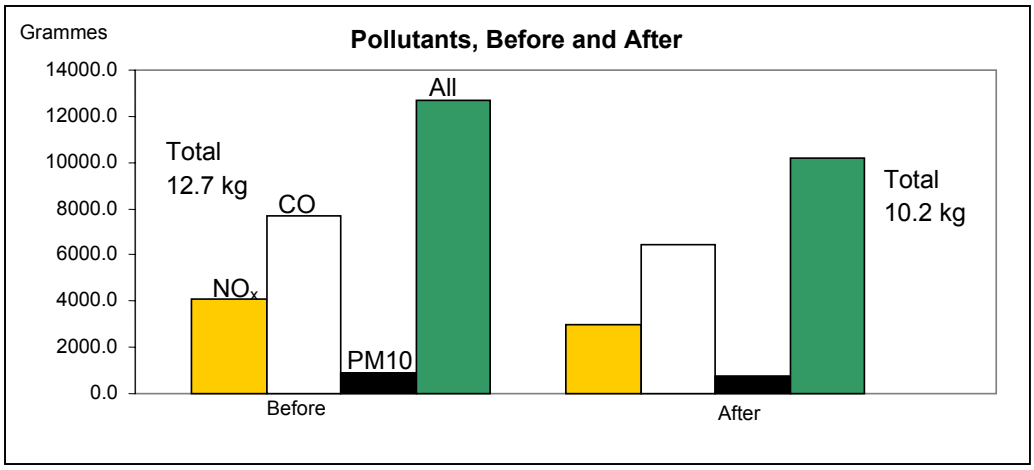


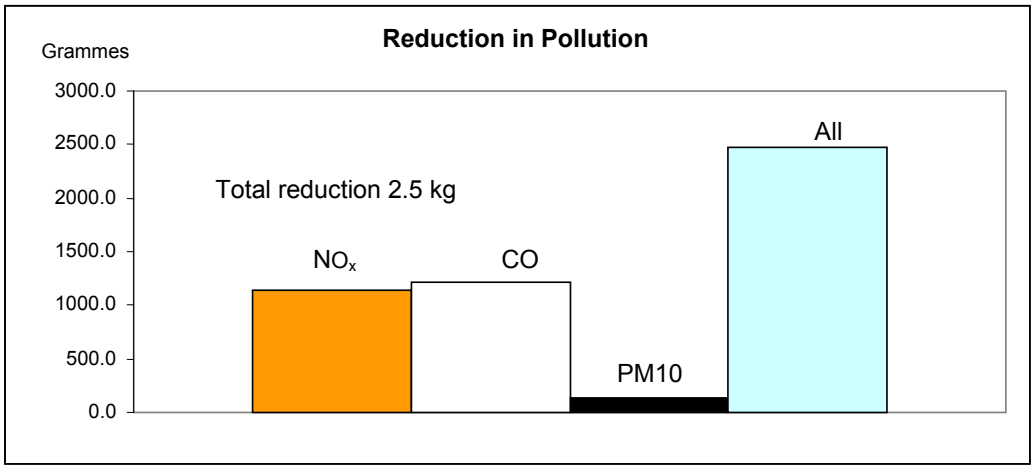
- Diesels generally produce more particulates than petrol engines: this is particularly so during cold running and at slow speeds.
- Diesels produce less carbon monoxide than petrol engines during cold starts and at all speeds.
- Diesel and petrol engines are coming closer together in terms of the production of nitrous oxides but diesels still produce more.

The analysis produced estimates of each pollutant produced by each member at during cold running and during warm running at both slow and higher speeds.

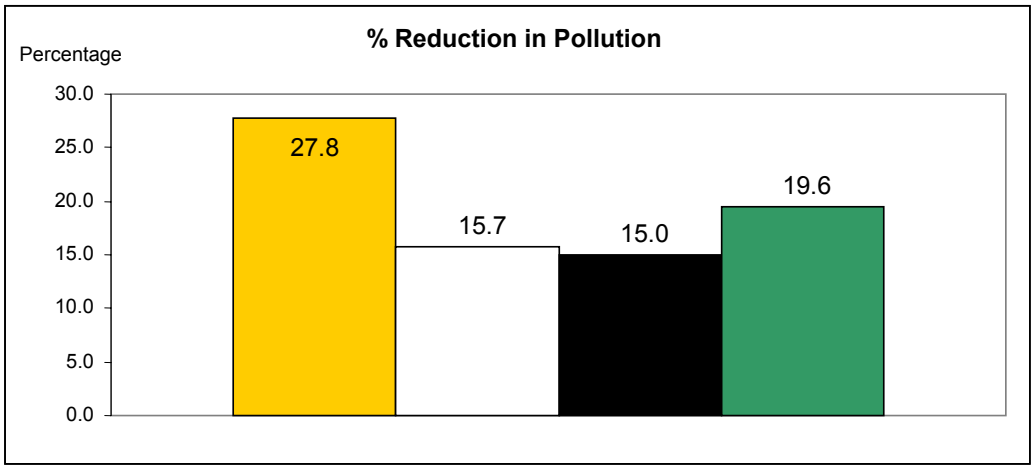
5.6 Air pollution, after modified behaviour

We produced at least 2.5kg less pollutants during the February week (this is equivalent to more than a bag of sugar).



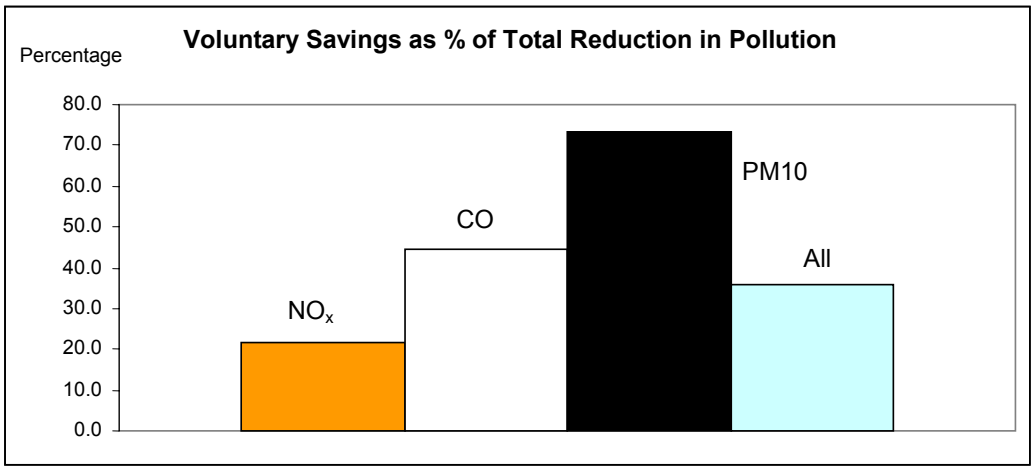


Comparing the two sets of data, our traffic related air pollution was reduced by 20 per cent. It would appear that our emission of nitrous oxides diminished by 27 per cent, our carbon monoxide by 16 per cent and particulates 15 per cent.



5.6 Confidence in the results

Some, but not all, of this reduction could have been the result of normal variations in travel behaviour from week to week. It is important, therefore, to identify the minimum level of reductions about which we can be reasonably confident. In this connection, the voluntary and modest changes to travel behaviour, as clearly identified in the travel diaries, produced 35 per cent of the overall reduction in pollutants. Individually these savings brought about 22 per cent of the total reduction in nitrous oxides, 43 per cent of the reduction in carbon monoxide and 75 per cent of the reduction in particulates.



5.7 Range of achievement

We have some confidence that the percentage reductions in the ranges represented in the table below were achieved.

Pollutant	Percentage reduction	
	At least	At most
Nitrous Oxides, NO_x	6	27
Carbon Monoxide, CO	7	16
Particulates, PM10	11	15
All three pollutants	6	20

6. Conclusions

The Travel Plan has been successfully implemented and has achieved its objectives.

It has:-

- made members aware of traffic related air pollution,
- made members aware that reductions can be achieved most effectively by changing their own travel behaviour,
- has demonstrated how only modest changes in travel behaviour can have a significant effect,
- resulted in significant reductions in traffic related air pollution produced by members,
- allowed the Rotary Club of Pudsey to be seen to act positively towards reducing traffic related air pollution, and
- enabled others to follow by producing detailed documentation on the methodology and preliminary analysis procedures.