

**Final Report for Publication**

**START**

**(Development of strategies designed to avoid the need for road travel)**

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## Project summary

The START (Development of strategies designed to avoid the need for road travel) project commenced in January 1998 and was completed in April 1999. The project aimed to (i) quantify the impact of measures to reduce road travel; (ii) assess the extent to which travel reduction strategies may affect road infrastructure financing and cost recovery plans and (iii) produce an action plan of policy packages to reduce the need for road based travel. The project was composed of five work packages; Work Package 0 (Project management); Work Package 1 (Establish baseline); Work Package 2 (Impacts of travel reduction measures); Work Package 3 (Developing policy packages) and Work Package 4 (Action plan).

### **Work Package 1: Establish baseline**

Work carried out included the identification and collection of basic sources of information on the impact of different travel reduction measures. The other main task was a review of approaches to road infrastructure cost recovery and financing. The output from this latter task was reported in Deliverable 1, completed in May 1998. This latter area of work was returned to in Task 3.2.

### **Work Package 2: Impacts of travel reduction measures**

The major activity in WP2 was to review and analyse available evidence on the travel and wider impacts of a range of different travel reduction measures. A supplementary activity was to review the results from a number of existing studies into public attitudes toward road transport, its related problems and the possible policy measures which could be used to alleviate those problems. The output from WP2 was reported in Deliverable 2, completed in December 1998.

### **Work Package 3: Developing policy packages**

Drawing on the output from WP2, the objective of WP3 was to develop policy packages which would lead to reductions in road travel and which were likely to be acceptable to policy makers, businesses and individuals. The output from this task was reported in Deliverable 3, completed in February 1999. A subsidiary activity was to assess the impact of travel reduction strategies on road infrastructure cost recovery and financing. This was reported in Task Report 3.2.

### **Work Package 4: Action plan**

Drawing on all of the preceding work packages, WP4 was concerned with the final objective of the project, the production of an action plan to reduce the need for road travel. Deliverable 4, Action plan, was completed in May 1999. Selection of measures for inclusion in this plan was, in broad terms, based upon: (i) research evidence concerning the impact and effectiveness of different travel reduction measures, collected in the earlier part of the project; (ii) a recognition that travel reduction is an intermediate objective and that the ultimate objective of policy is the maximisation of economic welfare and (iii) the need to propose a set of practical and efficient measures for reducing the need for road travel.

# 1. Objectives of the project

Measures to reduce road travel could have positive impacts for travellers - who benefit from a reduction in congestion - and for the wider community – who benefit from an improvement in the environment. These positive effects may, however, be counterbalanced by other, negative, economic and social impacts or they may have significant financial implications. If decision-makers believe these negative impacts may be large, or the financial implications disproportionate, then travel reduction measures may not be implemented.

The purpose of the START project was to further explore these issues. The project had three related objectives, which were to:

- (i) quantify the impact of measures to reduce road travel and assess their wider impacts in order to highlight barriers to implementation and find ways of making measures more acceptable;
- (ii) assess the extent to which pricing and other travel reduction strategies may affect road infrastructure financing and cost recovery plans, with particular emphasis on road Trans-European Networks (TENs) and
- (iii) produce an action plan of policy packages to reduce the need for road based travel, covering all levels of decision making, ensuring it is flexible enough to be applicable to different parts of the EU.

The key objectives of the project were (i) and (iii). Objective (ii) was a subsidiary objective that was to be progressed as far as possible, depending on the extent of information which was publicly available.

Table 1.1 shows the main written outputs produced by the START project.

**Table 1.1 – Written outputs from the START project**

Number	Report type	Title/Content
TR1.1	Task report	Extension of basic data collection work
D1	Deliverable	Approaches to road infrastructure cost recovery and financing
PP2	Position paper	Outline of the work to be carried out in work package 2
D2	Deliverable	The impact of road travel reduction measures
PP3	Position paper	Outline of the work to be carried out in work package 3
D3	Deliverable	Transport policy packages
TR3.2	Task report	Travel reduction and road infrastructure provision
PP4a	Position paper	First thoughts about the action plan
PP4b	Position paper	Development of an action plan
D4	Deliverable	Action plan

## 2. Means used to achieve the project objectives

It was not intended that the START project would undertake any new modelling work. Instead, the project drew on evidence from a range of existing studies and sources, from a number of countries.

### *Quantifying the impact of travel reduction measures*

The evidence collected in relation to the impact of travel reduction measures fell into three general categories:

- (i) ex-ante land use and transport modelling studies – previously carried out by the START partners and by others;
- (ii) ex-post evaluations of policies and measures implemented in practice and
- (iii) comparative studies.

The distinctions between these different types of study were important in terms of classifying impacts as either predicted or observed.

### *Public attitudes and potential barriers to implementation*

Evidence on public attitudes toward travel and transport related problems was collected by conducting a review of existing surveys of public attitudes in the START partner countries and in some other countries.

### *Issues in infrastructure provision*

Information on the relationship between travel reduction measures and the financing of road infrastructure was collected through:

- (i) analysis of public policy papers and statements;
- (ii) interviews with road providers, operators and regulators and
- (iii) interviews with officials from various EU institutions.

### *Travel and transport characteristics across Europe*

Information about the way that travel and transport characteristics vary across Europe was collected from:

- (i) other fourth framework research projects (such as DANTE and EXTRA);
- (ii) analysis of national travel statistics and
- (iii) analysis of public policy papers and statements.

### 3. Scientific and technical description of the project

#### 3.1 Overview

The START project was composed of five main work packages that followed one another in sequential order (except for work package 0, 'Project management' which ran throughout the project). Table 3.1 summarises the work packages and tasks and indicates the task leader for each activity.

**Table 3.1 – Summary of work packages and tasks**

Work package/Task	Title	Leader
WP0	Project Management	ME&P
WP1	Establish baseline	ME&P
Task 1.1	Extend data collection	TRT
Task 1.2	Review approaches to road infrastructure cost recovery and financing	ME&P
WP2	Impacts of travel reduction measures	TRT
Task 2.1	Overall impacts	TRT
Task 2.2	Public attitudes	ME&P
WP3	Developing policy packages	VTT
Task 3.1	Develop policy packages	VTT
Task 3.2	Issues in infrastructure provision	ME&P
WP4	Action plan	ME&P
Task 4.1	Develop action plan	ME&P
Task 4.2	Dissemination strategy	MECSA

The project produced four deliverables. These are listed in Table 3.2 together with their actual completion date and status.

**Table 3.2 - Schedule of deliverables**

Deliverable Title	Date Completed	Status
D1 Approaches to road infrastructure cost recovery and financing	May 1998	Accepted
D2 The impact of road travel reduction measures	December 1998	Accepted
D3 Transport policy packages	February 1999	Accepted
D4 Action Plan	May 1999	Accepted <sup>1</sup>

Notes: 1 - Deliverable assumed to have been accepted because no comments were received from the Commission within one month of the deliverable being submitted.

## 3.2 Work package 1: Establish baseline

### 3.2.1 Overview of the work package

WP1 comprised two sub-tasks; Task 1.1 - Extend data collection and Task 1.2 - Review approaches to road infrastructure cost recovery and financing.

#### *Task 1.1 - Extend data collection (Leader: TRT)*

The main objective of Task 1.1 was to identify and collect basic sources of information on the impact of different travel reduction measures. This would then be analysed in Work Package 2. The information available fell into three general categories:

- (i) ex-ante land use and transport modelling studies - carried out by the START partners and others;
- (ii) ex-post evaluations of policies and measures implemented and
- (iii) comparative studies of measures implemented.

The distinctions are important in terms of classifying impacts as either predicted or observed.

Table 3.3 gives some examples of relevant modelling studies, previously carried out by START partners. An initial review of these studies was carried out in Task 1.1. Table 3.4 then goes on to list some examples of other case study material which was reviewed in Task 1.1. The material listed in this latter table spans all three of the categories mentioned above.

**Table 3.3 - Examples of START partner modelling studies reviewed in Task 1.1**

Study Name	Geographical Area	Time Period Modelled
Scenario tests for London using LASER	London and the South East Region	1991 - 2011
Black Country integrated transport study	A sub-regional conurbation of the West Midlands region	1991 - 2011
Coventry integrated transport study	The city of Coventry	1988 - 2005
Vicenza master traffic plan (MEPLAN)	Vicenza	1992 - 2007
Naples master transport plan (MEPLAN)	The province of Naples	1996 - 2011
Model of Bilbao (MEPLAN)	Metropolitan area of Greater Bilbao	1986 - 2010
Model of the Basque Country (MEPLAN)	The Basque Country	1985 - 2015
HELVI models of passenger travel demand	Finland	Various

A secondary objective of Task 1.1 was to collect baseline data on travel trends for Spain and Portugal. The purpose was to complement similar work, already carried out for a number of other countries, in the projects DANTE and EXTRA. Whilst it did prove possible to collect information for Spain, for Portugal the data available was less comprehensive.



**Table 3.4 - Examples of case study material reviewed in Task 1.1**

<b>Title and Author</b>	<b>Date</b>
<u>Reducing Road Capacity</u>	
<i>Traffic impact of highway capacity reductions: Assessment of the evidence</i> , Cairns et al	1998
<i>Traffic impact of highway capacity reductions: Report on modelling</i> , MVA Ltd	1998
<u>Road Pricing</u>	
<i>The effects of road pricing on land use values and future settlement patterns</i> , Flowerdew and Stevens	1994
<i>The London congestion charging research programme, Final Report</i> , MVA Ltd	1995
<u>Parking</u>	
<i>Study of parking and traffic demand in Bristol</i> , Coombe et al	ongoing
<u>Traffic Demand Management (Mobility Management) in the USA</u>	
<i>Overview of travel demand management measures: Final Report</i> , US Department of Transportation	1994
<i>An assessment of travel demand management approaches at suburban activity centres</i> , Bhatt and Higgins	1989
<u>Telecommunications and Technology</u>	
<i>Potential of telecommuting for travel demand management</i> , Turnbull et al	1995
<i>Teleworking. An overview of the research</i> , Huws	1996
<i>Study of telework based transport-telecommunications substitution</i> , Mitchell and Todd	1994
<u>Land Use and Travel Behaviour</u>	
<i>Cities and Automobile Dependence: A sourcebook</i> , Newman and Kenworthy	1989
<i>Gasoline consumption and cities: A reply</i> , Gordon and Richardson	1989
<i>Travel patterns in the West Midlands: Implications for policies to encourage sustainable development</i> , ECOTEC	1995
<u>Travel Demand Elasticities</u>	
<i>A review of new demand elasticities with special reference to short and long run effects of price changes</i> , Goodwin	1992
<i>Concepts of price elasticities of transport demand and recent empirical estimates</i> , Oum et al	1992
<i>Public transport demand elasticities in Spain</i> , G. De Rus	1990
<u>General</u>	
<i>Impact of transport policies in five cities</i> , Dasgupta et al	1994
<i>Medidas de gestión de la demanda. Planes de reducción de viajes basados en las empresas (Traffic management measures. Plans for travel reduction based on firms)</i> Wensell et al.	1996

*Task 1.2 - Review approaches to road infrastructure cost recovery and financing (Leader: ME&P)*

The START project had the subsidiary objective (ii) of, ‘*assessing the extent to which pricing and other travel reduction strategies may affect road infrastructure financing and cost recovery plans, with particular emphasis on road Trans-European Networks (TENs).*’ Work toward the achievement of this objective, was divided into two separate project tasks, Task 1.2 and Task 3.2 – Issues in infrastructure provision.

The output from Task 1.2 was contained in Deliverable 1, ‘Approaches to road infrastructure cost recovery and financing’ that was completed at the end of May 1998. The Deliverable included:

- (i) a brief review of the theory relating to the costs and financing of road infrastructure;
- (ii) a survey of the approaches used, in practice, to finance development of the road network in France, Spain, Italy, the United Kingdom, Finland and Portugal;
- (iii) a brief review of the financing of TEN projects, particularly for road TENs and

- (iv) an initial analysis of the likely implications of measures to reduce travel for road infrastructure provision (this latter area of work was returned to in more detail in Task 3.2).

### **3.2.2 Main results from Deliverable 1: Approaches to road infrastructure cost recovery and financing**

Deliverable 1 began an approach, continued throughout the project, which attempted to set travel reduction within a framework which sees the maximisation of economic welfare as the overall objective of policy.

#### *The START project in the context of overall economic welfare*

The final output of the START project is an ‘Action plan’ to reduce road based travel. The objective of reducing road travel is, however, just one sub-objective which may contribute toward the overall societal objective of maximising economic welfare. Welfare maximisation implies striking a balance between the positive contributions that transport can make to social welfare whilst attempting to minimise its negative side effects. In producing strategies to reduce road travel, therefore, the START project must also take into account the implications of these strategies for the achievement of other policy objectives.

#### *Questions to be answered in Deliverable 1*

Given the overall aims of the START project and the specific aims of Task 1.2, the issue which Deliverable 1 sought to address was the extent to which road travel reduction strategies complement, or conflict with, methods of road infrastructure cost recovery and financing. This general issue can be addressed by answering two specific questions:

- (i) What is the potential for methods of infrastructure cost recovery and financing to contribute toward travel reduction strategies? For example, can tolls on inter-urban roads realistically be used as a tool to manage demand?
- (ii) Will the implementation of travel reduction strategies cause problems and thus be unacceptable because of the way that the costs of road infrastructure are financed or, recovered? This question can usefully be subdivided into two more specific elements:
  - (iia) What are the implications for the financing of existing infrastructure?
  - (iib) What are the implications for the approaches likely to be adopted for new projects and, in particular, for road TEN projects?

In the course of attempting to answer these questions, Deliverable 1 reported on a survey of the approaches used, in practice, to finance development of the road network in a number of countries. The conclusions from this survey are summarised below.

#### *Road infrastructure cost recovery and financing methods in practice*

The conclusions drawn in Deliverable 1 are largely based on experience in the START partner countries, Spain, Italy, the United Kingdom and Finland together with evidence from France and Portugal.

It is useful to distinguish local or urban roads from the national or even international network of trunk road roads and motorways. In most industrialised countries, in the post war era, local roads have typically been paid for by the public sector and financed out of general taxation. The method of provision of inter-urban trunk roads and motorways has tended to be more diverse. For this type of road there are, basically, two ways in which the costs have been recovered; through taxation or through the levying of user charges.

The first method, taxation, is one that has commonly been used to fund the development of the motorway network throughout much of northern Europe, the USA, Canada and Australia. One attribute that distinguishes taxation from user charges is that the revenues collected are not attached to any particular item of public expenditure. Road users are, however, generally liable for the payment of specific taxes. In most countries duties on fuel and vehicle ownership provide the majority of revenues from road related taxation.

The second method of cost recovery for roads is the levying of user charges, usually in the form of tolls. This method of funding has been used to develop the motorway network in several 'southern' European countries (including France, Italy, Spain and Portugal) and Japan. The levying of road tolls had the advantage, for many governments, of facilitating the use of private finance in the development of the road network.

Recent trends in public sector finance have encouraged governments to seek 'off-balance sheet' sources of finance for large infrastructure projects. This, together with perceived efficiency gains, has provided a further stimulus to the involvement of the private sector in the financing and provision of roads.

The following sections now turn to the questions that were posed above.

#### *Can cost recovery methods contribute to travel reduction?*

In Deliverable 1, it was only possible to address this question in the context of inter-urban roads. Whilst road pricing may have an important role to play in the future of urban traffic management, it has yet to achieve widespread use as a method of cost recovery (it is worth noting, however, that the impacts of urban road pricing schemes was considered in more detail in work package 2). Despite this qualification some of the comments made below, in the context of inter-urban user charging, are also relevant to urban charging.

Turning to the potential contribution that cost recovery methods can make to travel reduction, taxation can be used both to raise revenue and as a tool to influence the behaviour of individuals. In most countries, motoring taxation is used for both purposes although the objective of raising revenue is the dominant one. In terms of influencing the behaviour of road users, taxes on fuel and vehicle ownership are fairly blunt but potentially extremely powerful tools that could be used to contribute to road travel reduction. Motoring taxes at national level cannot easily be used, for example, to tackle the differing problems faced by urban and rural areas. They can, however, potentially play an important part in any overall strategy framed at national or international level.

Road user charges can, in principle, also be used either to raise revenue or influence behaviour. In practice they have almost exclusively been used for the former purpose. The extent to which tolls can be used to recover the costs of road provision is limited by the ability of individuals to use alternative routes or modes or to reduce the amount of travel that

they undertake. Where the road network is relatively well developed some users may find it more attractive to divert to other, un-tolled, roads. This problem of traffic diversion is important when considering the contribution that tolls can make to reducing travel.

Imposing a charge for the use of a given section of road will, other things remaining equal, be likely to reduce the amount of traffic using that particular section of road. In response to an increase in travel costs, individual users may choose to:

- (i) continue to use the road as before;
- (ii) travel by an alternative route;
- (iii) travel by an alternative mode or
- (iv) reduce their total amount of travel.

The overall effect of imposing a charge on a given section of road will, therefore, depend on the relative importance of these different responses. This will, in turn, depend upon the specific characteristics of the case being considered. Whilst it is, thus, difficult to generalise about the possible contribution that inter-urban tolls could make toward reducing travel, the following general statements can be made.

In an inter-urban context, where the level of tolls set is sufficiently high to induce any significant behavioural effect, the dominant response from users is likely to be a diversion to alternative routes rather than a switch to alternative modes or a reduction in the total amount of travel. The increased use of alternative routes is likely to be counter productive to the extent that the associated environmental and congestion costs on these roads are higher. To avoid this traffic diversion effect would potentially require all roads to be tolled at differential rates. Such a system of widespread tolling could not be practically implemented in the near future. Tolls are currently levied only in certain countries and, even within those countries, only on a subset of the inter-urban road network.

The other major problem with using tolls as a mechanism for reducing travel relates to the policy context within which they are being applied. In terms of maximising overall economic welfare, an optimal system of road charging would seek to make users pay the additional costs which their journey imposes both on other road users (in terms of lost time through congestion, for example) and on society in general (for example, through increased environmental pollution). A charging system based on the full social costs of road use will not, however, necessarily generate revenues equal to the costs of building or operating a road. Tolls are currently used, however, more or less exclusively for recovering costs.

If tolls can't realistically be used, in the near future, as the basis for an 'optimal' charging system on inter-urban roads, could they at least go some way toward contributing toward a reduction in road travel? The answer is still no, or at least not really, basically for the same reasons as were outlined above. Inter-urban express roads and motorways were originally built to improve mobility and attract traffic away from less suitable alternative routes. Attempts to restrict travel on these roads, which result in substantial diversion, rather than suppression, of traffic, contradict the purpose for which they were originally constructed.

The latter is a practical example of what is known in welfare economics as the ‘second best’ argument. Simply stated this implies that if one of the conditions for attaining a ‘first best’ optimum position cannot, for some reason, be achieved then attaining the ‘second best’ optimum may require violation of the other conditions required for a ‘first best’ optimum. Suppose, for example, that the first best optimum requires that prices on all roads be set equal to the marginal social cost of using that road. If this cannot be achieved for all roads then setting price equal to marginal social cost on the remaining roads will not, necessarily, lead to the second best optimum.

Finally, one practical way in which user charges could be used to contribute toward road travel reduction relates to the use of revenues raised from tolled roads when the concession period ends and all construction costs have been repaid. Rather than reducing or removing the toll, the operating surplus could be diverted toward the enhancement of other modes or used in other ways to contribute toward road travel reduction measures.

This approach would not be totally dissimilar to the French practice of using the revenues from financially viable sections of autoroute to subsidise the construction of potentially less profitable sections. The underlying objective, of course, would be different. An approach of this nature might be appealing from a practical or a political point of view. It is not, however, supported by any strong arguments based on notions of equity or efficiency. For example, why should motorists using a given section of road be forced to subsidise other modes of transport?

#### *What are the implications of travel reduction strategies for infrastructure financing?*

In seeking to address this question it is useful to distinguish between the financing of existing infrastructure and the approach likely to be adopted for new projects.

##### *Existing infrastructure*

In relation to existing infrastructure the vast majority of roads, at least in terms of length, are funded through general taxation. Whilst tax revenues would clearly be affected by strategies which influence the amount of road travel, the overall effect is likely to depend on the specific nature of the policies implemented.

In terms of carrying capacity and strategic importance, a significant proportion of the European road network has been or continues to be financed through user charges. Policies that seek to influence the amount of travel on these roads would clearly be of concern to road operators. Their implementation would probably be opposed or result in claims for financial compensation. The relative importance of this as a potential barrier to the introduction of road travel reduction strategies was investigated further in Task 3.2.

##### *New projects*

Turning to additions to the existing road network, the trend in most European countries and at EU level in relation to the transport TENs has been to seek to involve the private sector in the financing and operation of large infrastructure projects. The two main motives which underlie this approach are the opportunities which it creates to finance public goods and services from sources outside of public budgets and the perceived gains in efficiency to be

made by involving private sector financial and management skills in the design and delivery of projects.

If the perceived efficiency gains of involving the private sector in this type of project are to be realised one of the key requirements is the optimal allocation of risk between the public and private sector parties. Each party should bear the risks it is best able to manage and has most interest in controlling. In the context of START, the most important risk is that relating to the level of traffic on a new road. In existing contracts, where this risk is largely borne by the private sector, the introduction of policies to reduce road travel is likely to be opposed or result in claims for financial compensation by the company operating the concession. Introduction of these policies would also be likely to reduce private sector interest in future contracts of a similar nature.

The High Level Group, which examined public-private partnership financing of TEN transport projects, recommended that public policy risks in these type of projects be borne by the public sector. The intention was to encourage private sector involvement by minimising uncertainty. In the context of START, a question arises concerning the extent to which the implementation of policies to reduce road travel constitutes a policy risk or, in fact, would represent the introduction of a whole new set of objectives?

In many European countries, the road network is already developed to such an extent that most new roads are unlikely to be financially viable if funded solely through the collection of tolls. In some cases tolls may be used to recover a proportion of the costs, with the public sector subsidising the remaining costs of construction and operation. In other cases, the public sector pays the private sector to provide roads based on a system of shadow tolls. Within a general policy framework which has as one of its objectives a reduction in the amount of (or growth in) road travel and in order to maintain private sector interest in the financing and management of road infrastructure projects, the public sector would have to develop new ways to pay for roads.

One possible model for this type of approach could be the new payment mechanism being put forward in the A13 DBFO project in the United Kingdom. The method being proposed will be based upon a mixture of factors including a measure of the availability of the road to all users, levels of road safety and the reliability of public transport journey times. Shadow tolls, related to traffic levels, will also play a small but much downgraded role.

One final caveat, concerning additions to the road network, is the relative importance of new road construction in the future. In many European countries the road network is already well developed and substantial opposition exists to further expansion. At European Union level, of the estimated total investment in the fourteen priority TEN transport projects only 10% will go toward new road construction. Considering Europe as a whole, the majority of new road building will probably therefore take place in the less developed regions of the Union and in the countries of central and eastern Europe which, for the moment, remain outside of the Union. Approaches to restraining the growth of road travel in these countries may be set within a different overall policy context.

### **3.3 Work Package 2: Impacts of travel reduction measures**

#### **3.3.1 Overview of the work package**

The overall aim of Work Package 2 was to explain and, where possible, quantify the impact of different measures that could contribute toward reducing the need for travel. Apart from the immediate effects on road travel, measures will also have wider social, economic and environmental impacts. Some of these wider impacts may represent potential barriers to the implementation of strategies to reduce travel. A subsidiary objective of the Work Package was to review public attitudes to travel and traffic related problems and the possible policy measures which may be used to tackle those problems.

Work Package 2 was, therefore, directly concerned with objective (i) of the START project, namely to, '*quantify the impact of road (car and freight) travel reduction strategies and assess their wider impacts in order to highlight the barriers to implementation and find ways of making strategies more acceptable.*' WP2 was divided into two main sub-tasks, Task 2.1 - Overall impacts and Task 2.2 - Public attitudes. Both tasks were reported in Deliverable 2, 'The impact of road travel reduction measures' which was completed in December 1998.

##### *Task 2.1 - Overall impacts (Leader: TRT)*

Task 2.1 was the largest single task in the project and entailed the review and analysis of available evidence on the impact of different road travel reduction measures. The results from this task formed the major component of Deliverable 2.

##### *Task 2.2 - Public attitudes (Leader: ME&P)*

The purpose of Task 2.2 was to collect information on public attitudes toward road transport, its related problems and the possible policy measures which could be used to alleviate those problems. The material collected was used to supplement the work carried out in Task 2.1 and contribute toward the development of acceptable policy packages. Specifically, Task 2.2 contributed to the project as a whole by providing:

- insights into the likely acceptability and effectiveness of different policy measures;
- information on the extent to which attitudes differ between countries and, for a given country, between different groups within society and
- guidance on the objectives which should underlie the development of START policy packages and the Action Plan.

The resources available for this task were relatively small hence, for their own country, each partner concentrated on reviewing information from existing survey material and, where necessary, information from other sources such as pressure groups and other interested parties. No new surveys of public attitudes were carried out. Where available and time permitted, information was also collected from non-START countries.

#### **3.3.2 Main results from Deliverable 2: The impact of road travel reduction measures**

Deliverable 2 began by continuing the theme of travel reduction and its relationship with other objectives of policy.

### *Travel reduction as an objective of policy*

Over recent years, measures that could contribute to a reduction in road traffic levels have attracted increasing support. This is because these measures can simultaneously serve the needs of a range of different interest groups. A reduction in traffic levels could, in certain circumstances, contribute toward a reduction in environmental damage, improve road safety, benefit the functioning of the economy and reduce the relative disadvantage of particular groups within society.

Despite the current popularity of road traffic reduction measures, it is important to be clear that travel reduction cannot be pursued as the single, or ultimate, objective of policy. Economists typically think of the maximisation of ‘economic welfare’ as being the overriding, or ultimate, objective of policy. This ultimate objective is usually translated into the more operational objectives of economic efficiency, distributional justice and environmental sustainability. In seeking to maximise welfare it is recognised that these objectives may have to be traded off against one another. It is clear, for example, that a broad potential conflict exists between increases in the positive contributions that transport can make to economic welfare and the associated negative impacts that it has on the environment.

The ultimate goal of the START project is to produce an Action plan, composed of policy packages, to reduce road travel. The preceding discussion has shown that in order to produce such an Action plan, some way has to be found of reconciling travel reduction, as an aim, with other objectives of policy. This is a topic that was returned to, in work packages 3 and 4, as a part of policy package formation.

### *The approach adopted in Deliverable 2*

The purpose of Deliverable 2 was to provide information about the travel and wider impacts of a range of different road travel reduction measures. One commonly used way of examining the likely impact of different measures is through the use of transport modelling. START did not carry out any new modelling work but drew on available evidence from a range of existing modelling studies. The ex ante evidence on impacts, derived from these studies, was supplemented with evidence from a number of ex post studies of measures that have been implemented in practice.

The following section goes on to discuss the most important findings and the implications for policy from the work which was undertaken.

### *Factors influencing the demand for travel by car*

The demand for travel by car depends on a number of factors that evolve slowly over time (income, wealth, spatial distribution of population and employment, for example) and on three (or four) effective prices, or costs to the user, that can change over short periods of time. The relevant prices are the cost of car travel, the cost of travel by other modes, the cost of property/land, and the cost of all other goods. As consumers respond to relative prices, the cost of all other goods can be taken as given, and the three remaining prices can be measured relative to this background price level.

The *effective* cost of travel by car is the total perceived cost to the user, measured by the various financial components of running costs, fuel costs, any taxes or prices on fuel, any tolls or road prices, parking charges and so on and the non-monetary (but very real) costs of



inconvenience, delays, unpredictabilities and the general unpleasantness of driving conditions. For public transport, the total effective costs include the costs of transfer to public transport, including waiting times, uncertainties about travel times, the inconvenience and unpleasantness of the journey conditions and exposure to weather.

Listing all these costs makes it clear why it is often so difficult to find simple relationships between individual elements of cost (such as parking charges, fuel taxes, or road tolls) and their impact, which works by affecting the overall cost of travel by the various modes on offer. An apparently large increase in one item which is a small part of the total cost may have a relatively modest proportional impact on the total cost of travel by that mode, and therefore give rise to a rather modest effect on travel demand.

As a general economic proposition, a set of land use and transport policies will lead to an efficient allocation of resources if users are confronted with and react to the marginal social costs of using each mode of transport and each location decision. The total cost of using land will include its scarcity value or rent, and this will be endogenous, influenced by such factors as accessibility, the quality of local public services, and its location with respect to shops, work and other amenities. Changes in the cost of transport will affect the relative prices of different locations and their relative attractiveness and relocations of population will in turn have impacts on demands for travel. Land use policies affecting, for example, the density of building or zoning restrictions will similarly impact on land prices and travel demands.

There is general agreement that these impacts on land use and the consequential effects of land use on transport demand can have large impacts in the long run but understanding of the forces at work is limited and the speed with which these changes affect the pattern of activity and the level of transport demand is relatively slow. Detailed modelling of the interactions between land use and transport demand in particular areas is time consuming and expensive but can produce valuable insights into the relative attractiveness of policies. Often policies that appear at first sight to be attractive can have perverse longer run effects, while other policies that appear to have modest short run effects can have significant longer run impacts. A number of these land use and transport studies were discussed in Deliverable 2 but always with the qualification that the particular results are conditioned very much by the initial distribution of activities and other factors specific to the local context being considered.

### *Policy implications*

Land use policies may be important, can often have rather indirect and sometimes perverse effects, and deserve careful study in their own right. There do not appear to be any very simple conclusions, apart from the obvious ones that higher concentration of population in more compact urban areas provided with a good infrastructure of public transport and pedestrian/cycle friendly urban environment give rise to a more efficient urban system (measured by energy, pollution, or travel demanded per person). Unfortunately, as incomes increase, people prefer a more dispersed lifestyle and greater mobility, things which are not often compatible with dense urban living. As a result, car demand appears to rise more rapidly than income, and the pressures for decentralisation are almost irresistible. In part this is encouraged by the fact that car drivers pay considerably less than the marginal social cost of travelling to urban centres, and hence over use private transport in congested urban situations. If they paid the full cost of such travel they may consider that living in lower density suburban or rural settings, but paying a higher cost for travel to work, would no

longer appear so attractive compared to the alternative of living in an urban area and walking, cycling or using public transport for travel to work.

Consequently, the message that transport economists can send, with some confidence, is that if travellers face the right prices for their journeys (the marginal social cost of the journey, which will include the congestion costs and any adverse environmental costs) then they are more likely to make efficient decisions over location and transport demand. Getting the prices right is therefore a good starting point for the design of transport policies. Identifying the circumstances in which prices are too low will indicate where transport demand is too high and policy action is required.

The practical problems of raising prices to motorists in places where the marginal social cost exceeds the average private cost are considerable. In EU countries, fuel taxes are high and the average private cost of car use could actually exceed the *average* social cost of car use. The problem is that in uncongested conditions and most inter-urban and rural roads, the marginal social cost is well below the average private cost, but in congested urban conditions the opposite is true.

Road pricing is intended to address this, because efficient road pricing means that motorists are charged different prices on different roads and at different times of the day. Road prices would need to be adjusted to ration road space efficiently and to reflect the changing marginal social costs. The practical and political problems of introducing road pricing are considerable - the technology has not yet matured to the point that it is cheap, tamper proof, and reliable, while motorists resist additional charges for using streets that they already pay so heavily for through high fuel duties (amounting to over 80% of the final price of petrol in the UK, for example).

Most transport policies therefore attempt to find alternative methods of raising the apparent cost of car driving in congested urban conditions, either absolutely or relatively and seek simple, cost effective, ways of achieving this. It is useful to distinguish the various ways this may be done in a 2x2 matrix:

	Cars	Other modes
Prices	change in the effective price of car travel, per kilometre	change in the effective price of travel by other modes, per kilometre
Costs	change in real resource costs	change in real resource costs

The price of driving relative to travelling by other modes can be raised by either increasing the effective price of driving and leaving the price of other modes unchanged, or lowering the effective price of these other modes. Parking charges, cordon charges, and fuel tax increases raise the effective price of private transport, while bus subsidies reduce the price of public transport relative to private transport, and therefore effectively raise the relative price of private to public transport. In short, the modal split between car and non-car use will depend upon the ratio  $p_c/p_n$ , where  $p_c$  is the effective price of car travel per kilometre, and  $p_n$  is the effective price of travel by other modes per kilometre. This ratio may be raised by increasing the numerator or decreasing the denominator.

The second relevant dimension (reading down the matrix) is whether the policy raises prices without raising costs or whether real resource costs are increased. Thus if fuel taxes are increased, revenue increases and this revenue can either be returned to motorists by reductions in the annual licence charge, or can be used for other socially desirable activities, some of which may directly benefit motorists (such as improved public transport or other improved urban amenities in areas where the motorists live). Other policies may directly increase resource costs and not generate any comparable revenue streams. Thus, restricting the road space available to private cars will increase congestion and impose a real resource cost of increased travel time on motorists. It may thereby discourage some motorists from making a journey through raising the effective cost of travel, but it will not generate revenues that may be used productively elsewhere. Similarly, investments that improve public transport (and lower the effective price) are costly in resources, although they can be cost effective.

This approach suggests that the reason why it may be desirable to reduce the demand for road travel is the perception that, for a considerable fraction (perhaps approaching one half) of vehicle kilometres travelled (VKT), motor travel takes place in conditions where the marginal social cost exceeds the average private cost. Having said that, it is important to recognise that, for a considerable fraction of VKT, the opposite is true, particularly in rural areas. Blanket policies to reduce VKT regardless of location may therefore have very perverse economic impacts. To take an important example, increasing fuel prices will raise the effective cost of travel by slightly more per kilometre in congested urban areas than in uncongested rural areas, as fuel consumption in congested conditions is slightly higher than on most rural roads (of course, at some higher speeds the opposite may be true and this may well be the case on inter-urban roads). However, the *proportional* increase in the effective price of travel will be lower in congested urban areas where the time cost component is much higher, and is likely to lead to a smaller proportion reduction in VKT than in rural areas. The overall effect may be to reduce VKT but to lower welfare, as the reduction will be larger in areas where travel is already overcharged, and smaller in those areas where it is undercharged.

#### *Geographical scale of the study evidence reported*

Deliverable 2 therefore considered three geographical scales on which to examine the impacts of transport policies. Small and medium sized cities typically are less well endowed with public transport and often face more intractable traffic problems than large metropolitan areas with their adequate public transport infrastructure. Many municipalities are wrestling with policies to alleviate the harmful effects of road travel in these urban areas, and as a result there are a wide range of studies upon which to draw.

Large urban conurbations and agglomerations have experienced a loss of population to the suburbs, and a growing mismatch between the often rather elderly public transport infrastructure, designed for a more compact urban core, and the increasingly dispersed pattern of residence and activity. Policies to improve the transport efficiency of these urban conurbations and agglomerations must therefore deal with a wide range of conditions, and take account of land use policies and a much wider range of transport policies than single small urban areas. There are fewer such studies but they throw light on a wider range of issues than the small town studies, and were therefore separately distinguished in Deliverable 2.

Finally, some policies are intended to operate at the regional or national level and in any case other policies which may well appear initially attractive at the urban scale, become inappropriate when their impact on rural and dispersed or peripheral areas in the country are studied. It was therefore important to consider some regional or national level studies to see how robust the findings from the urban and agglomeration studies were.

### *Public attitudes*

Deliverable 2 also contained a review of the results from a number of existing studies into public attitudes toward road transport, its related problems and the possible policy measures which could be used to alleviate those problems. A picture emerged in which individuals have become increasingly aware of and concerned about environmental issues. Several studies have also revealed, however, that a gap exists between people's words and their actions. Whereas many people are willing to express concern about environmental problems fewer are prepared to take action, which may be costly to themselves, to alleviate those problems. Further, it is often the case that concerns about traffic levels are motivated by the personal inconvenience caused as a result of traffic congestion, rather than because of any underlying 'green' sentiments.

In terms of attitudes toward the different policy measures that could be used to tackle the growth in road travel and its associated problems, people are reported to favour measures that promote alternatives to the car, rather than measures which restrict or increase the costs of car use. The dilemma which governments appear to face, therefore, is the choice between potential losses of popularity as a result of increasing the burden of taxation to pay for improvements to other modes of transport or potential losses of popularity which result from the imposition of measures that directly restrict, or raise the costs of, car travel.

### *Lessons learned*

The study evidence confirms economists' intuition that the most effective way of dealing with market failures is to address the problem at source. One of the main market failures affecting road travel is the excess of the marginal social cost over the average private cost, in congested conditions. Policies that directly address this by raising the effective price to motorists without increasing resource costs will be the most cost effective. Several studies examine forms of road pricing that it may be possible to implement in the near future. The leading contenders are cordon charges and per kilometre charges, although the latter would probably require more sophisticated instrumentation than a simple cordon charge. Parking charges have a less direct impact and may not work where there is extensive private off-street parking within the congested area.

Such road pricing schemes are effective in increasing the efficiency of both the private and public transport system, as it is easier to raise prices to more fully cover the costs of a reliable and high quality public transport system when motorists have to pay the full cost of their travel. Nevertheless, the increased financial cost to private motorists represents a very real obstacle to their introduction, and too little effort has been devoted to designing methods of compensating these motorists that will not encourage them to maintain high levels of driving. Reduced vehicle taxes are one obvious method, but have so far been resisted by the Ministries of Finance in EU countries. More radical reforms of road taxation to replace a large part of fuel taxes by road pricing which varies by location could alter the relative cost of driving in congested and uncongested areas without increasing the overall payment by motorists.

Measures of this type might gain the support of a majority of motorists. They are, however, even more strongly resisted by Ministries of Finance, and are hard to introduce piecemeal.

Subsidies to urban public transport operate by raising the relative cost of private travel to public travel, but are considerably less effective for several reasons. First, by reducing the cost of public transport they induce additional travel demand by non-car users and can be an expensive way of reducing each VKT of private travel. Second, because the non-monetary perceived costs of public transport are already very high (time spent, waiting, inconvenience, unpredictability and inflexibility, for example) quite a large monetary subsidy may have a relatively small proportional impact on the perceived cost, and therefore a relatively small impact on the relative price of private and public transport. Finally, subsidies are fiscally expensive and therefore unattractive and are often largely sustained by the pressure of the public sector transport unions. They are frequently associated with inefficient public transport supply and are increasingly under scrutiny by fiscally strapped governments, aware of the benefits of privatised management under commercial regimes.

The main finding of many of the studies is that alternative methods which raise the resource cost while raising the effective price of private transport have serious adverse effects, and often not very significant impacts on private transport demand. Bus lanes, road capacity restrictions (or a failure to expand capacity in line with demand) operate by dramatically increasing the total effective cost of private transport and as such give rise to large inefficiencies. Many public transport investments designed to improve the relative attractiveness of public to private transport are very costly per VKT of private car demand reduced.

The often modest percentage reductions in private VKT reported in Deliverable 2 are mainly a reflection of the rather low elasticities of travel demand to the total effective cost, and the relatively small proportional change in the relative effective cost to the instrument in question. Most of the reported private travel reductions are of the order of one or two years' growth in (unconstrained) demand so policies are likely to be palliative over relatively short periods of time. This does not mean that the policies are necessarily ineffective or undesirable - that can only be discovered by proper social cost benefit analysis. What it does caution against is the belief that there is any simple strategy that will dramatically affect levels of urban congestion.

### *Conclusions - the need for a package based approach*

Drawing together the main points from the preceding discussion, it seems clear that an approach based on the application of a single travel reduction measure, alone, is unlikely to be as successful as one which combines several measures within a single package. Measures can be divided into two groups. Those, such as road or fuel pricing, which 'push' people away from certain behaviours and those, such as improvements to the public transport system, which 'pull' people toward more favoured behaviours.

As a general rule, 'push' measures tend to be more effective than 'pull' measures in reducing road travel but are associated with problems of public acceptability. Pricing policies that have as their main objective the internalisation of external costs, for example, are inherently likely to be unpopular because, almost by definition, the external costs are not actually perceived by road users. 'Pull' measures, on the other hand, tend to be favoured by the general public but, applied on their own, are likely to have a limited effect on road traffic

levels. The main barrier to the implementation of 'pull' measures is often the availability of funding to make the necessary improvements.

Successful strategies are therefore likely to contain a mixture of both 'push' and 'pull' measures, with the new sources of revenue collected from road users being used to fund improvements in other parts of the transport system.

### **3.4 Work Package 3: Developing policy packages**

#### **3.4.1 Overview of the work package**

WP3, which commenced in June 1998, was composed of two tasks, Task 3.1 - Develop policy packages and Task 3.2 - Issues in infrastructure provision. Task 3.1 was reported in Deliverable 3, 'Transport policy packages', completed in February 1999. Task 3.2 was reported in Task Report 3.2, 'Travel reduction and road infrastructure provision', produced in March.

##### *Task 3.1 - Develop policy packages (Leader: VTT)*

The aim of Task 3.1 was to develop policy packages which would lead to reductions in road travel and which are likely to be acceptable to policy makers, businesses and individuals. The work was divided into a number of sub-tasks. First, a review of current transport problems and policies across Europe was carried out. The relationship between existing problems and policies and travel reduction was explored, together with the way in which policy priorities are likely to vary across different geographical areas. This work provided a basis for specifying objectives and criteria for the policy packages.

In the second sub-task a framework was developed which would help ensure the coherence of the policy packages. The framework identified the various actors involved, a set of thirty available travel reduction measures, the relevant decision making levels and the spatial and temporal aspects of package development. A third sub-task involved the use of several different preliminary – top down and bottom up - approaches to the development of policy packages. In the fourth sub-task an appraisal of the initial list of thirty travel reduction measures was carried out. This was based on the evidence collected in Deliverable 2, concerning the likely travel and wider impact of measures.

A fifth sub-task was concerned with implementation issues relating to the thirty measures. This included consideration of their likely financial costs, public attitudes towards them (from Deliverable 2), the possibility to mitigate any potential barriers to implementation which had been identified, the relationships between measures and their compatibility with the requirements of the Common Transport Policy. This sub-task, in particular, drew on work carried out earlier, in work packages 1 and 2.

The next sub-task, based on the work of all the preceding sub-tasks, involved the development of four policy packages. An assessment was subsequently provided of their likely travel and wider impacts. A final sub-task looked at the different circumstances that prevail in the northern and southern parts of Europe. These regions do not share all of the same transport problems and policies as the central region. Suggestions were put forward for ways in which policy packages might be modified in order to be more applicable in these northern and southern regions.

### *Task 3.2 - Issues in infrastructure provision (Leader: ME&P)*

The purpose of Task 3.2 was to assess the implications of travel reduction strategies for road infrastructure cost recovery and financing. It followed on from Task 1.2, which reviewed different approaches to infrastructure financing and cost recovery and which was reported in Deliverable 1.

Building on the work carried out in Task 1.2, in Task 3.2 additional information was gathered from three main sources:

- (i) a series of interviews conducted with operators of existing toll and DBFO roads and with relevant government officials;
- (ii) several less 'formal' interviews conducted with officials from various EU institutions, with a view to collecting information about the TENs and
- (iii) a review of relevant results from the fourth framework research project FATIMA (Financial assistance for transport integration in metropolitan areas).

The interviews with road providers/operators and government officials were carried out in Spain, Italy and the United Kingdom. A standard format was drawn up providing a general framework for each interview.

### **3.4.2 Main results from Deliverable 3: Transport policy packages**

Deliverable 3 began by considering the relationship between travel reduction and the Common Transport Policy.

#### *Travel reduction and the Common Transport Policy*

The Common Transport Policy (CTP) aims to close the gaps in European transnational networks for both road and rail infrastructure. This has been mainly justified in economic terms; building new infrastructure is promoted as a way of generating economic growth and stimulating regional economic development. Most of the CTP objectives address the traditional problem (how to get from one place to another). Objectives 4 and 5 address the modern problem (environment and safety). None of the objectives directly addresses the post-modern problem (congestion and restricted room for expansion) which was actually the starting point for the START project.

More recently, the European Commission has examined ways in which transport prices can better reflect the costs to society of pollution, congestion and accidents in its White Paper on *Fair payment for infrastructure use*. This can be understood as a step toward developing transport policies that are also able to cope with the post-modern transport problem.

The Deliverable went on to consider the basic issues which arose in forming policy packages.

#### *Basic issues in the formation of policy packages*

It can be considered that in the end the attractiveness of a policy package will be determined by the answers to three questions: (i) How much will it reduce road travel?, (ii) What other

impacts will it have?, and (iii) Will it be acceptable? Of course these issues are interconnected, for example the size and type of impacts will influence acceptability.

The issue of time frame is fundamental because of the need to plan public investment on a long term basis and to establish a stable policy framework within which individuals and businesses can plan their investment. It is difficult to offer an ‘instant fix’ because very few measures can be implemented without a significant lead time. A period of ten years or more may be required, for example, to allow public investment programmes to be reshaped, for new planning regimes to begin to exert an influence on development patterns, for the location of activities to be influenced or for new public transport schemes to be implemented. Over the longer term still, say ten to twenty five years, new technologies such as electronic systems of road pricing, may be developed and implemented and major changes in working practices, based upon enhanced use of telecommunications, could be effected.

It has been noticed that larger reductions in road travel require more measures to be applied than smaller reductions. It is also obvious that many measures can only be used in urban areas, which is not actually a problem because it is in urban areas where congestion is most obvious and the need for the reduction of road travel is therefore the greatest.

Because START does not have the capability to determine the impacts of alternative packages in a rigorous way, well defined methods such as cost-benefit analysis cannot be used in selecting the measures to be included in packages. Instead packages could be formed through the use of ‘rules’ according to which possible measures would be selected. Measures need to be identified at all spatial scales, in this case meaning at urban, inter-urban, and rural levels.

Based on the review of existing policy packages it can be stated that the best policy packages could be obtained through a mix of different types of measures i.e. pricing and taxation, capacity management/restraint measures, public transport improvements, telecommunications and also land use planning.

#### *Possible measures and their impacts*

The available measures were categorised as those, which (i) suppress car/road freight traffic or (ii) improve other modes. In addition, there is a third group which includes (iii) other measures. The relationship between the first and the second group is a clear one. When the measures in the first group directly suppress the use of car/road freight transport (through increased cost, decreased space or constraint of movement), the improvement of other modes (public transport or rail freight) provides alternatives for travellers. The third group includes miscellaneous measures, which work through increasing the efficiency of car/road freight transport, promoting telematics or changing land-use planning.

In principle increasing costs seems to decrease car travel effectively both in urban and inter-urban conditions – especially, when the growth of costs is substantial. Available information about the impacts of other measures is more vague. Road freight on international networks is influenced by road pricing (price per vehicle kilometre) – again especially if the price is high. Also large scale improvement of rail services (e.g. through deregulation) is likely to attract freight from roads.



The measures capable of reducing road travel will probably also lead to improvements in congestion, the environment and road safety. However, there exist also other impacts that may be felt in a negative way. The obvious main negative impact of the measures including increased taxes or charges are increased costs of car use and freight transport. On the other hand, revenues will be generated which are available for other purposes, for example for financing improvements in public transport and rail freight services or, outside the transport sector, for tax reductions.

Decreasing road space and constraining car movements may increase congestion and journey times but also improve the environment for affected areas. The impacts are very much dependent on the combination of measures used.

Measures aimed at increased efficiency do not have many negative impacts and generally decrease operation costs. Measures for promoting the use of telematics also have very few obvious negative impacts and increase freedom in many activities. With the aid of land use planning, travel distances can be shortened but some people may resist living in dense urban structures.

It can be considered that the implementation costs (from the point of view of the public sector) for the vast majority of measures proposed would be relatively low, especially when compared with previous capacity expansion through road building. It has to be remembered that many measures, for example road pricing, could also generate substantial revenues, which can then be used to finance the implementation of other measures.

#### *Mitigation of negative impacts*

Measures such as increasing the efficiency of transport modes, use of telematics and land use planning are unlikely to encounter substantial public opposition. The evidence on public attitudes suggests that measures, which improve or promote alternative travel modes, are likely to be most acceptable to the general public. Direct moves to restrain the use of cars on the other hand are likely to arouse public opposition. Current research has, however, indicated that as people become more informed about the likely costs and effectiveness of different approaches to dealing with transport problems, their opposition to restraint measures tends to decrease.

The major means for mitigation of negative impacts include monetary transfers, use of telematics to substitute for actual travel and modifications in the transport system. A powerful measure to reduce car travel is to increase the costs of car use and the most obvious means to mitigate its negative impacts is the improvement of public transport. The revenues generated by increased taxes/prices can be used to finance improvements. This can be quite effective in urban areas. For inter-urban connections and in rural areas the possibilities for this kind of mitigation are more limited. A similar approach is available also in road freight transport for long journeys. Revenues generated by increased costs in road freight transport can be used for the improvement of rail freight services. In the long term, expanding the use of telematics will change living, working and production conditions and in that way probably also mitigate the negative impacts of the measures suppressing road travel.

### *Formation of policy packages*

The individual measures included in a policy package influence the effectiveness of one another, that is, there exist synergies and conflicts between measures. The objective of reducing travel is actually an intermediate rather than a final objective and there is a risk that some measures may change the relationship between the intermediate and final objectives so that their welfare impacts may turn out to be perverse. The main potential areas of concern relate to measures which may increase congestion, for example the reallocation of road space. Also, subsidies to public transport or rail freight services may create problems of “deadweight” support for trips which would have been undertaken anyway.

Central to the design of packages is a combination of ‘push’ type measures to reduce the demand for car travel and ‘pull’ type measures to provide - and attract people and goods towards - alternatives. Thus there is a strong synergy between demand management type measures (pricing, quantitative restrictions, regulation, etc.) and efforts to provide and promote the attractions of other modes (walking, cycling, public transport and rail freight transport).

There are also possibilities for conflicts between measures. Any policies which have the effect of increasing the cost or reducing the practicability of car use in urban areas are likely to create pressures for the decentralisation of population and economic activity to locations beyond the area in which the restrictive policies apply. This will clearly conflict with land use planning measures focused on urban containment and maintenance of residential densities.

The measures which reduce road travel in congested conditions usually coincide quite well with the objectives of the CTP because they probably also decrease pollution, improve safety as well as shortening journey times. Economic efficiency may be improved as a result. However, in uncongested conditions the influence on economic efficiency could be negative, depending on the perceived price of environmental impacts. This is a serious issue in rural areas when national measures, such as fuel taxes, are used.

### *START policy packages*

It has become clear that a successful policy package needs to involve combinations of measures. The measures have to be combined in such a way that they support one another and that some measures alleviate the problems caused by others. When forming START policy packages it was necessary to take into account the actual measures and their impacts, the related context of existing transport policy, time frame, spatial levels, decision-making levels and the various actors and their roles.

Current transport policies do not give clear guidance on how much road travel should be reduced. It can be supposed that the amount of reductions necessary varies through time and between countries/regions/cities. Because of these different requirements START has chosen to provide a set of packages with capabilities to reduce road travel with different degrees of severity. The chosen time frame influences the possibilities to attain new technological solutions and also the possibilities to apply long term measures such as land use planning. In addition, the possibility that public attitudes may change is greater in the longer term. Considering the results from the review of existing studies of travel reduction measures (from Deliverable 2) two target years - 2005 and 2020 – were chosen for policy packages.

According to the same review it seems unlikely, in the short term, to achieve large reductions in road travel. On the other hand discussions about long-term strategies which aim to achieve only a small reduction are not interesting because there are few difficulties in that. In that way a set of policy packages has been formed: Case 1 aiming for a high reduction of car/freight traffic in the long term; Case 2 for a medium reduction in the short term; Case 3 for a medium reduction in the long term and Case 4 for a low reduction in the short term.

Case 1 assumes severe concern about environmental sustainability, which justifies the implementation of drastic measures. The major measures to be used for reducing car traffic include increases of costs. Other measures more or less support these and/or mitigate the negative impacts or are used only for local purposes. The main measure in case 1 is road pricing, through which the required level of traffic is obtained. Yearly and purchase taxes are used for keeping the level of car ownership down, which improves the possibility to maintain the density of urban areas. Fuel tax has also the same impact for urban areas. For freight transport also the increase of costs - mainly through road pricing - together with improvement of rail freight services will have the major impact.

In Case 4 - because of the short implementation period - sophisticated road pricing systems do not exist. The low reduction of car traffic in urban areas is achieved with the aid of cordon pricing or, if that is not suitable, then parking charges can be used. Also fuel taxes are used in order to maintain residential densities. In order to mitigate negative impacts public transport will be improved. The reduction of road freight transport is not included because of great difficulties to obtain immediate results in it.

In Case 2 medium reductions are needed already in the short term. This of course presumes more serious concern about the environment than in case 4. When the time horizon is similar to case 4 also the measures to be used are the same but with higher levels of taxes/prices. Of course the implementation will then be more difficult than in case 4.

In Case 3 only medium reductions are needed in the long term. Then there are two options available. If an extensive road pricing system in Europe will be developed then we come to a similar package as in case 1 but with lower prices/taxes. If this kind of system is not available then cordon or parking charges are used but otherwise the package remains similar to case 1.

The reduction of road traffic obtained in cases 1 to 4 cannot be quantified. However, the evidence collected in START Deliverable 2 as well as results from other sources provides some indication of the reduction in road traffic likely to result from the various measures applied.

#### *Acceptability of policy packages*

The major negative impact of high taxes/prices enforced in transport is the increase of costs for users. This will also form a major barrier for implementation. At least a partial solution comes from the sensible use - improvement of public transport/rail freight services or tax cuts in other sectors - of revenues generated by tax/pricing measures. It is of course obvious that the level of taxes/prices has to reflect perceived concerns about environmental sustainability, which justifies the implementation of measures.

It can be seen that there are plenty of possible measures available for the reduction of car/road freight transport. These measures can be combined in order to form packages where the expected positive impacts are amplified and the negative impacts alleviated. It could be seen also that remarkable reductions in road travel are possible to obtain in the long term especially through pricing measures but to achieve immediate reductions is much more difficult. The problem is not the lack of means but the strength of opposition. All measures suppressing car and/or road freight transport will be opposed by the groups affected. Even though the negative impacts can - at least partially - be alleviated there remain opposing forces.

All actions must be seen against the perceived need for the reduction of road travel. The four policy packages formed were all aimed at different conditions. Large reductions were connected to great concern about the environment triggered, for example, by possible new information on serious damages caused by air pollution. This kind of information changes the opinions and weakens the position of opposing forces.

When considering situation in different parts of Europe, it was noticed that in non-central countries - both in the south and the north - there exist some differences in transport problems and policies compared to those of the countries in the Core area. These differences were considered further in the final part of the START project, the preparation of the action plan.

### **3.4.3 Main results from Task Report 3.2: Travel reduction and road infrastructure provision**

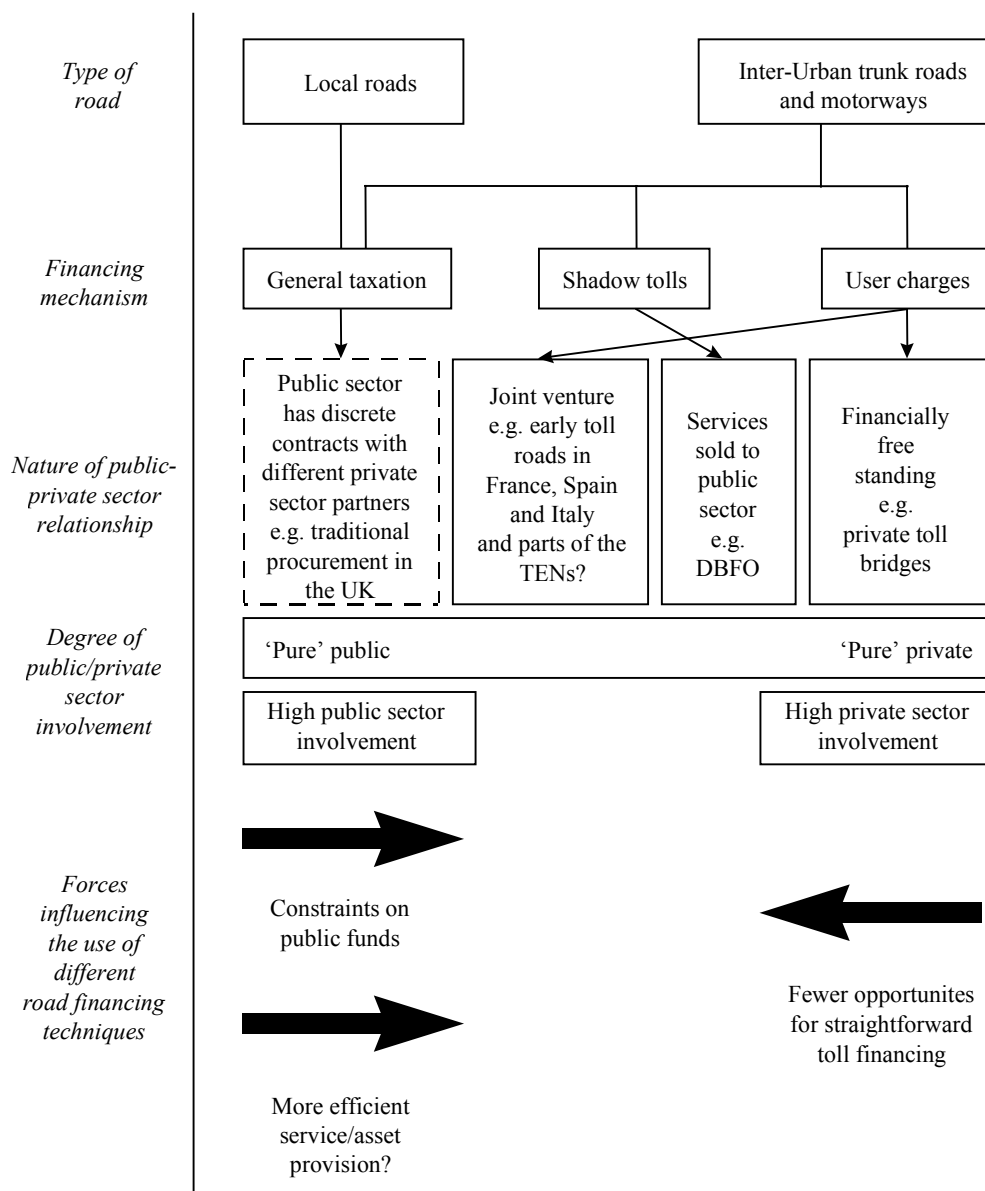
Deliverable 1 considered the extent to which road travel reduction strategies complement, or conflict with, methods of road infrastructure cost recovery and financing. In particular, two specific questions were addressed:

- (i) What is the potential for methods of infrastructure cost recovery and financing to contribute toward travel reduction strategies? For example, can tolls on inter-urban roads realistically be used as a tool to manage demand?
- (ii) Will the implementation of travel reduction strategies cause problems and thus be unacceptable because of the way that the costs of road infrastructure are financed or recovered? This question can usefully be subdivided into two more specific elements:
  - (iia) What are the implications for the financing of existing infrastructure?
  - (iib) What are the implications for the approaches likely to be adopted for new projects and, in particular, for road TEN projects?

Task 3.2 was concerned with further developing the preliminary answers that were given to questions (iia) and (iib) in Deliverable 1.

The starting point for Task 3.2 was the work carried out in Task 1.2. The different approaches to the financing of roads that were identified in Task 1.2 are summarised in Figure 3.1.

**Figure 3.1: Approaches to the financing of roads, identified in Task 1.2**



Reading from the top of the figure downwards, local roads are identified separately from inter-urban roads and motorways. Below this are illustrated the different types of financing mechanism that may be used and the sort of contractual relationship that might exist between the public and the private sector partners. On the left hand side, in the dashed box, is shown the traditional procurement method whereby the public sector contracts various private sector firms to provide the different individual elements of a new road scheme. The remaining three boxes show approaches which involve some element of private finance.

In the lower half of the diagram are highlighted some of the forces which typically influence the choice of financing method for road provision. Pressure on public budgets together with the perceived efficiency gains to be made have encouraged governments to seek private sector involvement in the financing and provision of roads. The opportunities for a 'pure' private approach are, however, often limited because of the comprehensive nature of the existing road network in many countries. Competition from alternative routes, or other factors, may limit the possibility to generate sufficient toll revenues to cover the cost of a new road. The interplay of these different forces has, in recent times, encouraged governments to seek to provide inter-urban roads and motorways on the basis of a mixture of public and private sector involvement.

Having identified in broad terms the different approaches that can be used to finance roads, the next step was to consider in more detail what the implications of travel reduction policies might be for each of these different approaches. In this respect it is helpful to consider separately the implications for the existing network and for new additions to that network.

Table 3.5 summarises the implications of introducing policies to reduce travel for existing and new roads, for each of the three main types of financing approach identified. In the left hand column the entries for existing and new roads are each subdivided into three rows. The first row shows the expected impact of reduced travel (regardless of how that might be achieved) on the financing method concerned. The second row provides some suggestions for where further information to complete the boxes in first row might be obtained. Finally, the third row comments on the overall significance of reducing travel for the method of road provision being considered.

Working through some examples from the table, starting in the top left hand corner, a reduction in travel would presumably lead to a fall in revenues from motoring taxation on existing roads. It should be possible to make some rough order of magnitude calculations of the likely size of this revenue effect based, for example, on assumptions about the associated reduction in fuel use that could be expected to result from a decline in road travel. There is a question, however, concerning how useful knowledge about the size of this effect would be. If a government is prepared to introduce policies to reduce travel then presumably it has already considered the effect that these policies may have on revenues from motoring taxation. On the other hand, if the policy were introduced at, say, EU level the governments of the member states may be more concerned about the revenue implications.

Moving across to columns three and four, a reduction in travel would also be likely to reduce the amount of revenue generated by existing toll roads. This would probably represent a more significant barrier to the introduction of travel reduction policies because of its influence on the commercial viability of existing road operators. Further information on this effect might conceivably be obtainable from published documents. It is more likely, however, that the only way to gather further knowledge in this respect would be through questionnaires directed at, or interviews with, existing toll road operators and/or representatives of government. This approach was pursued, later in Task 3.2.

**Table 3.5 - Implications of travel reduction for different methods of road finance**

	Method of finance		
	Taxation	Shadow toll/	User charges

		DBFO type		
Existing roads	Expected impact on financing method	Possible reduction in revenues from motoring taxation (overall effect unclear if taxes are used to reduce travel)	Uncertain, dependent on nature of public-private sector contract	Reduction in toll revenues
	Potential sources of information	Could make rough calculations of the impact on tax revenues	Interviews with road operators/ government	Published material and/or interviews with toll road operators/ Government
	Significance of the implementation of travel reduction strategies for this method of road provision	Not a significant problem?	Possibly important for individual schemes but DBFO roads currently account for only a tiny portion of the road network	Potentially a significant barrier to the implementation of travel reduction strategies in countries where many toll roads exist
New roads	Expected impact on financing method	Possible need to revise the framework within which road projects are assessed?	Uncertain, dependent on nature of public-private sector contract and any government guarantees	Reduced private sector interest in new schemes
	Potential sources of information	Published material	Interviews with road operators/ government	Interviews with toll road operators/ Government
	Significance of the implementation of travel reduction strategies	Raises questions about the framework within which road projects are currently appraised	Depends on the extent of new road building and the prevalence of DBFO style approaches	Depends on the extent of new toll road construction

Note: In Deliverable 1 it was briefly noted that the introduction of travel reduction policies would also have implications for other modes. In the case of tolling, toll revenues might provide an additional source of funding for other transport modes or, at least, remove some of the pressure from existing transport budgets. Policies that reduce road travel may also lead to greater patronisation of other transport modes.

The effect of a reduction in travel on existing DBFO type roads is unclear and would depend on the terms of the public-private sector contract and on existing road conditions. In current UK DBFO contracts, for example, shadow toll payments made by the public sector are typically capped at a certain maximum level of traffic flow. Traffic on the road above this level only adds to the costs of the road operator, through the need for increased maintenance. In this case, therefore, a reduction in traffic that takes place above the capped level may actually improve the profitability of the road operator. No published information exists about the details of specific DBFO contracts, hence the only hope of obtaining further information in this respect was via questionnaire or interview with DBFO companies.

Turning to new roads, the introduction of policies to reduce travel would presumably lessen the interest of the private sector in participating in new road schemes funded entirely by tolls. Regarding the DBFO type approach, continued private sector interest would hinge on the precise nature of the public-private sector contract. In both cases it seems likely that the only way further information could be gained in this respect would, again, be via questionnaire or interview with existing road operators. One caveat to this concerns just how important new road building of this nature will be in the future? The answer probably varies from country to country. In the UK, new construction will represent only a minor addition to the existing road network and the proportion of these schemes that will involve private finance will, in any case, be small. New road building may, however, be more significant in Spain and Portugal.

There is also the matter of the TENs. It is probable that parts of these will be developed through the use of public-private sector partnerships (PPPs). The discussion of the preceding paragraph also, therefore, largely holds true for the road TENs. The majority of new construction is likely to take place in the less developed parts of the Union.

Finally, regarding tax financed new roads, it has already been suggested, above, that the implications of travel reduction policies for existing roads financed through the tax system are probably not significant. The adoption of travel reduction as a formal objective of government policy would, however, raise some questions about the whole framework within which new road projects are appraised.

In seeking information about the potential impact of travel reduction measures on road financing the following interviews were therefore carried out with road operators/providers and government officials.

Interviews were conducted in Spain with representatives of:

- ASETA, the Spanish Association of Motorway Concessionaires;
- AVASA, the concessionaire of the Bilbao – Zaragoza Motorway;
- CINTRA, a company of the Ferrovial group that manages the participation of the group in the road concessionaire sector;
- the Government of the Madrid Region (which is currently introducing innovative mechanisms of road infrastructure financing);
- the Government of the Province of Bizkaia (which has recently involved the private sector in the provision of public sector infrastructure) and
- two experts in the field of infrastructure financing (Professor Rafael Izquierdo and Carlos Bonnelly).

Interviews were conducted in the UK with representatives of:

- the Department of the Environment, Transport and the Regions (DETR, the national government department responsible for developing and overseeing transport infrastructure and policy);



- the Highways Agency (an executive agency of the DETR and which is also responsible for administering the DBFO contracts between private road operators and the public sector) and
- a private DBFO operating company which is currently operating two DBFO road contracts in the UK.

In Italy an interview was conducted with a representative of:

- the Serravalle – Milan Ponte Chiasso Motorway Company (which manages both tolled and un-tolled motorways).

Based on the information collected in the interviews and the other analyses which were carried out in the course of the task, some short answers were finally provided to the questions originally posed at the beginning of Task 3.2. In response to (iia) it was stated that although private sector operators of existing road infrastructure could potentially be adversely affected by the implementation of travel reduction policies, in practice it seems likely that governments would undertake actions to mitigate any such effects. These actions might include, for example, a renegotiation of existing toll rates (shadow or real) or other forms of compensation for road operators, such as an extension of the concession period.

In relation to new projects (iib), the implementation of travel reduction policies was thought likely to represent a further difficulty to be overcome in attracting private finance for road infrastructure provision. If the interest of the private sector in such projects is to be maintained, new ways of paying for roads may have to be developed.

### **3.5 Work Package 4: Action plan**

#### **3.5.1 Overview of the work package**

WP4, initial work on which commenced in August 1998, was composed of two tasks, Task 4.1 - Develop action plan and Task 4.2 - Dissemination. Deliverable 4, 'Action Plan', the final deliverable of the project, was completed in May 1999.

##### *Task 4.1 - Develop action plan (Leader: ME&P)*

This task was concerned with the third and final objective of the START project which was to, *'produce an Action Plan of policy packages to reduce the need for road based travel, covering all levels of decision making, ensuring it is flexible enough to be applicable to different parts of the EU.'*

The action plan was presented in the form of a two-part document which comprised Part I: Strategy and Part II: Actions. Part I considered the rationale which lies behind reducing the need for road travel and went on to describe the way in which the action plan was formulated. Part II contained the START action plan, itself, a set of actions designed to reduce the need for road travel in the central region of Europe. Selection of measures for inclusion in this plan was, in broad terms, based upon:

- (i) research evidence concerning the impact and effectiveness of different travel reduction measures, collected in the earlier part of the project;

- (ii) a recognition that travel reduction is an intermediate objective and that the ultimate objective of policy is the maximisation of economic welfare and
- (iii) the need to propose a set of practical and efficient measures for reducing road travel.

Suggestions for the way in which these actions should be modified for application in other parts of Europe were contained in the final chapter of Part I.

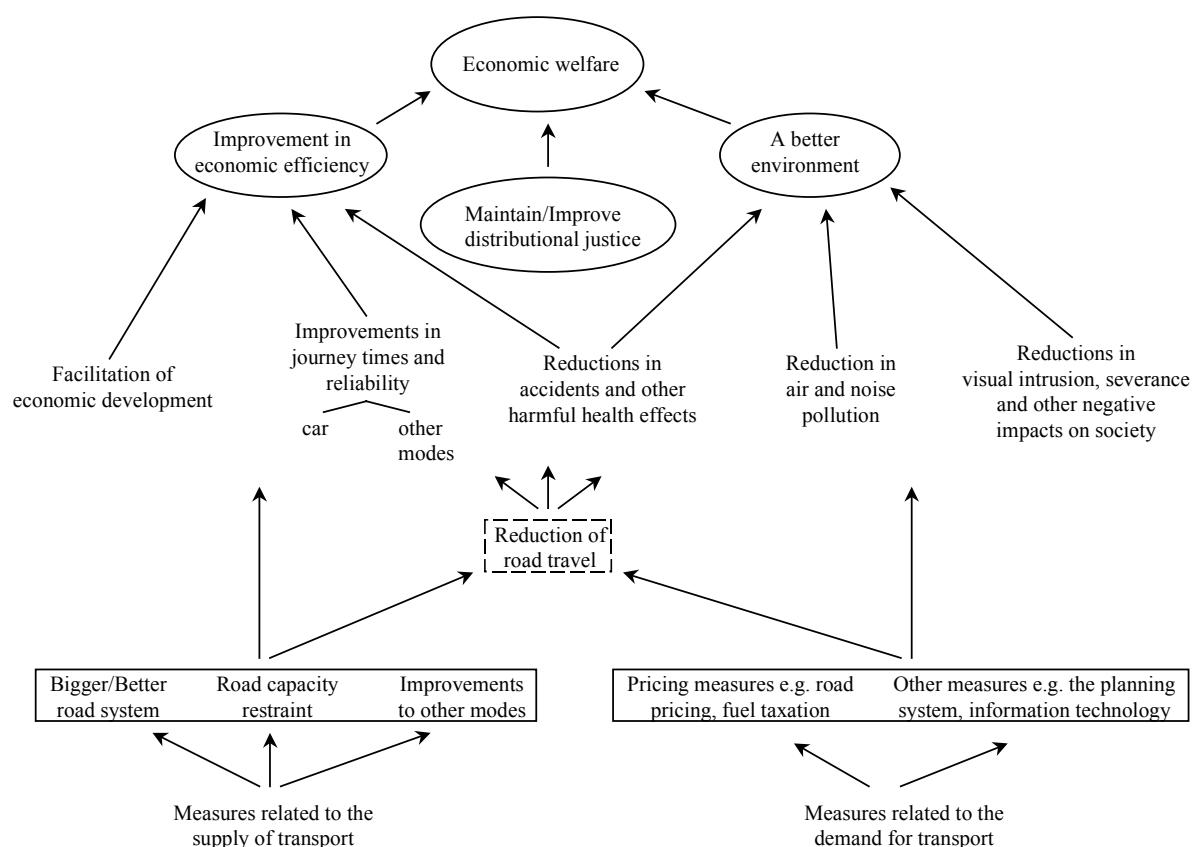
#### *Task 4.2 - Dissemination strategy (Leader: MECSA)*

This task was concerned with the dissemination of the Action plan. The following dissemination activities have been undertaken.

- (i) The project co-ordinator has made a summary version of the Action plan available on its web site (which is also linked to the DG VII web site), together with the facility to download the complete version of the Action plan, if desired.
- (ii) The project co-ordinator has produced a short article summarising the work of the project, suitable for publication in the DG VII transport research newsletter, 'Transport Advance'.
- (iii) All partners are making copies of the Action plan available to interested parties within their own countries/sphere of activities.

### **3.5.2 Main results from Deliverable 4: Action plan**

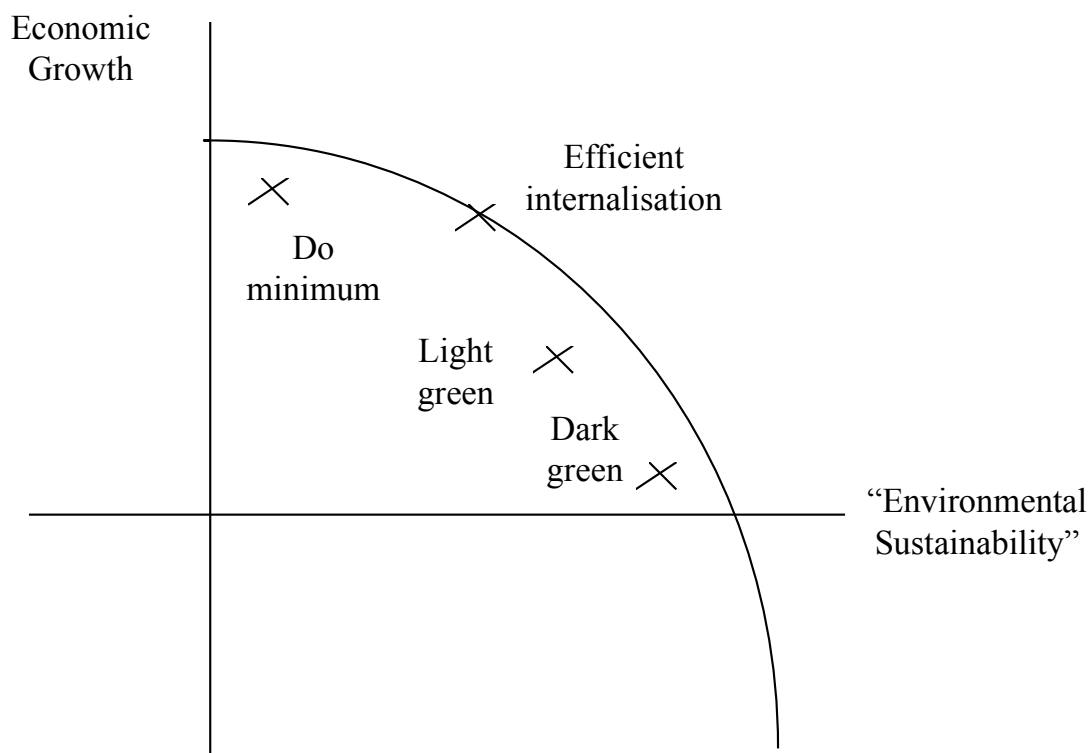
Part I of the Action plan began by summarising the main reasons which lie behind the desire to reduce road traffic levels. These include congestion, damage to the environment, problems associated with road safety and certain negative impacts on society in general. It went on to discuss the way in which travel reduction, as an aim, can be reconciled with other possible objectives of policy. Travel reduction is viewed as an intermediate objective within a framework that has the maximisation of economic welfare as its ultimate, or overriding, objective. This ultimate objective is typically translated into the more operational objectives of economic efficiency, distributional justice and environmental sustainability. Figure 3.2 illustrates the link between practical measures and high level policy objectives.

**Figure 3.2 – From practical measures to high level policy objectives**

In certain circumstances, conflicts are likely to exist between these objectives hence, in the course of formulating policy, it is necessary to decide upon their relative importance and trade off, or balance, the pursuit of different objectives against one another. A number of alternative approaches to policy, or ‘policy paradigms’, were introduced. Each paradigm reflected a different view of the relative importance of differing policy objectives. Figure 3.3 compares the various paradigms in terms of the trade off, which is assumed to exist, between economic growth and “environmental sustainability” (although it is accepted that the latter may, in practice, be hard to define as a scalar variable).

In the figure, economic growth is graphed against “environmental sustainability”. Any point inside or on the curved line, or frontier, represents a feasible combination of levels of growth and sustainability. The curved line, or frontier, shows the set of maximum feasible combinations of growth and sustainability that can be achieved by a particular economy or set of economies. Logically, any point on the frontier should be preferred to points lying to the south west of that point, because the latter will have lower combinations of both growth and sustainability. Assuming that a trade off does exist between growth and sustainability the curvature of the frontier indicates that, from any given point, a move along the frontier to a high level of economic growth will be associated with a lower level of sustainability. Moreover the cost in terms of lost sustainability rises as higher and higher levels of economic growth are obtained. The converse is also true. Improvements in environmental sustainability come at an ever-increasing cost in terms of reductions in the level of economic growth that can be achieved (and, indeed, growth could eventually even become negative).

**Figure 3.3 - Policy paradigms and the trade off between economic growth and “environmental sustainability”**



Each of the four paradigms is represented as a different position on the graph. For the purpose of the discussion here, the absolute position of each paradigm is not important. It is their positions relative to one another which is of interest. Thus the ‘dark green’ paradigm might be expected to be associated with a higher level of environmental sustainability but a lower level of economic growth than, say, the ‘light green’ paradigm. ‘Do minimum’ might be associated with higher growth but lower sustainability than the other paradigms.

The relative positions of the ‘efficient internalisation’ and ‘light green’ paradigms is less clear cut. In the figure it has been assumed that ‘efficient internalisation’ will be associated with higher growth but lower sustainability than ‘light green’. In practice, their relative positions would be likely to be determined by the way in which the associated policies were actually implemented.

Ultimately, it is for the policy maker to decide which position on the graph is ‘best’ for society as a whole. In START, the ‘efficient internalisation’ paradigm was chosen as the basis on which to develop policy. The justification for this as indicated by the figure is the assumption that, unlike the other paradigms, ‘efficient internalisation’ can achieve (or get closest to achieving) a maximum feasible combination of growth and sustainability. It is in this sense that the internalisation of external costs is ‘efficient’.

‘Efficient internalisation’ was therefore taken forward as the basis for developing an action plan to reduce the need for road travel in the central region of Europe. The plan itself was contained in Part II of the document. Presented in tabular format, it was composed of two sets of tables. Table A listed the actions to be implemented in the longer term, effectively a

‘vision’ to guide the development of transport policy in the longer run. Table B listed the actions which could be implemented in the short to medium term, the period before the longer run actions of Table A could be put into effect.

The final chapter of Part I considered the way in which the action plan could be modified for application in parts of Europe other than the central region. Three other European regions were identified, the North; the South and the CEEC. Appropriate modifications to the plan were then suggested for each region. These were presented in Table C of Part II.

## 4. Conclusions

The START project had three related objectives, which were to:

- (i) quantify the impact of measures to reduce road travel and assess their wider impacts in order to highlight barriers to implementation and find ways of making measures more acceptable;
- (ii) assess the extent to which pricing and other travel reduction strategies may affect road infrastructure financing and cost recovery plans, with particular emphasis on road Trans-European Networks (TENs) and
- (iii) produce an action plan of policy packages to reduce the need for road based travel, covering all levels of decision making, ensuring it is flexible enough to be applicable to different parts of the EU.

The key objectives of the project were (i) and (iii). Objective (ii) was a subsidiary objective that was to be progressed as far as possible, depending on the extent of information which was publicly available.

The project has been successful in achieving these objectives:

- (i) Deliverable 2 provided information about the travel and wider impacts of a range of travel reduction measures in both quantitative and qualitative form. It also identified a number of potential barriers to the implementation of particular measures. This information was used as an input to Deliverables 3 and 4, the production of policy packages and a final action plan.
- (ii) Difficulties were encountered in obtaining information about the likely response of road providers/operators to the introduction of travel reduction measures. Despite this, Deliverable 1 and Task Report 3.2 did contain an assessment of the extent to which pricing and other travel reduction measures might influence - and be influenced by – different approaches to road infrastructure financing and cost recovery.
- (iii) An action plan to reduce the need for road based travel was produced, covering all levels of decision making. Suggested modifications were also presented, which would make the plan applicable in different parts of Europe.

## **Appendices**

### **Appendix I**

#### **Conferences, publications, presentations and dissemination**

## Appendix I

### Conferences, publications, presentations and dissemination

- (i) Following the commencement of START, the project co-ordinator issued press releases announcing the project to local newspapers and to two professional publications (Local Transport Today and Traffic Engineering and Control). The latter were both national publications, widely read in the transport sector. The project subsequently received mentions in local newspapers, in the 26<sup>th</sup> February 1998 edition of Local Transport Today and in the February edition of Traffic Engineering and Control. Copies of the latter two press cuttings were included in Management Report 1.
- (ii) The project co-ordinator has established a web page for the project, linked to the company's web site and also to that of DG VII. The web site address is: <http://fpiv.meap.co.uk/fpiv/START.htm>. A copy of the executive summary from each of the four project deliverables is available from the site, together with the facility to download the complete version of deliverable four, the Action plan.
- (iii) In April 1998, the partner VTT presented a paper entitled, 'Work related travelling and telecommunications; substitution, stimulation, complementarity and mitigation' at the NECTAR Euroconference (No. 4); Sustainable Transport: Europe and its Surroundings, which took place in Israel from April 19<sup>th</sup> to 25<sup>th</sup>. The paper was based on work carried out under the projects EMRECU, POSSUM and START.
- (iv) The project co-ordinator attended a START/DANTE meeting at the Commission on 6<sup>th</sup> May 1998. The primary purpose of the meeting was for the DANTE consortium to update the Project Officer and other Commission staff on progress with the DANTE project. A secondary purpose was for START to learn more about DANTE and to try to ensure that the work of START complemented, rather than overlapped, the work of DANTE.
- (v) The project co-ordinator participated at a two day seminar in Bristol entitled, 'Traffic Reduction Strategies - Putting them into action' on 9<sup>th</sup> and 10<sup>th</sup> June 1998. The seminar was organised by the DANTE project, in co-operation with Bristol City Council.
- (vi) The project co-ordinator attended a START/TRACE meeting at the Commission on 6<sup>th</sup> May 1999. The purpose of the meeting was to present and discuss the results of the two projects to the Project Officer and other Commission staff. On behalf of START, the project co-ordinator made a presentation covering what was then the latest draft of Deliverable 4, 'Action plan'.