



Final Report

Greater Dublin Area Travel Demand Management Study

Dublin, October 2004

Submitted to:

DUBLIN TRANSPORTATION OFFICE

OIFIG IOMPAIR ÁTHA CLIATH

Submitted by:

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Booz Allen Hamilton Ltd
Regus House, Block 4
Harcourt Centre
Harcourt Road
Dublin 2

In association with:



Status of this Report

The Greater Dublin Area Travel Demand Management Study Final Report was presented to the DTO Steering Committee in November 2004. The report was considered at a number of meetings and the following decisions were made:

1. Proposed Travel Demand Management Promotion Measures

In May 2005, the DTO Steering Committee accepted the recommendations of the Travel Demand Management (TDM) Study Report in relation to the promotion of Travel Demand Management.

In December 2005, the DTO executive proposed the establishment of a Regional TDM Promotion Unit to develop and oversee the development of the TDM study recommendations in this area. The DTO Steering Committee noted that the proposal for the Regional Unit raised issues regarding staffing (within the constraints of government numbers), and funding. For these reasons, it decided not to proceed with the establishment of a Regional TDM Promotion Unit at this time

In the interim, the Steering Committee suggested that the DTO Executive should look at ways to move the proposals forward.

2. Proposal on Managing Travel Demand through the Land Use Planning System

In September 2006, Section 6 of the TDM Study Report – “Managing Travel Demand Through the Planning System” - was agreed by the DTO Steering Committee, with some amendments. The agreed version is contained in the Final Study Report.

3. Proposed Travel Demand Management Fiscal Measures

In May 2005, the DTO Steering Committee decided not to proceed with further work on charging for free workplace parking.

In May 2005, the DTO Steering Committee also agreed in principle to procure additional investigative work in relation to a congestion charging scheme

This work was to include a stated preference survey, to better determine the expected driver reaction to congestion charging. In November 2005, the Steering Committee decided to proceed with this work in 2007.

In the meantime, the Steering Committee suggested that the DTO look into a variety of different technology options for road user charging– aiming to build on technologies that have been tested elsewhere.

In this regard, the DTO Executive is continuing to keep technology options tested or in use elsewhere under regular review.

The authors of this report are employed by Booz Allen Hamilton Ltd. The work reported herein was carried out under a Contract placed by the Dublin Transportation Office (DTO).

This report was prepared solely for the information and use of DTO for the Travel Demand Management Study. No third parties shall have a right to rely on the report or be regarded as a third-party beneficiary of the agreement between the DTO and Booz Allen. The report was prepared by Booz Allen after due and careful enquiry, based on information provided by the DTO and other information on which Booz Allen relied and did not independently verify. The report states a number of assumptions made during our analysis. While we have no reasons to believe any of these assumptions are unreasonable, we note that if any prove incorrect, actual results could vary from those we have projected. Booz Allen expressly disclaims any warranties with respect to the information, findings and conclusions stated in the report.

Executive Summary

Background

Booz Allen Hamilton, in association with ERM, HOP and Halcrow, was engaged by the Dublin Transportation Office (DTO) in November 2002 to undertake a Demand Management Study for the Greater Dublin Area (GDA). Travel Demand Management is part of the Dublin Transportation Office's *A Platform for Change* – Transport Strategy 2000-2016 which describes Demand Management as the second, interdependent element of the Strategy:

“which seeks to reduce the growth in the demand for travel while maintaining economic progress, and which is designed to encourage a transfer of trips to sustainable modes”

The first element of the strategy is the supply of infrastructure projects and service improvements.

What is Travel Demand Management?

Travel Demand Management (TDM) is the implementation of programmes of measures which seek to change travel demand patterns by:

- **Trip reduction** – to reduce the need to travel and thereby reduce overall travel demand
- **Reduction in vehicle use** – in particular, to reduce the amount of car travel
- **Increase in vehicle occupancy** – to reduce the amount of single occupancy car trips and increase car occupancy
- **Increased travel by alternative modes** – this includes measures to encourage public transport use, walking and cycling in preference to car
- **Trip retiming** – to encourage travel at less congested times
- **Offering alternative destinations** – to encourage travel to destinations that are closer, and that lead to less overall congestion
- **Reduction in trip length** – by planning for the provision of employment, retail and other services closer to where people live.

TDM programmes are thus primarily demand oriented rather than supply oriented i.e. they attempt to manage people's travel rather than seeking to provide more physical capacity for travel (such as more roads, bus and train services etc).

Study Objectives

The main objectives for this TDM study can be summarised as:

- To reduce the need to travel, particularly by private car; and

- To yield a greater modal share for public transport over and above that achievable through the transport supply measures/infrastructure proposals described in '*A Platform for Change 2000 – 2016*'.

Study Process

The study process was set out in the DTO's Terms of Reference as follows:

- Initial consultation;
- Research and development of potential measures based on international experience, previous experience in the GDA and current travel demand trends in the GDA;
- Initial assessment of potential measures;
- Consultation on feasible measures;
- Assessment of the transport impact of feasible measures and packages of measures; and
- Evaluation of preferred package(s) of measures.

Why is Travel Demand Management required in the Greater Dublin Area?

Demand for travel in the GDA has increased rapidly as a result of increased economic activity and prosperity, reflected in a growing population and workforce.

- The Irish GDP grew from €36,300 million in 1990 to €129,300 million in 2002;
- The population of the GDA grew from 1,405,000 in 1996 to 1,535,000 in 2002; and
- The number of residents of the GDA in employment grew from 511,000 in 1996 to 680,000 in 2002.

Transport demands generated by a growing population and workforce are challenging to meet. The task is made more difficult as increasing numbers of people are housed in outer parts of the GDA where public transport supply is limited and where local services may only be accessible by car.

Average speeds on roads into the city in the morning peak hour (8am-9am) in 2001 were 16kph (10mph)¹. By 2008, without travel demand management, it is forecast that slow speeds will be more widespread and average speeds on the routes into the city will be 11kph (7 mph).

Such congested road conditions are inefficient and detrimental to the economy of the GDA and the well being of its inhabitants. For sustained economic development, travel demand needs to be better managed, employing two tactics:

- Reducing demand by locating activities so that travel distances are shorter – or using information and communications technology (ICT) to substitute physical trips with virtual trips; and

¹ DTO Transport Model

- Encouraging a shift from private car trips to more sustainable modes including public transport, walking and cycling.

There are two aspects to the second tactic. The first aspect takes the form of major public transport improvements such as the Luas and the upgrading of the DART and suburban rail network. In the longer term, very substantial public transport infrastructure is proposed in the *Platform for Change*. Along with initiatives to promote cycling and walking, these amount to a large incentive to change travel behaviour. Nevertheless, a second aspect, that of car restraint, will still be needed to persuade people not to continue to use their cars. This is evidenced by the forecast that, without demand management, average morning peak hour speeds on the radial routes into the city would fall to 9 kph (5.5 mph) in the year 2016, even with the proposed *Platform for Change* infrastructure completely in place.

The Problems to be Tackled

The problems to be tackled by TDM can be summarised as follows:

- The population has become more dispersed resulting in less sustainable settlement patterns which are reflected in a high mode share for car use – over 80% of trips made outside the M50 between 8am and 9am are by car;
- The share of trips to school and work made by car is increasing;
- The absolute number of trips to work by car is increasing;
- In 2002, 50% of all those travelling to work (150,000 people) in the Dublin City Council area did so by car;
- In the future, average car speeds are forecast to decline throughout the GDA; and
- Speeds are currently slower in the central areas than elsewhere, and this trend will continue into the future.

The Preferred Package of Travel Demand Management Measures

To address the problems, a package of TDM measures is required that:

- Influences land use planning policy and practice leading to more sustainable, less car dependent, settlement patterns in the GDA
- Facilitates drivers who would like to reduce their car use, particularly for trips to work and to school; and
- Strongly discourages unnecessary car use in certain areas where alternatives are available.

The package of measures also needs to be capable of implementation throughout the GDA in the short to medium term (to 2008). To achieve this, a package of measures is being considered which is best described in three groupings:

- **Measures that can be implemented through the planning system** – this includes measures through from long term spatial planning to development control for individual developments to regional parking restraint measures;

- **Measures to promote travel demand management** - incentive measures including car sharing, flexible working, individual marketing and all measures to encourage people to change their travel behaviour in favour of less driving. Typically, these measures would be packaged into a Travel Plan for an individual site or group of sites; and
- **Fiscal measures** – measures that introduce financial penalties to discourage car use.

The Preferred Package

- Land use planning measures
- Measures to promote travel demand management
- Fiscal Measures:
 - A City Centre Congestion Charge of €10 applicable between the hours of 7am and 10am to drive in the area within the canals
 - A workplace parking levy in the rest of the Dublin Counties and the Development Centres in the Hinterland Counties. This would be set in line with the market price for parking in each local area which is within the following ranges €1,000 - €4,500 in the City Council area (outside congestion charging area), €600 - €3,600 in the other Dublin Local Authorities and €350 - €900 in the Hinterland Growth Towns.

Managing Travel Demand Through the Planning System

The measures proposed for implementation through the planning system are diverse and wide ranging. They aim to achieve promote land use and transport integration at the strategic level and local level by:

- Consolidation as far as practicable of population growth in existing built up areas in the GDA region, where accessibility to work, leisure and other destinations by foot, cycle and public transport is generally better;
- Location of major trip-intensive land uses in areas well served by public transport or in areas that will be well served by public transport in future²;
- Relating the scale of urban centres to public transport accessibility³;
- Location of major trip-intensive land-uses as far as practicable in defined higher-order centres (e.g. city, town or district centre);
- Regional maximum parking standards, and the relation of maximum permitted parking provision to the scale and density of new developments to current and future⁴ public transport accessibility, and to the scale and proximity of the nearest centre;
- Providing a mix of local services within walking distance of their surrounding neighbourhood;
- Designing all new developments with walking, cycling and public transport in mind;

² As set out in the DTO's strategy *A Platform for Change*.

³ Accessibility measure based on existing and future population within a maximum public transport journey time, taking account of walk, wait and transfer time, and access delays that may occur due to lack of provision of sufficient public transport capacity.

⁴ As set out in the DTO's strategy *A Platform for Change*.

- Relating maximum permitted parking provision for new developments to existing and future public transport accessibility, and proximity to the nearest centre.

Some of the above recommendations were proposed for inclusion in the Regional Planning Guidelines for the Greater Dublin Area, during their preparation in 2004. Guidance at a regional level is required so that all local authorities act in a consistent manner, providing a “level playing field” in terms of TDM policy.

In summary, new development should be oriented towards non car use and should underpin existing centres of activity. In addition, new development that is likely to attract a large number of people should be highly accessible by public transport, cycle and on foot.

Measures to Promote Travel Demand Management

The application of incentives, marketing initiatives or other practical measures to promote travel demand management has been considered in terms of their potential to reduce car use for journeys to work and education. The measures focus on the workplace, schools, information and communications technology (ICT) applications and the possible role of marketing. Going forward, the larger employers, including local authorities and Government Departments, are considered to be key to a wider take up of workplace travel plans by implementing plans and advertising the positive results. It is therefore important that they put in place work place travel plans within the next few years. Guidance on implementing plans has already been prepared by the DTO⁵.

Potential components of **workplace travel plans**, or *Mobility Management Plans*, may include:

- Working with employees to address perceptions, fears and practical difficulties in overcoming car dependency;
- Establishing databases to assist ridesharing;
- Developing car pooling schemes;
- Providing shuttle services to nearby rail or bus services;
- Putting in place on-site measures to make cycling and walking safer and more attractive, e.g. footpaths, cycle lanes, crossings, secure cycle parking, shower facilities for cyclists;
- Providing incentives to use non-car modes;
- Introducing staggered or flexible working hours so that employees can avoid travel in the peak hour;
- Allowing compressed working weeks so that employees work a four day week, or nine day fortnight, but a longer day;
- Promotion of working at home, teleworking or working at another site to employers and assistance or technical support with implementation;
- Reducing the amount of car travel undertaken for work purposes by increasing the use of telecommunications;

⁵ “The Route to Sustainable Commuting”: An Employers Guide to Mobility Management Plans, DTO, 2001

- Introducing travel allowances and reimbursements that encourage non-car travel as a replacement for the current arrangements in some organisations which act as a financial incentive to unnecessary use of cars for commuting and business trips; and
- Restricting parking, e.g. giving priority for parking to ride sharers or individuals with certain needs - many successful travel plans are driven by a shortage of on-site parking.

In the longer term, employers' recruitment policies can also be included in the workplace travel plan. For example, employers can target employment in local areas, particularly those served by public transport. Employees can also be recruited with the understanding that free parking is not provided. Additionally, a long term workplace travel plan can ensure that any future relocation of the workplace is to a site that is accessible by non-car modes.

A workplace travel plan is, in effect, a site-specific (or multi-site in the case of some employers) demand management plan. Workplace travel plans can also cover more than one employer, for example, at the East Point Business Park, one plan serves all the employers located within the park

School travel plans are designed to overcome the barriers for pupils to walk, cycle or take public transport to school. The basic aim of school travel plans is to arrest the rapid growth in travel to school by car. School travel plans may include some or all of the following measures:

- Working with teachers, pupils and families to address perceptions, fears and practical difficulties in overcoming reliance on the car and agreeing a school policy to actively promote sustainable school travel;
- A toolkit of practical measures including walking, cycling, training, encouraging bus use, car lift sharing, incentive schemes, curriculum based promotion and managing parking and drop off; and
- Putting in place infrastructure to support the school travel plan and make the route to school safer to walk or cycle and creating a pupil centred front of school environment.

Individual marketing provides transport advice and information to people, based on an understanding of their personal trip patterns. This involves one-to-one interviews. Travel information is then offered which has been individually tailored and which encourages modal shift away from the car. The individual marketing approach is effective because many people make journeys by car for which a reasonable alternative (public transport, walking or cycling) already exists, of which they are unaware.

An individual marketing programme in the GDA may be worthwhile, particularly as public transport, pedestrian facilities and the cycle network have improved markedly in recent years and will continue to do so with the introduction of Luas, the DART upgrade, the Quality Bus Network and the expansion of the regional cycle network. It would be advisable to start with a pilot project in one area before embarking on a large-scale programme.

Rather than changing the mode by which people travel, **information and communications technology** can be used to alter the ways in which people fulfil their aspirations for mobility and access to work, services and shopping. This is referred to as "virtual mobility", a term that focuses on how activities can be undertaken without being dependent on physical mobility. The following possible measures are recommended to promote virtual mobility as

an alternative to physical mobility. They require working in partnership with other agencies and would not be promoted purely as travel demand management measures.

- Awareness campaigns both for organisations and for the wider public about the possibilities for reducing travel through virtual mobility;
- E-work pilots and programmes, promoting e-work amongst local organisations, including public sector organisations, with the development of flagship pilots and programmes;
- Telework centres - developing “telework centres” as have been developed in and around some US cities;
- E-commerce - promoting online shopping/home delivery amongst local firms and consumers;
- E-services - continuing to promote the use of online services - government and local authority services, online learning, telemedicine, etc and/or
- Development of “wired-up communities” - in collaboration with other stakeholders (public agencies, telecommunications companies, etc.) promoting “wired up communities” projects, to help overcome the digital divide, promote local work opportunities in less favoured areas away from the urban centre, and encourage use of online services.

Fiscal Measures

The two fiscal measures that are under consideration are a charge on free workplace parking and city centre congestion charging.

Congestion Charging

The preferred congestion charging area would be the area “within the canals”. The area has the advantages of a well defined boundary and the highest level of public transport provision in the GDA. Dublin City Council’s Outer Orbital Route would be outside the zone, providing diversion routes. The proposed Macken Street Bridge, which has been assumed to be in place by 2008, would also be outside the zone.

All vehicles moving in the charging zone during the hours of operation would need to purchase a licence, which would allow unlimited trips during that period. The charge would not apply at weekends and on bank holidays. Stakeholder consultation indicated a strong preference for morning peak only operation (7am to 10am), so that shoppers and other visitors arriving late morning onwards would not have to pay the charge.

The most appropriate technology to administer and enforce the congestion charge is currently considered to be that used in the London congestion charging scheme. Other feasible alternatives may emerge in future when the London scheme matures and planned schemes are introduced in Stockholm (2005) and Edinburgh (2006). The preferred system would work as follows:

- Drivers purchase a licence to drive in advance or on the day of travel by various media e.g. retail outlets, online, telephone, text message, etc;

- The driver's registration number is then entered in a database of vehicles licensed to drive in the charging area on that day;
- Cameras monitor and record the registration numbers of cars entering and driving within the charging zone during the charging hours; and
- The registration numbers are compared with the database and penalty notices are issued to registered owners of any vehicles without a valid licence.

Charges on Free Workplace Parking

A charge on free workplace parking is considered to be a measure that would be effective across the entire GDA, addressing the rapid growth in demand even in non-central areas. The charge could be implemented either by a workplace parking levy or "benefit in kind" taxation policy. With a levy, the employer would pay in the first place and then choose whether or not to pass onto the employee. With a taxation policy, the parking space would be declared by the employer and/or employee as a benefit in kind and would be paid for by the employee. Of these two options, the workplace parking levy was preferred, however, benefit in kind taxation would also be a possible option, and much better than doing nothing. For these reasons, a charge on free workplace parking is included in the preferred package of measures, as follows:

- It would apply in the Metropolitan Area and Development Centres (Large Growth Towns and possibly other Growth Towns) in the Hinterland Area of the GDA;
- It would not apply in the same area as the Congestion Charge; and
- The cost of the levy would vary locally depending on the local market price for parking.

By comparison with the congestion charge, a workplace parking levy (or taxation) would not be costly to introduce and administer. However, many practical difficulties have been recognised such as setting an acceptable yet effective level of charge, ensuring all the required spaces were registered, compiling an inventory of spaces, ensuring local on-street parking controls were in place to prevent transfer from car parks etc. As a result, there is less confidence that such a charge would be acceptable throughout the GDA, or even within designated centres in the GDA, or that it would be implemented in an effective manner. There is no comparable example of a regional workplace parking levy elsewhere that could be used as a model.

Other Fiscal Measures Considered and Rejected

Other fiscal measures considered and rejected during the study include an increase in fuel duty, tolls on the M50, regional road user charging and a road user charge for inbound traffic on radial roads crossing the M50. When assessed, these options were seen to be either less effective or likely to be less acceptable, at least in the short term than the preferred options of central area road user charging and workplace parking charges. Some also had less scope for implementation in the short to medium term. However, we consider all of these options should remain under consideration for the longer term when congestion is likely to be more widespread, or public transport is improved, or additional technological options become available.

Complementary Measures

Complementary measures may be required to make the TDM measures **effective**, for example:

- City Centre congestion charging would be more effective if traffic signals on the junctions on the Outer Orbital Route were adjusted;
- For the workplace parking levy to be effective, on-street parking controls would be required in all areas where the levy is applied; and
- For school travel plans or workplace travel plans to be effective, investment in, for example, footpaths on the approaches to the site may be required if footpaths are not already provided or are of a poor standard.

Other complementary measures may be required to make the TDM measures **acceptable**, for example:

- Traffic management measures in residential areas (or other sensitive areas) to deter through traffic diversion as a result of congestion charging;
- Parking measures in areas on the congestion charging zone boundary to deter “informal park and ride” or park and walk; and
- Rewards for employers in the hinterland Development Centres/Growth Towns e.g. financial support for a travel plan which would off-set the workplace parking levy and provide a more level playing field with employers outside the workplace levy area.

The above examples are all directly related to the proposed TDM measures, and would not take place otherwise. Equally, the TDM measures are less likely to be adopted without the complementary measures. Therefore a budget has been allowed for their provision, although individual measures have not been specified.

There are two further categories of complementary measures which it may be appropriate to finance from the TDM budget:

- Non-transport measures, for example, marketing initiatives to ensure the City Centre remains a vital and vibrant centre for shopping and cultural activities; and
- Additional buses.

The TDM measures are themselves complementary to long term transport strategy, for example, *A Platform for Change*.

The Benefits

The benefits of the preferred package would be primarily to reduce the number of car trips on the road network in the GDA. The resultant impacts were calculated using the DTO Transportation Model, for the morning peak hour (8am to 9am):

- Congestion would be reduced substantially – some 30,000 vehicle-hours (over 12% of total) would be removed from the road network in the morning peak hour alone;
- The amount of travel undertaken by car would be reduced substantially – total travel in the peak hour would be reduced by some 340,000 vehicle-kilometres (5% of total);

- Some 25,000 people would transfer from car to public transport in the peak hour, representing a 19% increase in public transport patronage;
- Average morning peak hour bus speeds would increase by 15%; and
- Average morning peak hour car speeds would increase by 8%.

These changes would result in other benefits:

- An estimated saving of 70 road traffic accidents per year, 15 of which would be fatal or serious; and
- An estimated 33,000 tonne reduction in CO₂ emissions per year, as well as substantial reductions in local air pollution.

The monetary value of the benefits arising from the preferred package is substantial, and has been calculated to be over €400 million per annum.

The Estimated Costs

The estimates of costs associated with the Preferred Package for the first full year of implementation (2008) are set out below. Establishment costs over the first three years are expected to reach €154 million, this will include traffic management measures which will be spread out as they are implemented over time. It is expected that a number of one off launch costs, estimated at €8 million will also be incurred. The annual operating costs of the congestion charge far outweigh those associated with the other measures combined and are likely to account for over 95% of the annual operating costs of the Preferred Package.

The cost estimate assumes that the economic-life for the congestion charging equipment is 12 years. Thereafter renewal is required. Given the total recurrent cost range of €67 - 127 million per annum, we assumed a mid range estimate of €97million per annum for the purpose of the appraisal.

The annual operating cost (recurrent cost) of the scheme has been based on the scheme currently operating in London. It is possible that the costs of congestion charging will fall in future as more experience is gained in London and other cities such as Stockholm (congestion charging planned for 2005) and Edinburgh (congestion charging planned for 2006).

Costs Associated with Preferred Package

Item	€ million
Capital Costs	
<i>Congestion Charge</i>	
System set-up – over 3 years	50
Complementary traffic management measures – over 2 years	44
Education / awareness programme – one-off	5
<i>Work Place Parking Levy</i>	
Inventory & database development – one-off	1
Complementary traffic management measures – over 3 years	25
Education / awareness programme – one-off	1
<i>TDM Support Measures</i>	
Establishment costs – one-off	2
Complementary traffic management measures – over 3 years	25
Launch costs - one-off	1.5
Total Capital Costs (over 3 years)	154.5
Recurrent Costs	
<i>Congestion Charge</i>	
Scheme administration – recurrent	5 pa
Scheme operations – recurrent	60-120 pa
<i>Work Place Parking Levy</i>	
Scheme administration – recurrent	1.3 pa
<i>TDM Support Measures</i>	
Scheme administration – recurrent	1.0 pa
Total recurrent costs	67-127 pa

The Economic Case

The economic case examines the balance between the costs of introducing and operating the package, and the benefits to the community such as travel time savings, reduced road traffic accidents, reduced vehicle operating costs and environmental improvements. The costs and benefits associated with the preferred package over a 25-year period were calculated, indicating:

- Present Value Costs: €1.62 billion
- Present Value Economic Benefits: €4.59 billion
- Benefit/Cost Ratio: 2.84.

This represents a very strong economic case for the Preferred Package. Sensitivity analyses indicated that the economic case is also very robust – there would be a strong case even if the capital and operating costs were 50% higher than forecast, or if there was less reduction in traffic than forecast. In summary, the Preferred Package would deliver overwhelming net economic benefits to the community.

If the Preferred Package was implemented without the workplace parking levy, (referred to as Reduced Package 1) the resultant reduction in economic benefits would be significant, but there would still be a strong economic case for the reduced package, even if the capital and operating costs were higher than forecast.

The economic case for a package with a €5 congestion charge and measures to promote TDM and without the parking levy (Reduced Package 2), indicated a reasonable economic case, unless outturn capital and operational costs were significantly greater than expected.

The Financial Case

The financial case examines the balance between the revenue raised by the Preferred Package and the capital and operating costs. As indicated in the table below, the annual revenues are substantial.

Annual Revenues Associated with Preferred Package

Item	€ million
Revenues (annual)	
Congestion Charge fees paid by those crossings the canals	144
Congestion Charge fees paid by residents within the canals	94
Work Place Parking levies paid for spaces within the GDA	81
Total	319

These estimates assume a congestion charge of €10 (payable for travel in the congestion charging zone between 7am and 10am, Monday to Friday) and average annual workplace parking levies of €2,000 in Dublin City Council area, €1,000 in Fingal, Dun Laoghaire-Rathdown and South Dublin and €500 in the Development Centres/Growth Towns in the Hinterland counties. In practice, the levy may vary across each local authority area in line with the local market price for parking.

Over a 25-year period, the Present Value of Revenues would total some €3.58 billion. Given a Present Value of Costs over the same period of €1.62 billion, this represents a 2.21 ratio of revenues to costs. A strong financial case for the Preferred Package is therefore indicated. Sensitivity analyses show that the financial case is robust, that it would be an attractive commercial proposition even if revenues were 30% lower than forecast and capital and operating costs were 30% higher than forecast.

If, as is the case in London, various categories of drivers were to be exempted from paying the congestion charge or heavily discounted (e.g. residents of the zone, taxis, emergency services, disabled badge holders and several other candidates), this could reduce the revenue by some €1.21 billion over the 25-year evaluation period. However, the financial case would still be reasonably strong.

The preference for morning only operation of the congestion charging scheme has significant financial implications. An all-day scheme, operating from 7am to 7pm (or 6:30pm as in London), would raise some €4.7 billion additional revenue over the 25-year evaluation period. It would therefore be stronger financially and give greater scope to offer discounts and exemptions and fund complementary measures.

Conversely, if congestion charging was to operate in the morning only (7am – 10am), as proposed, the need to offer extensive exemptions and discounts is questionable as drivers would have the choice to drive without paying after 10am. As far as potential exemptions for residents of the charging zone are concerned, it is noteworthy that they form the group

that will benefit most from reduced traffic flows and the resulting environmental benefits, and from faster bus and tram services.

If the Preferred Package were amended so that the congestion charge was set at €5 per day, and the workplace parking levy were not included (referred to as Reduced Package 2), significantly less revenue would be generated. The financial case would be substantially weakened and commercial success would only be achieved if the operating costs associated with the congestion charge were at the lower end of the expected range and/or the congestion charging scheme operated all day.

Conclusions

A viable travel demand management package and programme, capable of implementation in the short to medium term, has been prepared for the Greater Dublin Area. It is the result of extensive research of best practice internationally and locally, consultation and the assessment of the performance of a wide range of options in the GDA for the forecast year of 2008.

The Preferred Package

- Land use planning measures
- Measures to promote travel demand management
- Fiscal Measures:
 - A City Centre Congestion Charge of €10 between the hours of 7am and 10am to drive in the area within the canals
 - A workplace parking levy in the rest of the Dublin City Council area, the other Dublin local authorities and the Development Centres/Growth Towns in the Hinterland Area set in line with the market price for parking in each local area

The introduction of this package of measures would have very substantial benefits for the GDA, even in the short to medium term, which would greatly outweigh the costs of introducing the scheme. These include a reduction in congestion, a reduction in overall car use, an increase in public transport patronage, increased speeds for buses and other vehicles, accident savings and reductions in emissions. The extent of the benefits means that the economic case for the Preferred Package of measures is overwhelmingly strong. There is also a robust financial case for the introduction of the measures i.e. the revenues raised would amply cover the capital and operating costs, and provide funds for complementary measures such as public transport improvements.

If the workplace parking levy were not introduced, the resulting “reduced package” would also have a strong economic case, as it too would deliver substantial benefits to the GDA. Excluding the workplace parking levy would reduce the revenue generated, but there would still be a robust financial case for such a package.

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1 Introduction

Background

1.1. Booz Allen Hamilton, in association with ERM, HOP and Halcrow, was engaged by the Dublin Transportation Office (DTO) in November 2002 to undertake a Demand Management Study for the Greater Dublin Area. Travel Demand Management is part of the Dublin Transportation Office's *A Platform for Change – Transport Strategy 2000-2016* which describes Demand Management as the second, interdependent element of the Strategy:

“which seeks to reduce the growth in the demand for travel while maintaining economic progress, and which is designed to encourage a transfer of trips to sustainable modes”

1.2. The first element of the strategy is the supply of infrastructure projects and service improvements.

1.3. The Terms of Reference for the study are provided in Appendix A to this report.

What is Travel Demand Management?

1.4. Travel Demand Management (TDM) is the implementation of programmes of measures designed to reduce journey times and congestion by:

- Increasing the number of persons in a vehicle; or
- Influencing the time of travel; or
- Influencing the need to travel; or
- Influencing the destination of travel.

1.5. TDM programmes are thus primarily demand oriented rather than supply oriented i.e. they attempt to manage people's travel rather than seeking to provide more physical capacity for travel (such as more roads, bus and train services etc). TDM programmes can, however, complement supply oriented programmes by, for example, providing priority in traffic for new public transport services. They can also ensure that the benefits of improvements in supply are not eroded by induced traffic.

1.6. There are seven different types of travel change which TDM measures can seek to achieve, as shown on the next page.

Types of Travel Change sought by TDM Programmes

Trip reduction – to reduce the need to travel and thereby reduce overall travel demand.

Reduce vehicle use – in particular, to reduce the amount of car travel.

Increase vehicle occupancy – to reduce the amount of single occupancy car trips, and increase car occupancy.

Increase travel by alternative modes – this includes measures to encourage public transport use, walking and cycling in preference to car.

Trip retiming – to encourage travel at less congested times.

Alternative destinations – to encourage travel to destinations that are closer, and that lead to less overall congestion.

Reduction in trip length – by planning for the provision of employment, retail and other services closer to where people live.

1.7. The objectives for this TDM study can be summarised as:

- To reduce the need to travel, particularly by private car; and
- To yield a greater modal share for public transport over and above that achievable through the transport supply measures/infrastructure proposals described in '*A Platform for Change 2000 – 2016*'.

Why is Travel Demand Management Required in the Greater Dublin Area?

1.8. Demand for travel is increasing rapidly in the Dublin area, derived from increased economic activity. The growth is evident across all modes, although demand for bus and rail travel has grown more slowly than for private transport. Increased economic activity and prosperity has made the GDA more attractive resulting in an increase in population of 130,000 (or 9%) between 1996 and 2002 to a total of 1,535,000¹. During the same period, the number of residents of the GDA in employment grew dramatically by some 169,000 to over 680,000², an increase of 33%.

1.9. Transport demands generated by a growing population and workforce are challenging to meet. The task is made more difficult as increasing numbers of people are housed in outer parts of the GDA where public transport supply is limited and where local services may only be accessible by car.

1.10. Average speeds on routes into the city in the morning peak hour (8am-9am) are 16kph (10mph)³. By 2008, without travel demand management, it is forecast that

¹ Census 2002, *Principal Demographic Results, Table 4*

² Census 1996 and Census 2002, *Travel to Work School and College, Tables 9A*

³ DTO Transport Model

slow speeds will be more widespread and average speeds on the routes into the city will be 11kph (7 mph).

1.11. Such congested road conditions are inefficient and detrimental to the economy of the GDA and the well being of its inhabitants. For sustained economic development, travel demand needs to be better managed, employing two tactics:

- Reducing demand by locating activities so that travel distances are shorter – or using information and communications technology (ICT) to substitute physical trips with virtual trips; and
- Encouraging a shift from private car trips to more sustainable modes including public transport, walking and cycling.

1.12. This second tactic requires a “Carrot and Stick” approach. The “carrot” takes the form of major public transport improvements such as the Luas and the upgrading of the DART and suburban rail network. In the longer term, very substantial public transport infrastructure is proposed in *Platform for Change*. Along with initiatives to promote cycling and walking, these amount to a large incentive to change travel behaviour. Yet, regardless of how attractive this “carrot” is, a corresponding “stick” of car restraint measures is also needed to persuade people not to continue to use their cars. Without demand management, average morning peak hour speeds on the radial routes into the city are forecast to fall to 9 kph (5.5 mph) in the year 2016, even with the proposed *Platform for Change* infrastructure completely in place.

1.13. Travel demand management can be tackled across a wide range of policy areas, including:

- Planning policy and practice;
- Fiscal measures;
- Traffic and parking management measures;
- Mobility management plans; and
- Information and Communications Technology (ICT) applications such as teleworking

Study Objectives

1.14. The Demand Management Study Brief sets out the following main objectives for Demand Management:

- To reduce the growth in overall travel by motorised modes of travel in the Greater Dublin Area (GDA);
- To effect further modal transfer from private car to public transport modes over and above that achievable through the infrastructure and service enhancement measures described in *A Platform for Change*;
- To achieve a good level of service on the road network for essential road users; and
- To encourage more sustainable trip distributions and modal split throughout the Greater Dublin Area (Dublin, Meath, Kildare and Wicklow).

1.15. The Demand Management Study objectives, as set out above, relate primarily to reducing motorised mode travel, particularly at peak times, and in encouraging more sustainable trip distributions and modal share.

Study Process

1.16. The study process was set out in the Terms of Reference included in Appendix A as follows:

- Initial consultation;
- Research and development of potential measures;
 - International experience;
 - GDA experience; and
 - GDA trends;
- Initial assessment of potential measures;
- Consultation on feasible measures;
 - Stakeholder liaison;
 - Public consultation; and
 - Market research;
- Assessment of the transport impact of feasible measures and packages of measures; and
- Evaluation of preferred package(s) of measures.

1.17. The DTO's Demand Management Steering Group directed the study. Members of the Group are listed in Appendix B.

1.18. The initial consultation, the research and development of potential measures and the assessment of those measures were discussed in the Interim Report, May 2003, and are summarised in this report. The outcome of the consultation on feasible measures is described in the Consultation Report, June 2003, and is summarised in this report.

1.19. Appendix C contains a list of TDM references (i.e. bibliography).

The Structure of this Report

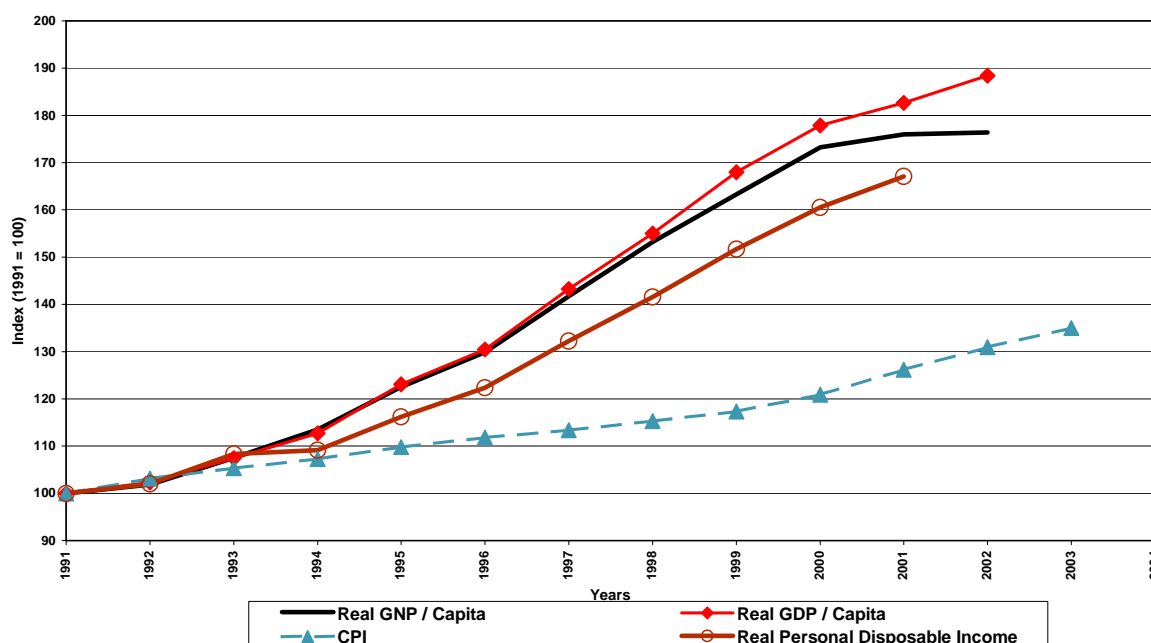
1.20. Following this introductory section, Section 2 expands on the characteristics of the growing travel demand in the GDA. An overview of potential travel demand management measures (TDM) is set out in Section 3. Section 4 summarises the outcome of the consultation and market research work undertaken. Section 5 brings together the work of the early stages of the study and identifies the key issues going forward into the detailed assessment. Options for managing travel demand through the planning system are discussed in Section 6. Section 7 discusses the most appropriate measures that can be used to promote TDM in the GDA. Feasible fiscal measures to manage demand are described in Section 8. Section 9 describes a Preferred Package of measures for implementation in the short to medium term, and the impact of that package. The economic and financial appraisal of the package is explained in Section 10. Section 11 presents the conclusions and outlines the possible next steps. There are several appendices to this report, contained at the back of the main report and listed in the Table of Contents.

2 Travel Demand in the Greater Dublin Area

Past and Current Trends

2.1. Demand for transport is derived from other demands, such as the need to work, attend school, shop etc. Since the late 1990s, demand for transport has increased enormously as a result of greatly increased economic activity. This is shown by the large increase in GDP from €36,312m in 1990 to €129,344m by the year 2002 (current prices). As indicated in Figure 2.1, on average, individuals became more prosperous: GDP/capita increased by 90% between 1991 and 2002. Real personal disposable income increased by almost 70% between 1991 and 2001.

Figure 2.1 Indicators of Increased Relative Prosperity in Ireland



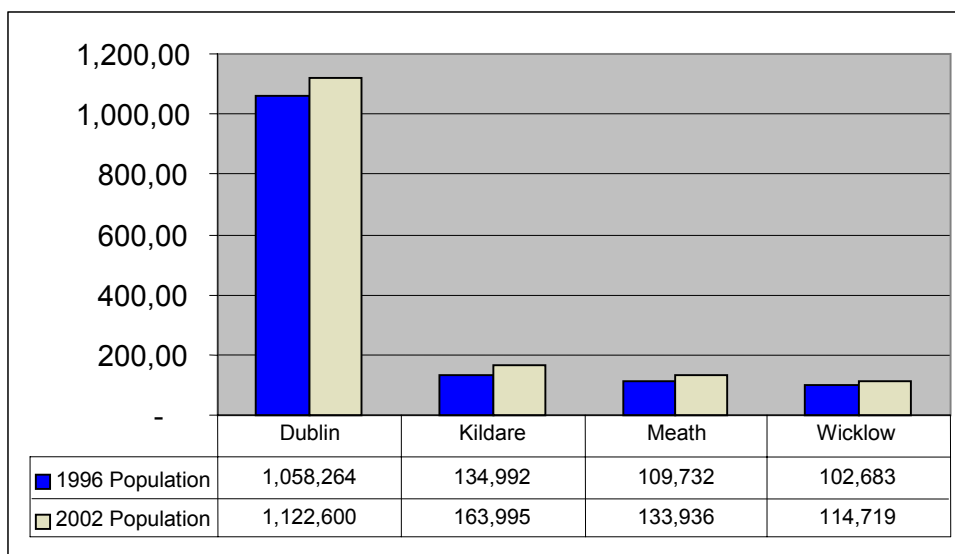
Source: Booz Allen, based on ESRI data

Note: "Real" GNP, GDP and disposable income are adjusted for inflation, using the consumer price indices (CPI) published by the CSO.

2.2. Within the GDA, disposable income per person grew from €9,490 in 1994 to €18,620 in 2001 in the Dublin Region and from €7,941 in 1994 to €15,860 in the Mid-East Region.

2.3. Increased economic activity has made the area more attractive. The population of the GDA area grew by 138,000 (or 9%) between 1996 and 2002 to a total of 1,535,000. As Figure 2.2 shows, growth has not been evenly spread. The population of County Dublin has increased by 6%, compared with 21% in County Kildare, 22% in Meath and 12% in Wicklow.

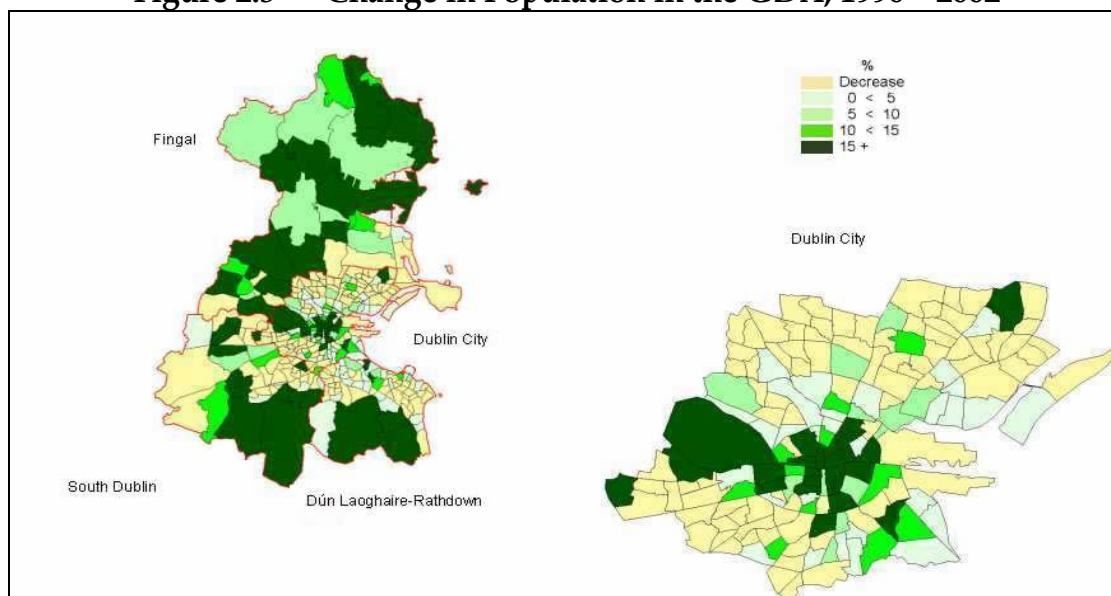
Figure 2.2 Change in Population in the GDA Counties



Source: CSO

2.4. Within County Dublin there has been growth in the Inner City, reflecting the City's regeneration. This is a positive step for travel demand management because people living or working in the Inner City have generally good alternative travel choices as well as shorter distances to travel. Another trend, however, is the growth in the greenfield sites on the county's fringes and the decline in population in the established suburbs closer to the city. The implication of these new settlement patterns is for longer distance, generally car dependent, commuter trips. The changing population patterns are shown in Figure 2.3.

Figure 2.3 Change in Population in the GDA, 1996 - 2002



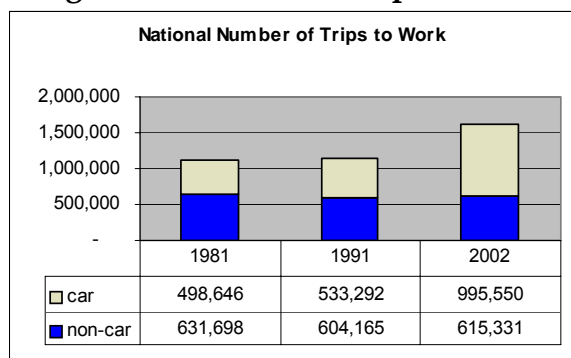
Source: CSO

2.5. As a result of increased economic activity and increased population, travel demand management in the GDA has become a much larger task. More dispersed settlement patterns mean that travel demand management has also become a more difficult task for two reasons. Firstly, dispersed settlement in most cases lacks the “critical mass” needed for public transport services to operate. Secondly, new housing areas often lack local services, schools or employment opportunities within walking or cycling distance.

2.6. Nationally, the proportion of people travelling to work by car⁴ has increased to 62% in 2002 from 47% in 1991 and 42% in 1981. As the number of people in work has increased greatly too, the result is around 50% more cars travelling to work now than in 1981, as shown in Figure 2.4.

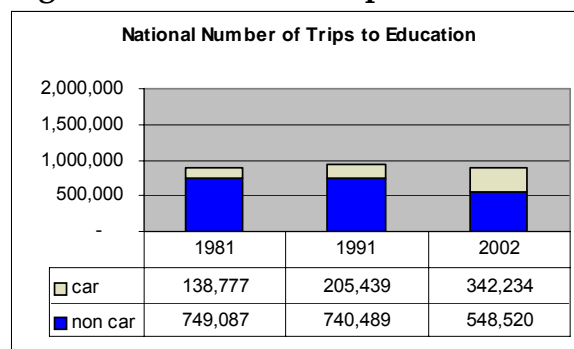
2.7. For school travel, the shift to car has been even greater. Nationally, 38% of trips to education are by car, compared with 16% in 1981. The effect of this is mitigated by the fact that the number of people in education has not changed significantly, unlike the number of people working. Figure 2.5 shows how travel to school has changed historically.

Figure 2.4 Growth in Trips to Work



Source: Census 2002

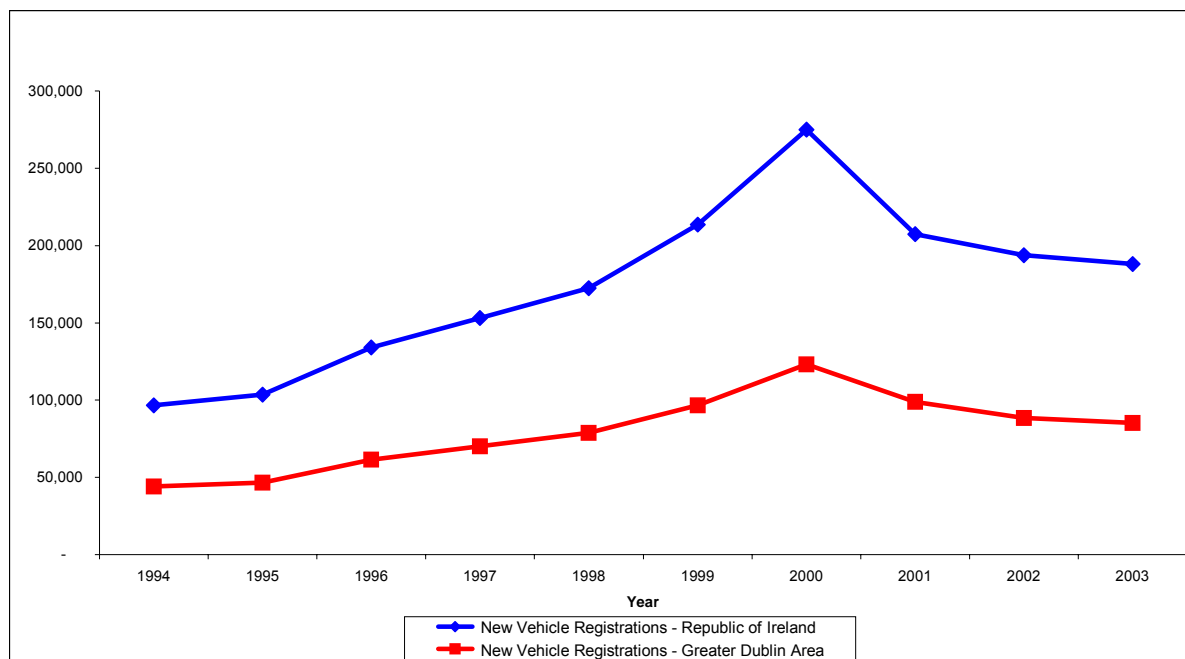
Figure 2.5 Growth in Trips to Education



2.8. As Figure 2.6 shows, there has been high growth in new car registrations in the GDA, albeit at a slower rate than the country as a whole. Table 2.1 shows that, of the approximately 680,000 workers in the GDA, the majority (63%) travel to work by car, which is similar to the proportion for the country as a whole (62%). Within the GDA, some 336,000 persons travel to education of which some 107,000 (32%) travel by car, by comparison with 26% in the country as a whole.

⁴ Includes car passengers. “Non-car” includes walk, cycle, bus, coach, train, motorcycle and goods vehicles.

Figure 2.6 Growth in New Car Registrations



Source: Derived from CSO data

Table 2.1 Travel to Work and Education in the GDA

	By all modes	By car (driver and passenger)
Residents travelling to work	679,752	426,710
Residents travelling to education	336,204	107,807

Source: Census 2002, Volume 9: Travel to Work, School and College

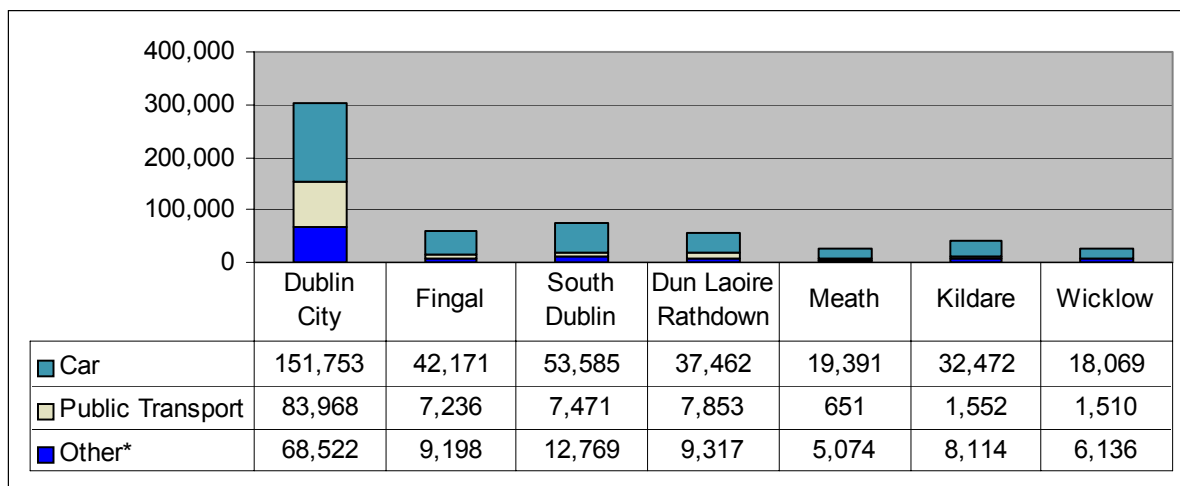
2.9. As Table 2.1 indicates, within the GDA, car trips to school and college represent less than 20% of all car trips to work, school and college, two in five of which are combined with a work trip⁵. Yet, school trips often seem to have a disproportionate impact on the road network in some locations. This may be because they are more peaked than work trips. Also, unlike a work trip, a school car trip that is not combined with a work trip may lead to a return car trip to home in the peak period. It is also noted that when schools are closed for holidays, many work trips also change because parents take holidays or alter their working arrangements.

2.10. Within the GDA, there is great variation in the level of car usage. To the City Council area, some 50% travel to work by car. To the rest of the region, the proportion ranges from 69% in Dun Laoghaire Rathdown to 77% in Meath and Kildare, which is well above the national average. Figure 2.7 shows these mode share trends. It also illustrates the absolute number of trips. Two issues are

⁵ DTO's Schools Survey, Spring 2002

apparent. Firstly, despite having a relatively high proportion of non-car use, TDM is required in the City Council area as well as in the counties. Secondly, because of the sheer volume of trips and the availability of other modes, TDM is likely to have the greatest impact in the city. A more detailed breakdown of the way people travel to work in the GDA is provided in Appendix D.

Figure 2.7 Trips to Work in the GDA by Mode



Source: DTO, based on Census 2002.

*Other includes walking and cycling

2.11. Census 2002 reports that 172,153 people travel into the City Centre (within the canals) to work. Of these, 69,750 travel by car (driver and passenger), representing a 41% car mode share. A further 63,130 travel by public transport, representing a 37% public transport mode share.

Forecast Future Trends (without Demand Management)

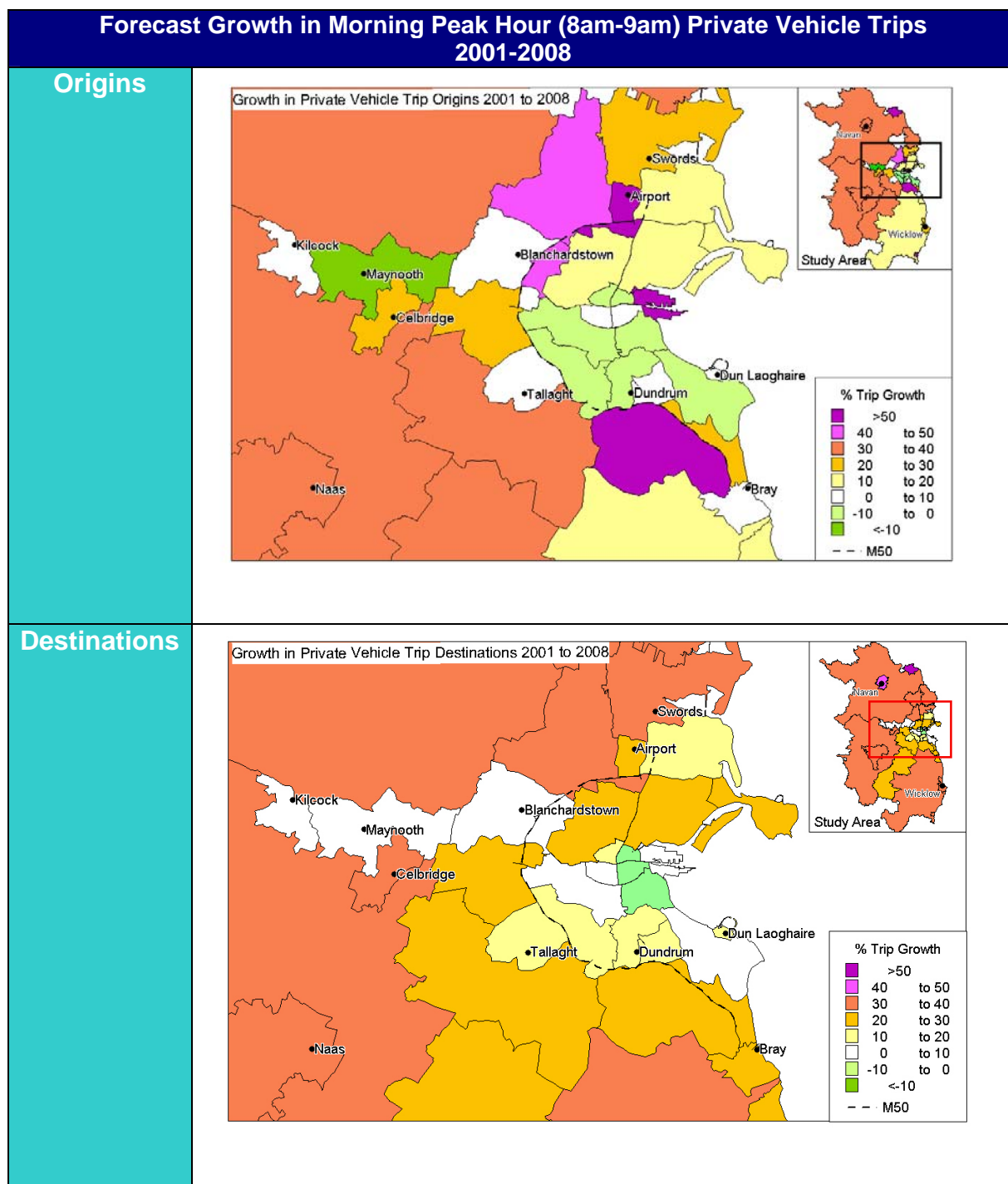
2.12. The DTO transportation model provided the base for analysis of future problems in the GDA road network. The analysis assumed that no new travel demand management measures were in place. It took into account all the proposed public transport improvement and road schemes that are assumed to be in place in the short to medium term (within five years), including Luas, the DART and suburban rail upgrade, the Dublin Port Tunnel and the South East motorway extension. These future network and service assumptions are summarised in Appendix E.

2.13. The forecast growth in car trips in the short to medium term across the GDA is shown in Figure 2.8. These forecasts were produced by the DTO Transportation Model, based on a DTO population distribution derived from local authority

forecasts, by area, constrained to Strategic Planning Guidelines⁶ totals. Car trips are predicted to grow more rapidly in the outer areas that are not served by rail, and in the areas where development is taking place. A decrease in car trips originating inside the M50 and in other areas with improving public transport is forecast, except in areas with significant development, e.g. the “North Fringe” (the development area to the North East, straddling the Fingal County Council and Dublin City Council borders), Docklands and Cherrywood.

⁶ *The Strategic Planning Guidelines (1999) have been superseded by the Regional Planning Guidelines published on 8th July 2004. The planning data assumed for the purpose of this study for the year 2016 are broadly in line with the RPG forecasts for the year 2010.*

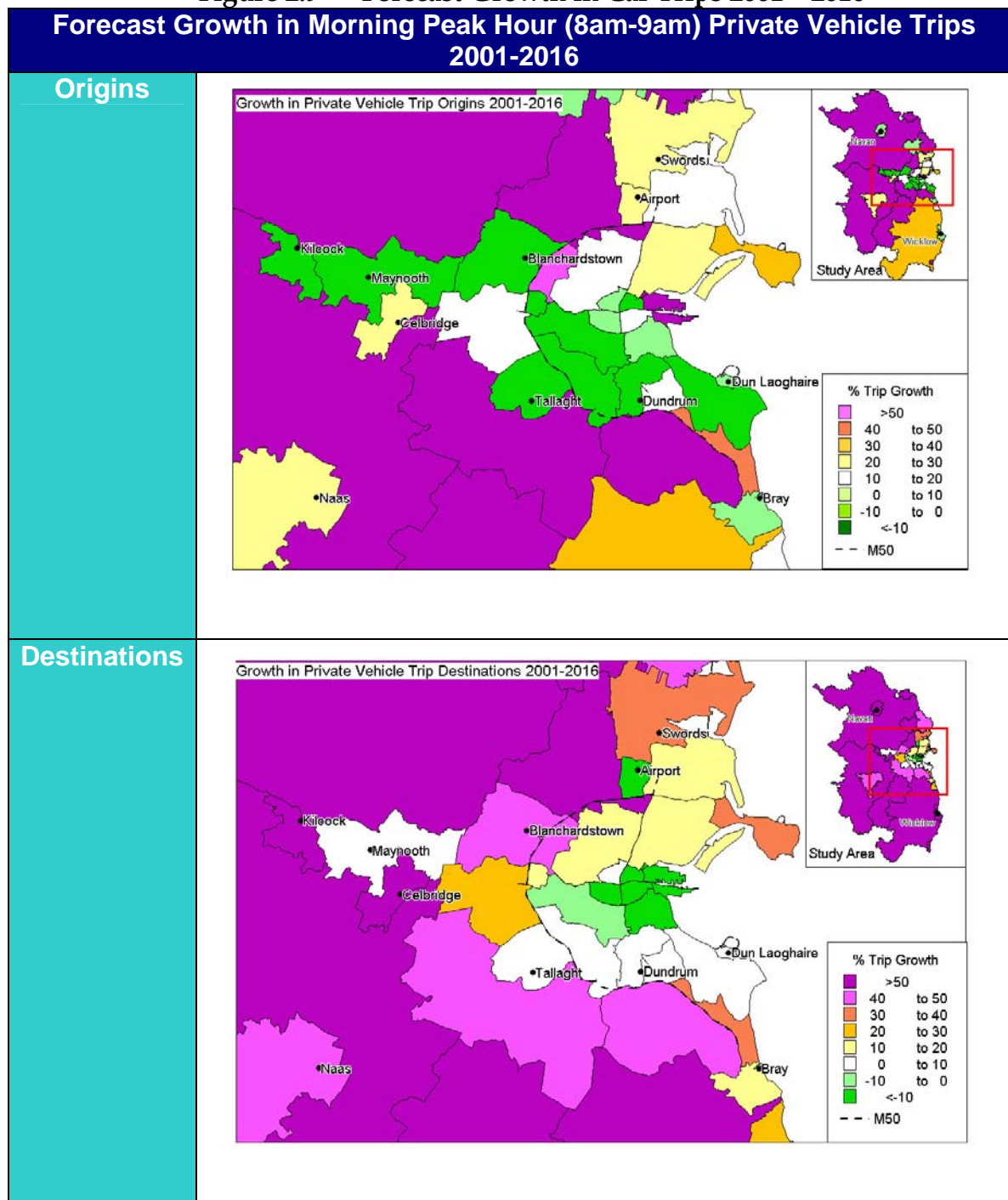
Figure 2.8 Forecast Growth in Car Trips 2001-2008



Source: DTO Model. Booz Allen analysis

2.14. Figure 2.9 shows the growth in car trips forecast in the longer term (2016). By then, it has been assumed that the infrastructure proposed in *Platform for Change* will be in place. Consequently, public transport would be provided for most of the trips originating in the metropolitan area or development centres, and a decrease in car trips originating from those areas is expected. In particular, a decrease in car trips originating inside the M50 is expected, except for areas with significant

development, e.g. North Fringe, Airport, Docklands and Cherrywood. By contrast, a substantial increase is forecast in car trips originating in the Hinterland, outside the development centres. Growth in car trip destinations is also predicted to be generally greatest outside the M50 and in areas not served by rail. By 2016, although the major improvements planned in *Platform for Change* will improve access to many areas, it will not be possible to provide high levels of public transport provision to all parts of the GDA. Therefore, TDM will need to be implemented through the planning system to curb development in areas with poor public transport access.

Figure 2.9 Forecast Growth in Car Trips 2001 – 2016

Source: DTO Model

2.15. Table 2.2 shows how transport demand is forecast to increase in both the short and longer term. In the short term (to the year 2008), both public transport trips and car trips are forecast to grow by about 15% across the whole GDA. In the longer term, public transport trips are forecast to grow by 78% overall, but private vehicle trip growth is forecast to “flatten off”. The combination of the extensive public transport network proposed in *Platform for Change*, and the highly congested

conditions forecast on the road network by 2016 (without demand management) explains the high rates of public transport growth that are forecast.

2.16. Table 2.2 also shows how the forecast growth in public transport use by 2016 will be most dramatic for residents of the area outside the M50, where the number of public transport trips is forecast to almost treble. By comparison, the growth in car trips by this group is only forecast to grow by 29%, and the car mode share will decline from 81% to 67%. Within the M50, by 2016 public transport is forecast to account for over half of all morning peak hour trips.

Table 2.2 Future Growth in Morning Peak Hour (8am-9am) Trip Origins

	2001		2008		2016	
	Car	Public Transport	Car	Public Transport	Car	Public Transport
City Centre						
Peak hour person trips	26,216	14,900	28,961	15,113	26,703	21,171
Mode share	64%	36%	66%	34%	56%	44%
% Increase from 2001			10%	1%	2%	42%
Between canals and M50						
Peak hour trips	113,417	69,002	123,898	73,868	121,091	96,396
Mode share	62%	38%	63%	37%	56%	44%
% Increase from 2001			9%	7%	7%	40%
Outside M50						
Peak hour trips	138,563	31,513	167,053	45,074	178,498	87,714
Mode share	81%	19%	79%	21%	67%	33%
% Increase from 2001			21%	43%	29%	178%
Total						
	278,196	115,415	319,912	134,053	326,292	205,282
Mode share	71%	29%	70%	30%	61%	39%
% Increase from 2001			15%	16%	17%	78%

2.17. Vehicle-hours and vehicle-km are both predicted to grow far more rapidly than vehicle trips, in both the short and the longer term, as shown in Table 2.3. By 2016, vehicle-hours are forecast to double and vehicle-km to increase by 86%. This is with the full *Platform for Change* infrastructure in place. Increased vehicle kilometres indicate both more trips and longer trips due to origins and destinations becoming further apart and diversion onto longer routes to avoid congestion. Increased vehicle-hours indicate longer length of trips and slower, more congested journeys. The fact that vehicle hours are forecast to increase more rapidly than vehicle-km indicates that the average journey speed by car is going to be slower in future.

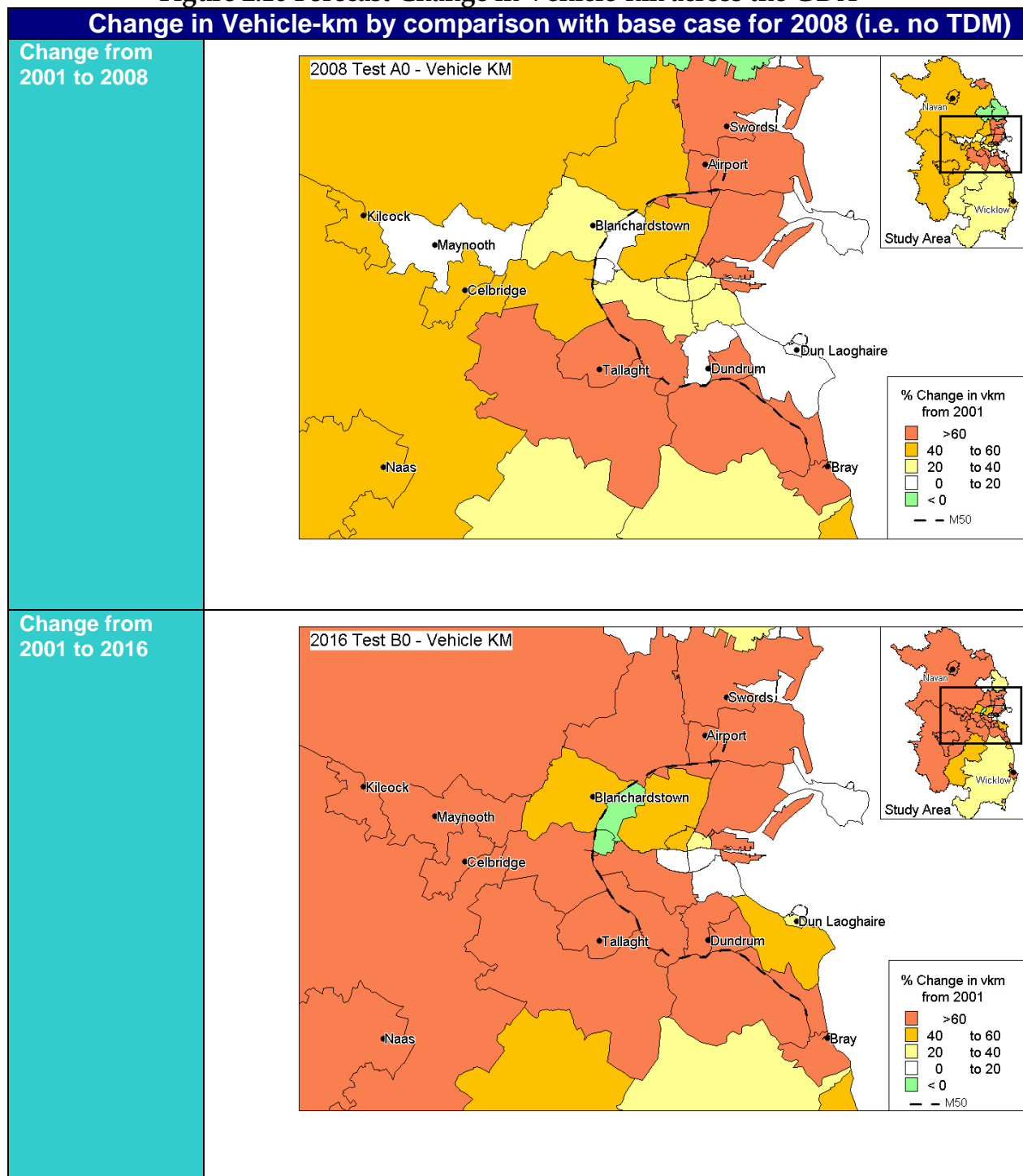
Table 2.3 Future Growth in Travel Demand and Changes in Journey Speed⁷

	2001			2008			2016		
	Vehicle hours	Vehicle km	Speed kph	Vehicle hours	Vehicle km	Speed kph	Vehicle hours	Vehicle km	Speed kph
City Centre									
8am-9am	11,261	135,194	12.0	17,607	179,437	10.2	14,125	157,844	11.2
% Increase from 2001				56%	33%	-15%	25%	17%	-7%
Between Canals and M50									
8am-9am	38,183	758,129	19.9	64,281	1,151,621	17.9	83,313	1,590,362	19.1
% Increase from 2001				68%	52%	-10%	118%	110%	-4%
Outside M50									
8am-9am	96,999	3,435,598	35.4	166,203	5,222,109	31.4	215,710	6,472,338	30.0
% Increase from 2001				71%	52%	-11%	122%	88%	-15%
Total									
8am-9am	146,443	4,328,922	29.6	248,091	6,553,167	26.4	299,022	8,062,699	27.0
% Increase from 2001				69%	51%	-11%	104%	86%	-9%

2.18. Looking across the GDA, in the short term, vehicle-km are forecast to grow most rapidly in around the South East Motorway Extension, the Docklands and the North Fringe area. Rapid growth in most of Meath and Kildare is also forecast. In the longer term, forecast growth in vehicle-km is most pronounced in the hinterland, and a few development areas within the M50. The spatial distribution of growth in vehicle-km is illustrated in Figure 2.10.

⁷ The data in this table are for the period 8am-9am only, not for the overspill beyond 9am when some trips are still being completed. The data are for links only, data relating to centroid connectors has not been included. Vehicle-km are calculated by multiplying the flow on each link between 8am and 9am by the link distance, and summing to get a total for the area presented. Similarly, vehicle-hours are calculated by multiplying the flow on each link by the time taken on that link. Speeds are calculated by dividing the vehicle-km by the vehicle-hours.

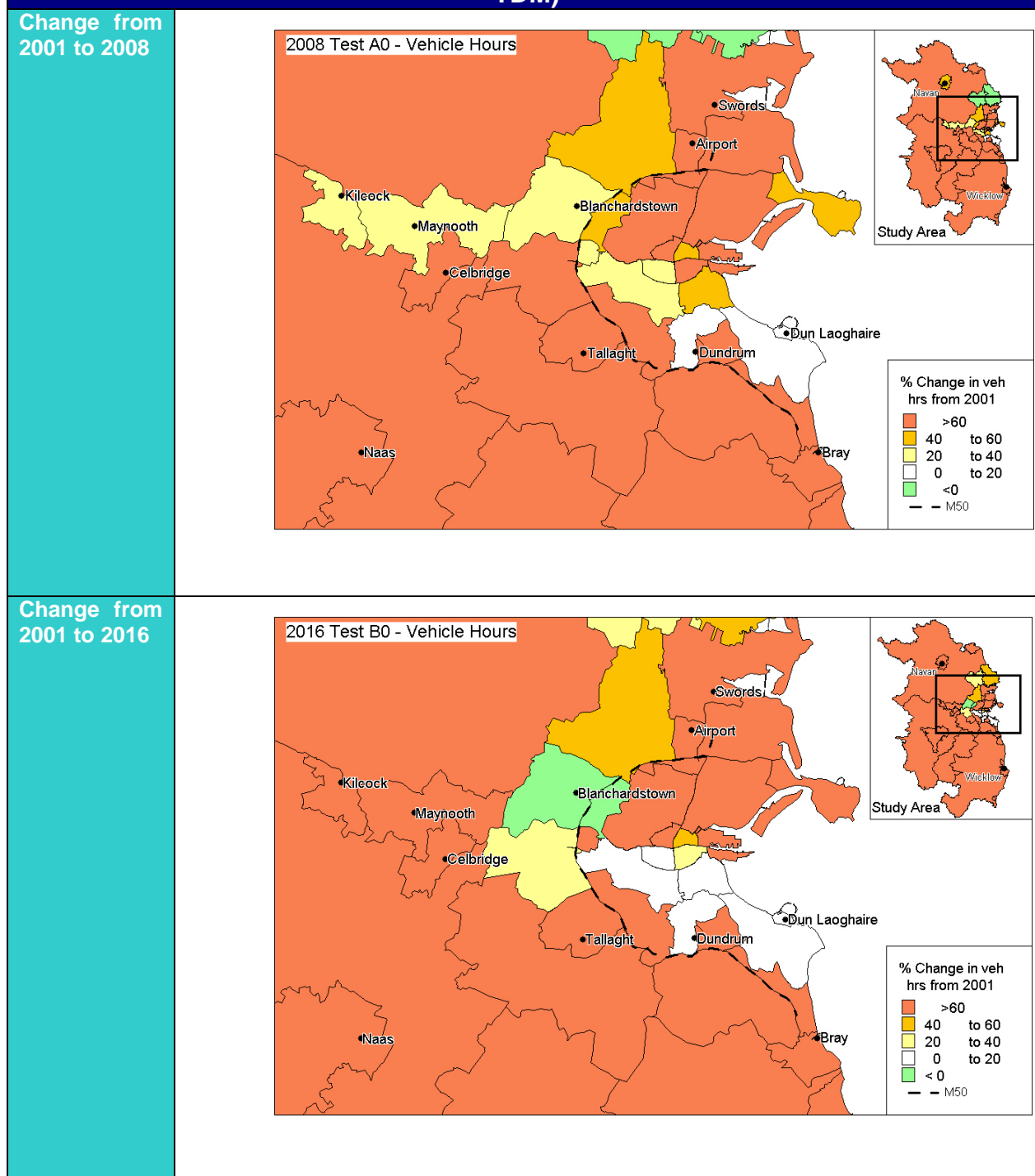
Figure 2.10 Forecast Change in Vehicle-km across the GDA



2.19. Figure 2.11 shows how growth in vehicle-hours across the GDA follows similar patterns to the growth in vehicle-km, but at higher rates of growth.

Figure 2.11 Forecast Change in Vehicle-hours across the GDA

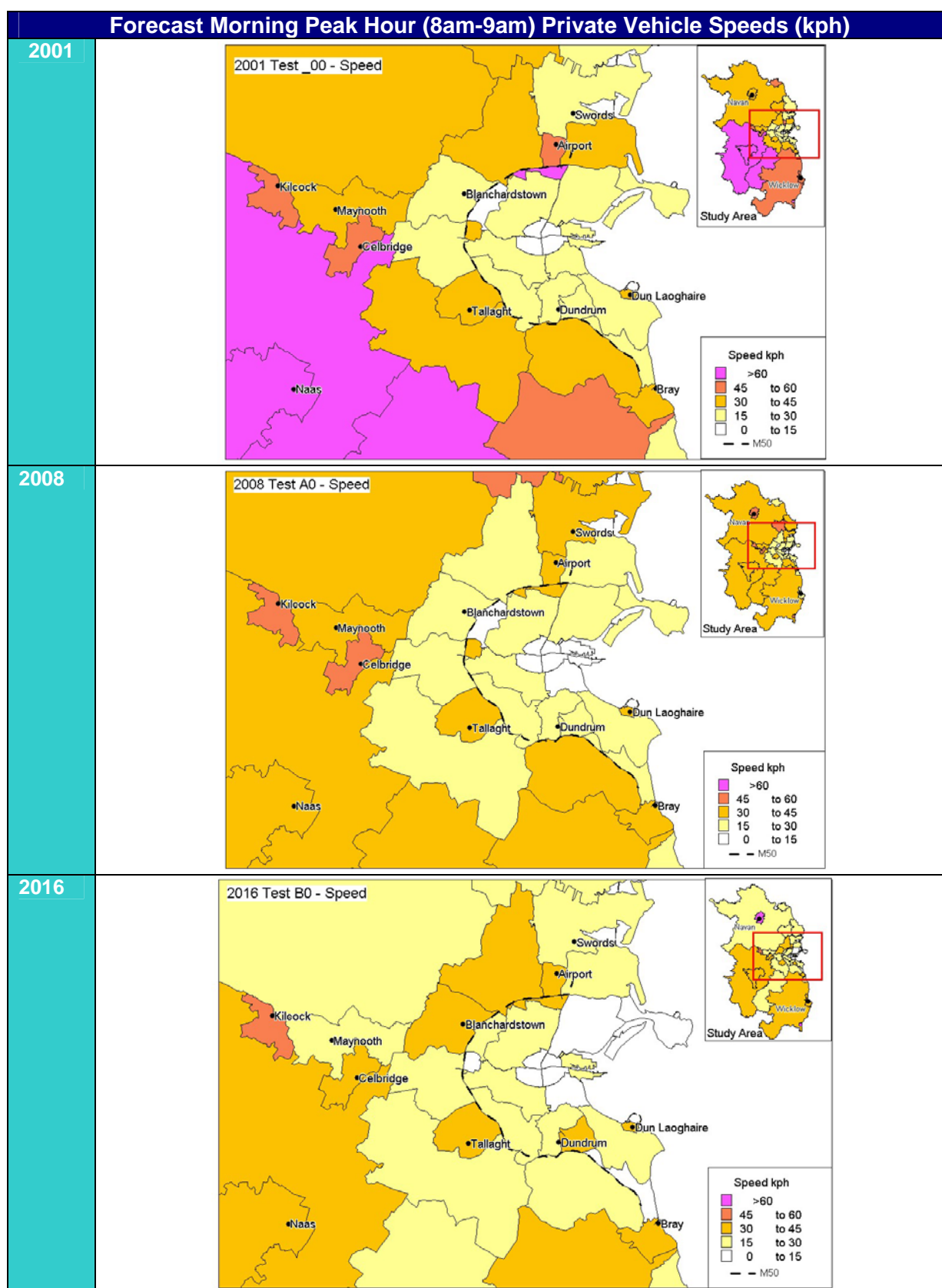
Change in Vehicle-hours by comparison with base case for 2008 (i.e. no TDM)



2.20. Figure 2.12 shows morning peak hour speeds for the years 2001, 2008 and 2016, without travel demand management. It can be seen that, by 2008, average speeds of less than 15kph will be more common within the M50. Outside the M50, speeds will be greatly reduced, even in the rural Hinterland. The same trends will continue to 2016, when a large part of the area within the M50 will have average

speeds of less than 15kph, and where almost all of the GDA will have average morning peak hour speeds of less than 30kph.

Figure 2.12 Average Morning Peak Hour Speeds



2.21. As Table 2.5 shows, traffic leaving the City Centre in the morning peak hour is forecast to increase, particularly in the northbound direction. Traffic entering the city from the south is forecast to decline slightly by 2008 and by 12% in 2016. Traffic entering the city from the north is forecast to continue to increase until 2008 and to decline thereafter. Traffic leaving the city in the AM peak is predicted to increase significantly by 2008, probably in response to greater numbers of residents living in the city and more jobs outside, but by 2016, driving out of the city appears to become less attractive with public transport alternatives coming on-stream. Traffic crossing the Liffey is predicted to increase by 2008 then decrease back to 2001 levels in 2016 in the northbound direction but, by 2016, it declines in the southbound direction.

Table 2.5 Increase in Morning Peak Hour Traffic Flows in the City Centre

Increase in AM Peak Hour (8am-9am) Traffic Flows						
		2001	2008	% increase from 2001	2016	% increase from 2001
Canal cordon south	inbound	14,451	13,915	-4%	12,759	-12%
	outbound	8,974	11,151	24%	11,216	25%
Canal cordon north	inbound	10,082	11,598	15%	9,894	-2%
	outbound	5,802	9,431	63%	8,515	47%
Liffey Bridges	northbound	7,253	8,155	12%	7,222	0%
	southbound	9,699	9,836	1%	8,647	-11%

Summary of Problems to be Tackled by TDM

2.22. Based on the above analysis, the problems to be tackled can be summarised as follows:

- The population has become more dispersed resulting in less sustainable settlement patterns which are reflected in a high mode share for car use – over 80% of trips made outside the M50 between 8am and 9am are by car⁸;
- Car use for trips to school and work is increasing;
- The absolute number of trips to work by car is increasing;
- Some 50% of all those travelling to work in the Dublin City Council area do so by car. While this is a relatively low car mode share compared with that of people travelling to work elsewhere in the GDA, it accounts for over 150,000 workers entering the City by car every morning⁹;
- In the future, speeds will become slower throughout the GDA. By 2016, if no demand management is undertaken, the morning peak hour speed will have fallen to below 15kph through much of the GDA¹⁰; and

⁸ Source: DTO model for 2001

⁹ Source: DTO, from Census 2002

¹⁰ Source: DTO Model for 2016, Booz Allen analysis

- Speeds are slower in the central areas than elsewhere, and this trend will continue into the future

2.23. It is these problems that a set of mutually reinforcing travel demand management measures will need to address in the GDA in the future, by:

- influencing land use planning policy and practice leading to more sustainable and less car dependent settlement patterns in the GDA
- facilitating drivers who would like to reduce their car use, particularly for trips to work and to school; and
- strongly discouraging unnecessary car use in certain areas where alternatives are available

2.24. It is anticipated that TDM policies that tackle work trips to the city (from all areas) will be the most effective because:

- These account for the greatest proportion of trips in the peak hour; and
- City destinations continue to have a greater level of access by non-car modes than elsewhere in the GDA

2.25. TDM policies to curb growth in trips by car to destinations outside the M50 are also needed. However, given that public transport options will not be available to many of these destinations, even by the year 2016, developing acceptable TDM solutions for those that have already located in these areas will be challenging. The emphasis would be on tackling future growth in unsustainable development in car dependent areas by reflecting TDM in the planning system. This would limit the extent to which the existing problem will continue into the future.

2.26. Potential measures, their application and effectiveness are discussed in the following section of this report.

3 Overview of Potential TDM Measures

Introduction

3.1. During the early stages of the study, extensive work was undertaken to review international practice with TDM. This examined the TDM measures that are in place, or have been considered and investigated how effective they have been and how they might be applied in the GDA context. A review of experience to date with TDM in the GDA was also undertaken. The Interim Report (May 2003) and the working papers (February 2003) describe the work in detail which is summarised in this section of this report.

Application of Travel Demand Management (TDM)

3.2. TDM can be applied to work, school, shopping, leisure, tourist and other trips. The most common trip market for TDM measures has generally been the work trip. This has been because:

- The work trip generally causes the greatest level of congestion on the road system;
- It is the trip for which there are the greatest number of alternatives available (e.g. higher level of public transport service available at this time); and
- The workplace has been found to be the most effective unit for organising programmes to promote travel demand management

3.3. TDM measures have also been applied to other trip markets with some success. These markets have mainly been trips to tertiary education facilities (mainly students), trips to large hospitals (staff and visitors), and trips to school. The school trip has become an increasing focus as its effect on peak period congestion has increased with ever-larger proportions of school trips being made by private car and less by walk or cycle.

3.4. Some TDM measures also affect other trip markets besides commuting (e.g. shopping, business travel) as they are implemented to cover a relatively wide geographical area and a wide time frame (for example, road pricing).

3.5. In its most fundamental application, TDM is pursued through the planning system. Integrated transport and land use planning, from strategic spatial planning to individual site-specific development design, will ultimately do most to ensure that unnecessary car travel is minimised. Integrated transport and land use planning can ensure that different activities are located within walking or cycling distance of each other, or that they are served by public transport. The challenge for assessing the

impact of land use planning on travel demand management is that a long time frame is required to properly demonstrate the benefits – say 40 years. This is because, even in a rapidly developing urban area like the GDA, the overall amount of new development each year is small by comparison to that which already exists.

3.6. Although appropriate land use policy and practice is a necessary condition for successful travel demand management in the long term, travel demand management measures are needed to curb car use, even in the most well planned of urban areas.

Area of Application

3.7. The focus on the work trip has meant that the main institutional focus for TDM has been the employer - a well-defined organisational structure with the capability of reaching the intended travel market. However, TDM has been applied in three different geographic dimensions:

- **Individual site.** This can be an individual employer (seeking to implement TDM measures for its employees) or an individual trip end (e.g. a business park, university, hospital, or school).
- **Sub-area or corridor.** This generally involves participation by a number of organisations, and brings together organisations that have a common interest in good transport provision (e.g. developers, chambers of commerce, public transport agencies, employers etc). One result of this has been the formation of 'associations' that are generally formed by developers or employers with the primary focus on implementing a TDM programme to reduce traffic congestion in the commuter influence area. In addition, some TDM measures are applied on an area basis rather than at an individual site (road pricing falls into this category, as do land use measures).
- **Regional level.** This has involved the use of TDM as one element of an overall congestion reduction strategy, or as a mechanism for implementing legislation focused on such things as growth management or air quality. For example, the South Coast Air Quality Management District in California established specific trip reduction targets for all employers with 100 or more employees. Certain measures need to be applied on a regional basis to have any effect. For example, if land use measures are not applied regionally, development can simply move to another part of the region to avoid the planning constraint.

Overview of TDM Strategies

3.8. Table 3.1 sets out an overview of possible TDM strategies separated into those measures which seek to manage travel demand by attempting to alter conditions at the demand source, and those which alter the supply of transport in some way (with a resultant effect on demand)¹¹.

Table 3.1 Overview of Travel Demand Management Strategies

Orientation	Strategy	Description
Demand	Financial Measures	Financial incentives to use alternative travel modes.
	Taxation Measures	Adjustments to the taxation system, which favour travel by alternative modes. This could include 'benefit-in-kind' tax on employer provided parking.
	Road Pricing or Congestion Charging	Imposing a charge on road users travelling at a certain time, or in a certain area (or both) to manage travel demand.
	Alternative Hours	Measures which involve employees working non-standard work hours.
	Ridesharing	Measures which promote two or more people travelling together by private vehicle transport on a regular basis.
	Information Communications Technology (ICT)	Enable substitution of travel by telecommunications based arrangements, e.g. teleworking.
	Alternative Modes	Measures to promote walking and cycling (car sharing also included here).
	Parking Restraint	Parking pricing and supply measures which make car use more expensive and less convenient, thereby increasing the attractiveness of non-car modes.
	Travel Plans	A package of TDM measures tailored to a particular site.
	Land Use	Planning measures aimed at fostering land use location and design, which is favourable to public transport, walking and cycling.
	Intelligent Transport Systems (ITS)	The coupling of information technology and communications to provide information for travellers enabling them to make informed travel choices.
	Administrative	Administrative and regulatory measures which provide a framework for implementation of particular TDM measures
	Education/ Marketing	Education and marketing programmes which aim to encourage people to use alternative transport modes
Supply	Traffic Management	Road infrastructure measures aimed at giving public transport and high occupancy vehicles priority, and slowing down or redirecting traffic.
	Parking Restraint	Controlling the supply of parking spaces to encourage non-car travel modes.
	Public Transport	Improving the quality of public transport services, and increasing service levels.
	Intelligent Transport Systems (ITS)	Using information technology to improve public transport information systems

Note: several TDM strategies are both 'demand' and 'supply' strategies (e.g. Parking Restraint and 'ITS')

¹¹ The 'link' between the potential success of a TDM programme and public transport supply is recognised.

Application and Effectiveness Factors

3.9. A review of international experience with TDM identified the main situations in which different TDM measures are best applied, and the key factors which determine the effectiveness of TDM measures.

Application

- Certain TDM measures are regularly applied at the worksite level when employers are faced with local issues, for example, a shortage in parking, the need to provide travel options for employees, or as a planning requirement.
- The presence of significant road congestion is also an important factor in determining whether or not many TDM measures are likely to be applicable.
- Most TDM measures are best applied where a good quality high frequency public transport service is available. This ensures that people have a travel option available apart from the private car (this does not apply to measures which are a substitute for public transport, e.g. ridesharing).
- Measures which aim to significantly increase the cost of car use such as parking restraint and road pricing are generally only applicable in medium to large urban areas. These generally have a spread of business activities and sufficient amenity, character and ambience to which make them attractive to businesses, even if costs increase. They also generally provide greater opportunity for making a trip on public transport, by bicycle or on foot.
- Certain measures are more applicable to some types of organisations than others. For example, ridesharing is more suited to organisations or groups of organisations with a substantial number of staff working largely fixed and regular hours

Effectiveness

- Generally, TDM measures which do not involve either an incentive to start a new travel behaviour or a disincentive to an existing behaviour, achieve only limited results. For example, simply setting up a ridesharing scheme without providing any incentives to rideshare (e.g. high occupancy vehicle (HOV) parking, carpool allowance) or disincentives to drive alone (e.g. charged parking) will only have a minimal effect on modal share.
- TDM measures are most effective when implemented as a package rather than as individual measures. This enables both incentives and disincentives to be provided, which increases both the acceptability of the TDM

measures and their effectiveness. It also recognises that certain TDM measures tend to reinforce the benefits of other measures, so that the combined effect of a package of measures is greater than the total effect of individual measures.

- TDM packages also need to include measures which help mitigate the adverse effects of other measures, or help compensate for particular difficulties, which may arise. For example, a potential difficulty with ridesharing schemes is being able to get home if needing to work later than the scheduled carpool or vanpool time. Providing a Guaranteed Ride Home scheme to cover this eventuality will give employees confidence that they will not be caught out when working late and will increase participation in the ridesharing scheme.
- Many TDM measures are most effective when implemented in conjunction with improvements to alternative modes, particularly public transport services, so that travel options are available for potential mode switchers.
- The effectiveness of some measures will be very dependent on local factors and the actions of organisations involved. For example, public parking restraint is most effective in reducing traffic levels in areas with a relatively low proportion of through-traffic and a high proportion of parking spaces in local authority control.
- Compliance is an important effectiveness factor for some measures, for example, parking restraint, workplace parking levies, road user charging (congestion charging), high occupancy vehicle (HOV) lanes, and public transport priority (e.g. bus lanes). Poor compliance, perhaps due to inadequate enforcement, will render these types of TDM schemes ineffective.
- The take-up of certain TDM measures is also significantly affected by the perceptions and 'paradigms' of the target organisations. This has been found to be particularly the case with teleworking in which the beliefs of management as to what constitutes effective work practices, and their perceptions towards teleworking (and unsupervised work in non-office locations) are often the most important factor in determining whether or not teleworking is taken up in a particular organisation. Education programmes specially prepared for target organisations will be important for measures of this type.

3.10. The “Long List” of TDM measures available which was determined from a review of international practice with TDM measures is shown in Appendix F. Appendix G provides a brief overview of international practice with TDM measures. Appendix H expands upon the issues of application and effectiveness. A summary

of the measures implemented elsewhere which have been most effective and which have most influenced the work of this study are summarised in Table 3.2.

Table 3.2 Leading TDM Examples from International Experience

Measure	Leading Examples from International Experience
Fiscal Including Financial Incentives Taxation Measures Road Pricing	<p>London congestion charging was introduced in 2003 and is widely considered to be a success. It has reduced traffic significantly and is generating revenue to be re-invested in public transport improvements.</p> <p>In the Norwegian cities of Bergen, Oslo & Trondheim toll rings around the urban core were introduced in the early 1990s to raise finance. They achieved that goal. Now the authorities are considering their retention as TDM measures.</p> <p>Singapore was the first country to implement an area licensing scheme to alleviate congestion. The first scheme in 1975 required a fee to enter the restricted zone in the morning peak. An evening restriction was subsequently introduced in 1989 and extended across the day in 1994. Full electronic pricing started in 1998.</p> <p>Electronic road user charging for heavy goods vehicles has been introduced in Switzerland and Austria. An ambitious scheme to introduced satellite positioning system based HGV scheme in Germany ran into difficulties and was abandoned in February 2004. Development is now underway again and the signs are that all requirements will be met.</p> <p>Sydney and Perth have a workplace parking levy. The city of Nottingham, UK, is proposing a workplace parking levy.</p> <p>Ireland has introduced a tax free commuter ticket scheme.</p>
Education/ Marketing	<p>Major "Individual Marketing" programmes have been successfully implemented in the UK, Australia, Germany and Austria. Travel awareness campaigns are undertaken by local authorities in many countries. Throughout Europe, many towns and cities participate in the annual "Car Free Day".</p>
Information and Communication Technologies (ICT)	<p>The Eurobarometer reported that, in 2002, 2.4% of the Irish workforce was teleworking regularly. This compared with a European average of 5%. In Denmark, the same survey found that 17% of the workforce was regular teleworkers. The US Federal government has promoted teleworking for many years. Currently around 4% of workers telework regularly in the GDA.</p> <p>Teleworkers under the BT Workabout scheme (UK), working on average 2-3 days per week from home, saved an average 93 miles per week in car commuting, or 143 miles per week in rail commuting.</p> <p>A telework pilot at the Dutch Ministry of Transport found that teleworking resulted in a 17% decrease in the total number of trips by teleworkers, with peak-hour travel by car reduced by 26%.</p> <p>Local Authority workers in the Yorkshire & Humberside area (UK) who undertook telework as part of the EU TARGET project reduced their travel to work mileage by an average 2182 miles over the year that was monitored. Car commuters in this group reduced their mileage by 2559 miles.</p>
Site specific Travel Plans Including Workplace and School Travel plans	<p>Workplace travel plans, which incorporate a range of site-specific TDM measures, have been adopted by public and private sector employers in many countries. They have been operating for the longest in the US and the Netherlands. In the Netherlands, it is reported that basic plans (e.g. car sharing schemes) achieve 6-8% reduction in vehicle-km to a site and extensive plans (including measures such as work buses and parking restraint) achieve a 15-20% reduction in vehicle-km. In the US, an average car trip reduction of 15% to sites where a plan is implemented was reported.</p> <p>School travel plans, or "Safe Routes to Schools", also incorporate a range of site-specific TDM measures. They were first introduced in the UK in 1995 where it is reported that 4% of primary schools and 5.5% of secondary schools had a plan by 2001. An average car trip reduction of 20% associated with each plan is reported. Safe Routes to Schools are currently being piloted in the GDA.</p>

Measure	Leading Examples from International Experience
Land Use Including Parking Restraint at New Developments	<p>UK Government has established planning guidelines to foster land use development that supports public transport, walking and cycling, i.e. high density, mixed use, located on public transport corridors.</p> <p>Construction of the Docklands Light Rail and, later, the Jubilee Line Extension were integrated into the development of the London Docklands.</p> <p>Hong Kong is a leading example of transport led development where large scale commercial and residential developments were incorporated into the design of each station on the mass transit system.</p>
Integration and Priority Measures	<p>In the Netherlands, with the introduction of bus lanes, gates and signal priority on all major routes in some cities, daily ridership is 20% higher than the national average.</p> <p>The introduction of priority signalling in Bern, Switzerland, has resulted in a 75% saving in delays for trams and 50% saving to buses.</p> <p>An initiative in the Danish town of Aarhus encouraging the use of cycling resulted in an increase of 44% of trips by bike with a reduction in the use of a car of 45%.</p>

TDM Measures Implemented in the GDA

3.11. Several TDM measures have been introduced and accepted in the GDA. Various pilot schemes have also been trialled with varying results.

3.12. The measures have all been implemented to deal with specific transport issues, sometimes in a very specific location. Measures tend not to have been implemented as part of an overall demand management strategy, which would include other measures to increase the effectiveness of the measure implemented.

3.13. The majority of demand management measures implemented have involved traffic management and parking, as shown in Table 3.3, which sets out the various measures which have been implemented in the GDA.

Table 3.3 – TDM measures piloted/implemented in GDA

<p>Traffic Management</p> <ul style="list-style-type: none"> • Environmental Traffic Cells • Traffic Relief/Management Schemes • Car Free Day • Bus Gates • QBC's • Pedestrianisation (complemented by high density commercial and residential development and no/low car development). • Safe Routes to Schools <p>Parking</p> <ul style="list-style-type: none"> • Pay and Display Parking • Residents parking schemes. • Maximum Off Street parking standards (Administered under the planning process) <p>Mobility Management</p> <ul style="list-style-type: none"> • Mobility Management Plans • Oracle Commuter Centre <p>Cycling</p> <ul style="list-style-type: none"> • Strategic Cycle Network 	<p>Park and Ride</p> <ul style="list-style-type: none"> • DART and Suburban rail stations. <p>Car Sharing</p> <ul style="list-style-type: none"> • Pay as you Drive Car Sharing <p>Ride Sharing</p> <ul style="list-style-type: none"> • www.dublintraffic.ie <p>Financial</p> <ul style="list-style-type: none"> • Tax saver Commuter Tickets <p>Teleworking</p> <ul style="list-style-type: none"> • 4% of workforce in the Dublin region, 4.5% of the workforce in the Mid East region.¹² <p>Integration Measures</p> <ul style="list-style-type: none"> • Real time passenger information pilot • GUADI Smartcard project
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3.14. In addition, changes in land use development are occurring that complement and facilitate TDM. In Dublin, there is an increase in higher density mixed use development in the centre of the City, in some of the local town centres and in developing outer areas. Residents will often have little or no use for the car and may not require parking. Visitors can travel to these areas by public transport, or park on the edge, and then move about by foot. This trend for city living and mixed developments is reflected in numerous other cities throughout the world and has been largely driven by urban renewal initiatives.

Traffic Management

3.15. The Quality Bus Corridors (QBCs) are arguably the most well known measure thus far implemented. These involve the reallocation of sections of road space to buses along designated routes and improvements to the network to reduce bus journey times and improve timetable reliability. While aimed at increasing the capacity of a road corridor in terms of people moved, they have had the secondary impact of restricting road capacity for cars in many places.

3.16. Seven environmental traffic cells have been implemented in the City Centre with others being finalised. The purpose of the cells is to remove 'through traffic'

¹² CSO, *Quarterly National Household Survey, Q3, 2002*

and create a safer and more sustainable environment for the residents of the cell, pedestrians and cyclists.

3.17. There are at present a number of “Safe Routes to Schools” schemes being developed. These schemes involve improvements to identified routes used by students through traffic calming and the provision of cycling and crossing facilities.

3.18. A number of other traffic management measures such as bus gates and pedestrianisation, have been implemented with positive results.

Parking

3.19. A number of schemes involving ‘Pay and Display’ parking restriction and Residents Only parking permits have also been implemented, largely in the Dublin City Council area. The majority of these schemes are aimed at removing all day commuter parking.

Park and Ride

3.20. Some 4,748 car parking spaces are provided by Iarnród Éireann and local authorities at DART and suburban rail stations in the GDA. In addition, some 1,900 park and ride spaces are located at Luas stops. Informal ‘Park and Ride’ occurs in the car parks of out of town retail centres and along existing QBC routes. This can cause difficulties for residents and local businesses, leading to demand for parking controls.

Mobility Management

3.21. Mobility Management Plans (“Workplace” or “Employer Travel Plans”) are used by private companies and business parks to encourage staff to use public transport and alternative modes to the car. The main reasons for their implementation by the employer are the lack of parking at the employer’s site and retention/attraction of staff.

3.22. There are various examples of mobility management initiatives such as the shuttle bus from Clontarf DART station to Eastpoint Business Park, which is funded by the business park management company. There are 5,000 employees at the Business Park and it is estimated that 3,000 use public transport or cycle/walk, the remainder drive cars to work. More recently, the Eastpoint Business Park has set up a commuter centre on site to encourage staff to use public transport and alternative modes to the car. The motivation for setting up the commuter centre is the limited number of parking spaces at Eastpoint and attraction/retention of staff.

Cycling

3.23. A strategic cycle network is currently being developed for the Greater Dublin Area. The aim is to encourage the use of cycling as a mode of travel, particularly for commuters. Some 300 km of this network has already been implemented. Experience with the current network is currently being reviewed. This process will inform that design of an additional 150 km of network in future, and identify any revisions required to existing sections.

Car Sharing

3.24. A car-sharing club was piloted in Dublin city in 1997. The 'Pay as You Drive Car Sharing' scheme had three cars located at two DART stations and ten members. The scheme ceased due to difficulties with motor insurance issues.

Ride Sharing

3.25. A website was set up in the year 2000 which aimed to encourage and facilitate commuters who wished to ride share to work. The website allows commuters to post their travel details and contact information. The information is displayed geographically to help commuters identify possible car poolers in their area or along their route.

Financial

3.26. The Taxsaver Commuter Tickets scheme was introduced in the year 2002 in Ireland. It offers employers and employees tax deductions on the cost of monthly or yearly public transport tickets.

Teleworking

3.27. The CSO Quarterly National Household Survey (Q3, 2002) reported that in the Dublin Region some 4% of the workforce works at home (with or without a computer) on a regular basis. In the Mid East, 4.5% of the workforce work from home on a regular basis.

Integration Measures

3.28. Measures to improve public transport integration within the GDA have been underway for several years. These address travel information, ticketing and fares.

3.29. With respect to integrated travel information, plans for a GDA-wide, multi-modal passenger travel information system, including real time passenger information (RTPI), but also including improved paper information, internet journey planners and telephone inquiry systems, were formulated by a DTO working group of stakeholders. This is under consideration by the Department of Transport. As yet there are no firm plans for implementation. It is noted that Dublin Bus has been

piloting an RTPI system along the Lucan QBC for sometime. The system is similar to current DART and suburban rail system and it gives the destination of the next bus and estimated time of arrival. Luas has RTPI at all stops.

3.30. In terms of integrated ticketing, the Railway Procurement Agency is currently developing a contactless smartcard based integrated ticketing system for the GDA. This is due to be operational by the end of 2005.

3.31. Improved integration of fares through the reduction of financial penalties for passengers that need to use more than one service per trip is currently being considered by the Department of Transport through its Fares Policy Study.

Potential TDM Measures for GDA

3.32. An initial assessment of the Long List of TDM measures (Appendix F) to identify the relative contribution of different measures to achieving the DTO's transport and land use objectives was undertaken. The purpose of this 'initial assessment' was to provide a basis for prioritising TDM measures, and to assist with the developing of a possible package of TDM measures for the GDA. A Goals Achievement Matrix approach (a form of multi-criteria analysis) has been used for the initial assessment. The assessment enabled TDM measures to be ranked according to their overall performance over all criteria; and, to be classified in terms of how well they support different objectives. Table 3.4 provides the objectives and criteria used in the initial assessment.

Table 3.4 Objectives and Performance Criteria for Initial Assessment

OBJECTIVES AND PERFORMANCE CRITERIA FOR INITIAL ASSESSMENT	
Objective	Performance Criteria
1. Reduce the growth rate of overall travel in the Greater Dublin Area (GDA).	A - The extent to which the measure reduces total trips and average trip length.
2. Encourage modal transfer from private car driver to alternative travel modes (public transport, rideshare, walk, cycle).	B1 - The extent to which the measure increases the attractiveness of public transport. B2 - The extent to which the measure increases the attractiveness of ridesharing. B3 - The extent to which the measure increases the attractiveness of walk and cycle. C - The extent to which the measure increases the (generalised) cost of private car travel relative to other modes of travel.
3. Reduce road congestion, particularly in the morning peak hour.	D - The extent to which the measure will reduce the number of peak time car trips. E - The extent to which the measure will reduce the number of non-peak car trips.
4. Minimise the adverse environmental, safety and health impacts of transport.	F - The extent to which the measure will reduce weighted Vehicle Kilometres Travelled (VKT).
5. Support sustainable urban and hinterland development.	G - The extent to which the measure supports intensive land use and mixed-use development.
6. Minimise adverse local economic impacts of TDM measures.	H - The extent to which the measure increases the attractiveness of an area for business location.
7. Favour TDM measures which are relatively easy to implement and operate.	I - The extent to which the measure is easy to implement and operate.
8. Favour TDM measures which have wide ranging support.	J - The extent to which the measure is likely to have wide ranging support.
9. Favour TDM measures which achieve benefits in the short to medium term.	K - The extent to which the measure's benefit stream commences in the short-term.

3.33. The outcome of the initial assessment was that the majority of the Long List measures were considered to be potential measures for the GDA, apart from the following measures:

Car purchase and ownership taxes	- These are already relatively high in Ireland. They also would not be focused on the GDA, which would make their acceptability questionable.
Tax deductible public transport passes	- Already available on Dublin bus and rail services.
Teleshopping and Teleservices	- The introduction of these measures will be governed mainly by commercial and public service delivery considerations rather than travel demand management issues.
Parking – Commuted Payment Schemes	- Will not be appropriate given the desire to introduce parking maximums rather than minimums.

- Trip Reduction Ordinances - This type of regulatory control of employers is not suitable to the Irish regulatory environment (and has also been discarded in most places where it has been trialled).

3.34. Table 3.5 lists potential TDM measures which, on the basis of the investigations undertaken, are considered to be feasible for the GDA. These feasible potential TDM measures cover 11 of the TDM strategies identified in Table 3.1. In addition, five other TDM strategies (bus priority measures, walking measures, cycling measures, integration measures and traffic management measures) are already being implemented in the GDA and are included in the DTO's *A Platform for Change* strategy. It has been assumed that implementation of these five particular TDM strategies will continue as planned. The measures identified in this report are incremental (and in many cases complementary) to those five measures.

Table 3.5 Feasible Potential TDM Measures

Incentives	Disincentives	System Changes and Information
Employer Travel Plans (Mobility Management Plans) <ul style="list-style-type: none"> Promotion of travel plans to employers, and provision of assistance/technical support with implementation. Provision Seed/initial funding to employers to help defray/offset Travel Plan development costs. Incorporates Actions below under: ICT, Alternative Hours, Ridesharing, and Financial Measures. Promotion of travel plans for groups of neighbouring employers. 	Parking Restraint <i>On-street Parking:</i> <ul style="list-style-type: none"> Impose charges in town centres throughout the GDA. Reduce the number of parking spaces in Dublin City Centre. Use of pricing policy to regulate demand and optimise the use of parking. Introduction of Controlled Parking Zones to complement possible road pricing. <i>Off-street Parking:</i> <ul style="list-style-type: none"> Maximum parking standards for new development and redevelopment tied to the level of public transport accessibility – whole GDA. Parking ceiling/cap for Dublin City Centre. Employee parking spaces charged or removed in areas with high public transport accessibility. Parking Levy on workplace parking spaces or other non-residential parking spaces in areas with high public transport accessibility. 	Land Use <ul style="list-style-type: none"> Higher Residential densities and lower parking provision at High Public Transport Accessibility locations. Higher density Commercial development with lower parking provision at High Public Transport Accessibility locations. Hierarchy of Centres focussed on the potential for growth within centres. Application of Transport Development Area/ Urban Design land development approaches at Existing and Proposed centres. Application of Integrated Development and Transport development approaches to new residential neighbourhoods. No and Low Car housing schemes. Development Contributions to Non Car Modes (including public transport). Inclusion of Travel Plans (Mobility Management Plans) as a requirement for planning permission for large developments. Maximum parking standards for new development and redevelopment tied to public transport accessibility levels.
Information Communications Technology <ul style="list-style-type: none"> Promotion of teleworking to employers, and provision of assistance/technical support with implementation. Provision of Seed Funding to employers to help defray set-up costs. 	Congestion Charging Three main options: <ul style="list-style-type: none"> (A) Area Licence Scheme – pay once to enter area and drive unlimited during scheme time period. Possible parameters: City Centre cordon, charge weekdays for 11 hours (e.g. 7am – 6.30pm), fixed charge to enter area, paper licence with (camera based) Automatic Licence Number recognition. (B) Cordon Charge Scheme – pay every time to cross the cordon. Possible parameters: City Centre cordon, charged all the time, differential charges by time of day, use of GPS technology. (C) Extension of options A or B, but with the addition of outer cordons, e.g. strategically important routes 	Education and Marketing <ul style="list-style-type: none"> Roll out of Individualised Marketing programmes in conjunction with public transport improvements. Travel Awareness Campaigns.
Alternative Hours <ul style="list-style-type: none"> Promotion of Compressed Work Weeks to employers. Staggered working hours and Flexible working hours. 		
Ridesharing <ul style="list-style-type: none"> Promotion of ridesharing to employers, and assistance with setting up ridesharing schemes. 		
Financial Measures <ul style="list-style-type: none"> Possible subsidy for set up costs for carpooling schemes (e.g. ride matching software/systems), and provision of start-up matching grants for employer carpooling allowances. Possible grants to employers who improve walking and cycling facilities, and support cycling costs (e.g. cycle and helmet purchase). 	Taxation <ul style="list-style-type: none"> Employee parking subsidy as a taxable 'benefit-in-kind'. Increases in motor fuel taxes. 	
School Travel Plans <ul style="list-style-type: none"> Promotion of travel plans to schools, and provision of assistance/technical support with implementation. 		

4 Consultation and Market Research

Introduction

4.1. There were three different strands in the overall consultation process:

- on-going stakeholder liaison;
- public consultation; and
- market research.

4.2. In each case, the approach was framed following discussions with the Demand Management Steering Group. The process was informed by the review of international experience and “long-listing” of feasible measures as described in Section 3.

4.3. Stakeholder liaison aimed to stimulate debate and information flow so that any TDM measures proposed are pragmatic, acceptable and coordinated with other transport initiatives. Stakeholders were first consulted in the initial stages of the study when a series of workshops were held. The workshops were followed up with another set of meetings and workshops as part of the main consultation phase. Appendix I provides a list of the stakeholders.

4.4. The public consultation process was concerned with getting information on the study into the public domain, to develop awareness and seek initial feedback. Some 10,000 leaflets were distributed around the Greater Dublin Area, in libraries and towns halls. The leaflet set out the feasible potential TDM measures shown on Table 3.5. Advertisements were placed in national and local newspapers within the Greater Dublin Area. Written submissions were invited and a total of 58 written submissions were received. Appendix J contains a list of people and organisations that made written submissions.

4.5. The market research was a structured exercise designed to obtain attitudes of the adult population in Leinster towards measures to restrict car travel such as road user charging, working from home, use of public transport and parking restrictions. A dual approach was taken using quantitative and qualitative methods of research. For the quantitative research, around 650 household interviews were undertaken. The qualitative research comprised two focus groups.

4.6. Specifically, the market research focused on:

- the areas of Leinster in which restrictions on travel are needed;
- the benefits of restrictions on travel;
- willingness to pay tolls/other charges;

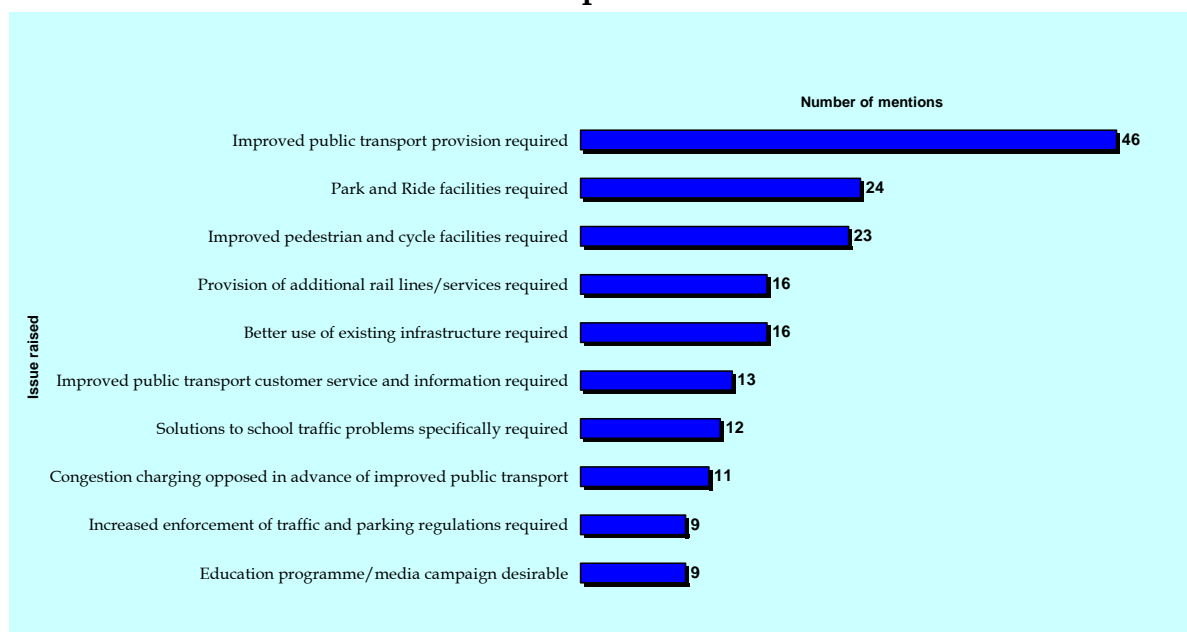
- alternative travel arrangements that would be considered or made if charges were introduced; and
- attitudes towards public transport

Outcome

General

4.7. Both the submissions received and the workshops and meetings arranged showed far more interest in improving infrastructure and services and than in managing demand. This is illustrated in Figure 4.1 which details the top ten issues raised in terms of the number of mentions in meetings and submissions. Congestion charging was the only potential TDM measure to attract significant interest. The market research overcame difficulties of getting people to engage by asking direct questions in the household interview. The focus groups then allowed those questions to be explored in more detail. The research and consultation feedback are fully described in the *Consultation Report*, June 2003.

Figure 4.1 Top Ten Issues Raised in Submissions, Meetings and Workshops



4.8. A majority (56%) of those interviewed in the household survey agreed that restrictions (of any sort) on car use were required, but a significant proportion (31%) disagreed with the idea of any restrictions on car use. Nearly everyone (85%) who thought that restrictions were required thought that they were needed in the City Centre. Few thought that restrictions should be introduced elsewhere in the GDA.

4.9. The primary benefit of restrictions would be less traffic jams, according to 51% of those surveyed. Other respondents identified other benefits as being more

important, such as quicker journey times (27%), nicer walking conditions (13%), better air quality (12%), better street atmosphere (9%), easier parking (8%), better cycling conditions (7%) and more pleasant driving conditions (5%).

Parking Measures

4.10. Parking restraint was widely understood and supported as a demand management measure, except in the case of no/low car housing which was an unpopular concept (preference for a “stay at home car” model was frequently voiced). Of those interviewed in the household survey, 64% said that if parking charges increased, they would use public transport to travel to the City Centre, 33% would switch to public transport for trips to their local shopping centre.

4.11. Some participants in the focus groups regarded free workplace parking in the City Centre as a luxury upon which a levy would be fair. If those with free parking at work were charged the most likely reaction would be to pay the charge, according to 34% of those interviewed in the household survey. Other likely reactions were taking public transport (15%) or car sharing (10%).

4.12. In general, increased restrictions on parking were broadly supported. It was thought that commuter parking should be tackled first; however, parking restrictions at suburban shopping centres were generally not considered appropriate. It was also felt that parking restrictions could not be imposed on existing developments, although they may emerge through market forces (e.g. redevelopment of car parks as other land uses or introduction of charging to manage space better).

4.13. Although Park and Ride was not one of the potential measures listed for consideration¹³, it was raised as an issue by many consultees and stakeholders. In the hinterland and outer counties it is seen by many as an essential measure to encourage people to use public transport.

4.14. On the other hand, a strong appreciation of the practical difficulties of providing Park and Ride (including cost, difficulty of site acquisition, planning approval and car park security) emerged in discussions with local authorities having direct experience of the issue. It was also noted that informal park and ride throughout the GDA is an increasing problem for local residents, the Gardaí and businesses, leading to demand for parking controls (permit and pay and display systems).

Congestion Charging

4.15. Congestion charging raised much interest, reflecting a high level of awareness due to the publicity surrounding the London scheme which was seen to be working by those consulted in the GDA. Consequently there was no strongly negative

¹³ As a separate initiative, the DTO is preparing strategies for park and ride for bus and for rail.

reaction to the concept of a congestion charging scheme in Dublin. There was a sense that some form of congestion charging is inevitable in the future; however, there was also a sense that it would be a difficult project to implement and other, simpler, measures should be tried first.

4.16. All consultees considered that public transport alternatives would need to be in place for charging to be acceptable. While there was some concern about an additional cost/tax on motoring, a significant proportion (20%) of those interviewed in the household survey said that they would be willing to pay if it made the roads less congested. The proportion willing to pay increased to 32% if the money raised was used to fund public transport improvements.

4.17. Of those people willing to pay a charge, 41% lived in Dublin and 59% in the rest of Leinster, 58% drove to work regularly and 49% have free car parking at work.

4.18. Almost half (42%) of those surveyed said that they were likely to change travel plans to avoid a peak hour charge to enter the City Centre, but a large minority (31%) said that they were unlikely to change their travel plans. Those living in Dublin were more likely to change their travel plans than those living in the rest of Leinster, possibly reflecting the greater travel choice available to Dublin residents.

4.19. In terms of location, congestion charging outside the City Centre was not envisaged; however, some of the City Centre business groups opposed the idea of congestion charging within the City Centre, particularly because of the perceived impact it would have on shopper trips to the City Centre. These groups felt that it is already difficult to compete with suburban locations.

The Planning System

4.20. In terms of measures that could be implemented through the planning system, the location of jobs to balance housing growth was suggested on many occasions. This was in response to the understanding that new housing has moved to outer areas, and now local jobs are sought to balance that residential growth. It was also recognised that the increased rates base generated by more non-residential development would help local authorities in the outer counties provide services for their increased populations.

4.21. The desire for more jobs was not limited to the outer counties. In fact, competition for jobs between local authorities throughout the GDA is intense. It was stressed that travel demand management proposals that gave uneven competitive advantage would not be welcome.

4.22. Many local authorities and other stakeholders discussed the difficulties of improving public perception of the benefits of increased development density. This was reflected in the focus groups where many participants did not see an immediate connection between development density and the viability of public transport.

However, the majority (62%) of household survey respondents agreed that areas with higher density development should be given priority in public transport provision.

Other Measures to Promote TDM

4.23. Increased fuel taxes were unpopular with most consultees. The majority (70%) of those interviewed in the household survey did not agree that an increased fuel tax would be preferable to toll charges or increased parking charges. If the tax were used to fund public transport improvements, the majority (53%) still thought that toll charges or parking charges were preferable.

4.24. There was a positive attitude to most other measures, although they were frequently regarded as ineffective in practice. Support for enforcement and monitoring of Mobility Management Plans (MMPs) was widely called for by local authorities.

4.25. Flexible working was regarded positively in general by the public but there was a mixed response to ride sharing and car pooling measures.

4.26. Public education campaigns were seen as a good idea. It was recognised that car dependency is ingrained in our society and that people may not be aware of either the environmental damage it causes or the alternative travel arrangements available.

4.27. Public transport fare reductions, especially for trips needing more than one bus or train service were called for. Other financial incentives were suggested including weekend tax and insurance schemes and increased business travel expenses for non-car use.

Critical Factors for Success

4.28. A set of critical success factors for the introduction of demand management measures emerged from the consultation:

- The benefits clearly explained;
- Existing systems optimised through management and enforcement before moving to complex or contentious measures; Satisfactory public transport alternatives in place;
- Local economic activity and competition between centres taken into account; and
- Funds raised used to improve non-car modes.

Summary of Direction from Consultation and Market Research

4.29. The consultation and market research gave clear direction on some points:

- Of all the options, parking charges seem to be the most immediately acceptable to people in general:
 - Free workplace parking, especially in the City, is regarded by some as a reasonable target for charging; and
 - General increases in the cost of parking would be acceptable where public transport alternatives exist;
- Due to the recently introduced London scheme, awareness of congestion charging is high and it is regarded as a measure that works:
 - The prevailing response was one of acceptance as a longer term measure, given public transport alternatives; and
 - A significant proportion would be willing to pay a charge in order to reduce congestion;
- The response to the majority of other measures was positive, but these were not considered likely to bring about a big change in the short term.

4.30. Some conflict is apparent. For example, while there is a desire to tackle the obvious growth in travel demand in areas beyond the M50, including the rural hinterland as well as centres such as Swords, Tallaght and Blanchardstown, restrictions on car use are generally not seen to be acceptable anywhere except in the City Centre. The apparent lack of confidence in the implementation of public transport schemes and the “softer” measures to promote TDM is something to be overcome in developing TDM with both stakeholders and the general public.

5 Measures to be Developed

Introduction

5.1. The measures to be developed as candidate TDM measures for application in the GDA were selected based on:

- The analysis of current and future travel demand problems;
- The review of international practice;
- The consultation and market research; and
- The way in which TDM could be combined and applied at a strategic level across the GDA.

5.2. Going forward to consider TDM in Dublin on the above basis, the potential measures have been gathered into three distinct groupings.

5.3. **Measures that can be implemented through the planning system** – this includes measures through from long term spatial planning to development control for individual developments to regional parking restraint measures. These measures will address the need to travel which can be achieved by more sustainable settlement patterns that bring homes, workplaces and services closer together, or at least linked by public transport.

5.4. **Measures to promote travel demand management** - the “softer” measures including car sharing, flexible working, individual marketing and all measures to encourage people to change their travel behaviour in favour of less driving. Typically, these measures would be packaged into a Travel Plan for an individual site or group of sites. They will facilitate new travel behaviour at current and future developments.

5.5. **Fiscal measures** – “sticks” that introduce financial penalties to discourage car use. “Carrots” such as fiscal incentives to use other modes would be considered under measures to promote travel demand management or complementary measures. These will strongly discourage car use in certain situations where alternatives exist.

Key Issues for Consideration

5.6. Travel demand management policies to restrain the use of the private car for the work trip are the priority, as most of the car trips undertaken during peak periods are to work. Work trips to the City are the primary target as they are the most numerous as well as being most likely to have a non-car alternative. Trips to all other areas also need to be addressed. This includes trips to the developing areas outside the M50 where public transport access is poor and where public transport access is likely to remain relatively poor even in the longer term. Ultimately, further

future growth in such areas needs to be limited through TDM measures that are implemented through the planning system.

5.7. School trips also account for a significant proportion of peak hour car trips at present. The proportion of children being driven to school is growing enormously and TDM policies are required to tackle this demand.

5.8. Following the review of international practice, potential measures to tackle the identified issues were sifted down to those measures that were applicable in the GDA, or at least that were worthy of consideration. It also showed that there are a great number of potential measures available, but which can be gathered together into the three groupings set out above.

5.9. The public consultation and market research confirmed that an integrated approach was required that would address land use planning as the underlying cause of many travel demand problems, but that would also address measures that could take effect within a relatively short time frame. Such short to medium term measures would need to address fiscal measures to actively discourage car use as well as other measures to promote demand management.

Complementary Measures

5.10. The TDM strategies already being implemented in the GDA and outlined in Section 3 of the report are important parts of a total TDM package. These comprise bus priority, park and ride, walking, cycling, traffic management and integration measures (such as integrated fares, ticketing, and information). While these measures act as TDM measures, they also improve transport provision for public transport users, cyclists and pedestrians. All of these strategies may need to be reinforced or extended on a local basis to complement specific TDM proposals. Also, other complementary measures may need to be considered. This is discussed in Section 9 of this report.

6 Managing Travel Demand through the Planning System

Land Use Planning as the Foundation of Travel Demand Management

6.1. Land use planning and transport planning are inextricably linked, and their proper integration is a key determinant of the sustainability of development in transport terms. At the same time, it is important to acknowledge that there are important non-transport factors (e.g. water supply, drainage) that need to be considered and taken into account by the relevant land use planning authorities.

6.2. Urban policies from the 1950s to the 1990s tended to promote low-density suburban development, the separation of land use zonings, and the use of the car as the dominant mode of transport. The resultant dispersed pattern of development increased distances between housing, services and places of employment, making walking and cycling more difficult. The lower densities and car orientated design of such development also made it more difficult to serve with public transport. As a result patterns of land use over time have worked to undermine public transport provision in the GDA and have been a contributor to increasing car congestion levels in the Area.

6.3. However, some land use policies that support TDM are in place, and are set out in the National Spatial Strategy, the Regional Planning Guidelines for the Greater Dublin Area and in City and County Development Plans.

6.4. A glossary of terms used is provided at the end of this section of the report.

Travel Demand Management measures that can be implemented through the planning system

6.5. Appropriate land use policy and practice is a necessary condition for successful travel demand management. Where development is properly integrated with transport, the people who travel to or from a development will have a range of transport choices. When transport choice is available, travel demand management measures to encourage travel by means other than the car may be more acceptable.

6.6. Among the benefits of an integrated approach to land use and transport planning over time will be shorter average journey distances, less motorised travel overall and in particular less travel by car.

6.7. For land use and transport to be successfully integrated, land use planning is required at both the strategic ("where to build it") level and the local ("how to build it") level. The relevant statutory planning policy documents for the Greater Dublin

Area include the National Spatial Strategy, the Regional Planning Guidelines, Local Authority Development Plans, and Local Area Plans. Non-statutory policy documents include County/City Development Board Strategies and Development Briefs. Each must foster the integration of land use and transport policies to support sustainable travel throughout the Region.

6.8. Two of the policies underlying the Residential Density Guidelines (DEHLG, 1999) are the need to optimise the use of infrastructure and the need for more sustainable commuting patterns. Suitably located development land, and the infrastructure needed to support on-going development are scarce and often non-renewable resources. One of the principles of sustainable development is that the consumption of such resources should be minimised.

6.9. Land use and transport integration therefore can be achieved at the strategic level and local level by:

- Consolidation as far as practicable of population growth in existing built up areas in the GDA region, where accessibility to work, leisure and other destinations by foot, cycle and public transport is generally better;
- Location of major trip-intensive land uses in areas well served by public transport or in areas that will be well served by public transport in future¹⁴;
- Relating the scale of urban centres to public transport accessibility¹⁵;
- Location of major trip-intensive land-uses as far as practicable in defined higher-order centres (e.g. city, town or district centre);
- Relating the scale and density of new developments to current and future¹⁶ public transport accessibility, and to the scale and proximity of the nearest centre;
- Providing a mix of local services within walking distance of their surrounding neighbourhood;
- Designing all new developments with walking, cycling and public transport in mind;
- Relating maximum permitted parking provision for new developments to existing and future public transport accessibility, and proximity to the nearest centre.

6.10. In other words, new development must be more orientated towards non-car use and should underpin existing centres. Where new centres are being established,

¹⁴ As set out in the DTO's strategy *A Platform for Change*.

¹⁵ Accessibility measure based on existing and future population within a maximum public transport journey time, taking account of walk, wait and transfer time, and access delays that may occur due to lack of provision of sufficient public transport capacity.

¹⁶ As set out in the DTO's strategy *A Platform for Change*.

development should support fully integrated transport choice to, from and within such proposed areas.

How these measures can contribute to Travel Demand Management in the GDA

Consolidation

6.11. One of the most coherent themes that emerges from comparing cities across the developed world is that density of development is a major factor in determining levels of car use/dependence. Levels of private transport use are inversely related to urban density (measured as persons per hectare), with car use per person falling as densities increase¹⁷. Car use for commuting is observed to fall and the share for public transport is observed to rise in line with the degree of urbanisation. Average travel distances to work and shopping destinations are also lower in more consolidated cities¹⁸.

6.12. There has been a decline in population in many established residential areas within the Greater Dublin Area (GDA). In order to identify appropriate consolidation policies to redress the forecast population decline in established areas, the reasons for the decline need to be identified. The decline can be attributed to a number of factors including:

- Falling average household size generally;
- “Empty nest” households – most prevalent in mature residential areas dominated by a single (family) household type

6.13. Measures to encourage consolidation of population in existing built up areas might include support for and promotion of:

- Redevelopment of under-utilised sites;
- Construction of additional dwellings within the curtilage of existing dwellings;
- Review of inappropriate existing open spaces, seeking both opportunities for development, and to provide better quality open spaces with improved facilities for the local community; and
- A greater mix of dwelling types in an area, to permit up-sizing (e.g. couples and young families) and down-sizing (e.g. older people) without the need to move out of an area.

6.14. Many of these measures are already being pursued, not least due to developer initiatives driven by the strength of the residential market in the GDA at present. However, there is scope for greater local authority involvement to further promote

¹⁷ Newman P and Kenworthy J, *Sustainability and Cities: Overcoming Automobile Dependence*, Island Press, 1999.

¹⁸ Tim Schwanen, Martin Dijst and Frans M. Dieleman, *Policies for Urban Form and their Impact on Travel: The Netherlands Experience*, *Urban Studies*, Vol. 41, No. 3, March 2004.

the process, through development plan policies, which set out the general objectives and criteria under which such densification in established areas would be considered. Development plans could also identify locations where such consolidation policies would be appropriate, and where appropriate local authorities could develop Local Area Plans and Integrated Development Briefs (see Paragraph 6.45) for potential investors and developers.

Location of trip-intensive land uses in areas well served by public transport

6.15. If developments that are likely to attract a large number of trips are located in areas well served by public transport, it may be expected that more people will choose to access them by public transport. This is evident in cities that have a reasonably well-developed public transport network, Dublin included. In 2002, the public transport share for trips to work destinations in Dublin City Centre, where public transport accessibility is highest, was 37%, compared to only 3% to 6% for trips to work destinations in the outer GDA counties of Kildare, Meath and Wicklow, where public transport accessibility is lowest¹⁹.

6.16. The location of developments likely to attract a large number of trips (such as major retail, employment or leisure uses) in areas well served by public transport will make it more likely that a higher proportion of trips to the developments are made by public transport. This will have the added benefit of making best use of existing and future investment in public transport.

6.17. The optimum location of development in terms of the resultant patterns of travel will be assisted if development areas are defined in relation to highly accessible locations on public transport networks ("Public Transport Nodes"). Advice on the identification and treatment of such areas should be provided as part of the implementation of the regional planning guidelines for the Area. Critically, suitable development areas around public transport nodes need to be defined in each local planning authority's Development Plan. The delivery of this objective could then be achieved through Local Area Plans for these areas (similar to a "Transport Development Area") (setting out acceptable land uses, densities etc).

6.18. Suitable land uses for Local Area Plans focussed on public transport nodes include:

- High density housing;
- High trip generating employment activities;
- Larger retail sites;
- Business facilities, e.g. exhibition/conference centre;
- Leisure facilities, e.g. cinemas or concert hall;
- Higher and further education facilities; and

¹⁹ CSO, *Census 2002*

- Major public facilities, e.g. hospitals, civic offices etc.

6.19. A Local Area Plan prepared on this basis would typically be centred on a rail station or bus/rail interchange point, which would be surrounded by relatively high-density development, with the highest densities in the centre.

Relating the scale of urban centres to public transport accessibility

6.20. For the purposes of this report an Urban Centre is defined as the core commercial area of a city or town or village in the Greater Dublin Area. An Urban Centre will have a range of services, which may include retail, employment, institutional and other uses depending on its scale and function.

6.21. The attractiveness of an Urban Centre to the population within its travel time catchment is in general related to the scale of the centre. In order to maximise the use of public transport in accessing them, the scale of Urban Centres should be related to their accessibility by (local and regional) public transport. This can be achieved by defining, and applying through the planning process, a hierarchy of Centres, with the scale of each type of land use permitted in a Centre based on public transport accessibility to the centre.

6.22. The Regional Planning Guidelines, the Retail Planning Strategy for the Greater Dublin Area and development plans acknowledge the need for a clearly defined hierarchy of centres. A hierarchy of centres (in the RPG context meaning centres and their associated settlements) is set out in the Regional Planning Guidelines. A separate “retail centre” hierarchy is set out in the GDA Retail Planning Strategy.

6.23. From the point of view of public transport, it may be appropriate to review and refine hierarchies of centres into a common Urban Centre hierarchy, covering employment, retail, and other service provision encompassing the regional and local level, related to their accessibility by public transport. The purpose of a refined hierarchy would be to act as:

- Guidance on the location of new development, particularly major trip attracting uses, e.g. employment, retail, other services;
- A focus for higher density residential development and mixed use development; and
- A focus for co-ordinated public transport investment

6.24. In the context of the GDA, the classification need have no more than four or five levels, (which could be based on the Regional Planning Guidelines hierarchy of centres (Section 7.6 of the Regional Planning Guidelines)) e.g.:

- City Centre;
- Major Town Centre (e.g. centre of Metropolitan Consolidation Towns and Large Growth Towns);
- Town Centre (e.g. centre of RPG Moderate Growth Towns); and

- Neighbourhood/Local Centre (e.g. RPG Small Growth Towns and Villages)

6.25. The placing of each Urban Centre in the hierarchy should be related to the level of existing and future public transport accessibility. It would also need to take account of the scale of existing retail, employment, leisure and other services already present in a Centre. The Regional Planning Guidelines appear to be the appropriate place for setting out a refined hierarchy of Centres at the higher-order (city/major town centre/town centre) level. Local authority development plans are the place for setting out hierarchies at the lower order level, together with the higher-order Centres for that authority as set out in the Regional Planning Guidelines. The function and scale of an Urban Centre may evolve over time in line with the development of the network of public transport services serving a Centre.

6.26. The Regional Planning Guidelines introduce the concept of “dynamic clusters”, which can be visualised as groupings of complementary Urban Centres (including associated settlements), with the objective of supporting employment and enterprise growth. Generally, regional public transport will serve higher-order Urban Centres within dynamic clusters. Local public transport will link the Urban Centres within the dynamic cluster.

Location of key destinations in defined Urban Centres

6.27. The grouping of key attractions in a defined higher-order Urban Centre provides the opportunity for multi-purpose trips to the Centre. Within the Centre, people can make these trips on foot. Indeed the opportunity to work, shop and socialise in the one place, without the need to travel elsewhere, is one of the key attractions of higher -order Centres. By avoiding the need to travel to several different destinations, overall travel demand can be reduced.

6.28. Some traditional Urban Centres, for example, the City Centre, have a good mix of employment, retail, leisure and other services. Many Urban Centres however lack the mix or scale of uses corresponding to their function. For example, many Hinterland Centres do not currently have a good range of employment or comparison retail uses. Also, while newer Centres in the Metropolitan Area tend to have a better range of retail uses, there can be a limited range of employment opportunities within walking distance.

6.29. The GDA Planning Authorities need to ensure that adequate provision is made, in the defined Centres, for employment (especially employment-intensive uses such as offices), retail, leisure and other services. Some retail and employment uses are less suitable for Urban Centres (e.g. where good road access is required to transport heavy/bulky items or for distribution purposes). Where these uses are likely to attract relatively large numbers of trips, they should be located as close as possible to the defined Urban Centre. Low employment-intensive distribution based uses should not be located in urban centres, their primary location consideration being accessibility to the strategic road network.

6.30. The geographical boundaries of Urban Centres should be defined on the Planning Authority development plans. As an overall guiding principle, key land

uses likely to attract large numbers of person-trips should be located within comfortable walking distance of each other. Development Plans should include an objective to improve the safety and comfort of those who walk to centres.

Relating development densities and scale to existing and future²⁰ public transport accessibility²¹ and proximity to nearest centre

6.31. Considerable opportunity for urban consolidation may exist in areas that have good public transport accessibility. This is because the capacity to move people into and out of these areas from the surrounding areas, without adding to road congestion, will be greater than elsewhere. Areas close to higher-order centres (e.g. town centres and the City Centre - see Paragraph 6.24) also provide good opportunities for consolidation because of the opportunity to make multi-purpose trips without the need to travel long distances, and the greater scope for using non-car modes to access the centre.

6.32. The Residential Density Guidelines, published by the Department of the Environment and Local Government in 1999, set out residential density standards appropriate for development on public transport corridors and in proximity to town centres. Within the GDA, where the public transport network is generally better than elsewhere in the country, higher minimum densities for certain locations should be specified by local authorities, related to their public transport accessibility.

6.33. Regional guidelines on appropriate retail and employment densities, related to public transport accessibility, should also be developed initially in the form of a regional guidance/advice note, which may ultimately be incorporated into the Regional Planning Guidelines for the Mid East and Dublin Regional Authorities.

6.34. Densities could be specified at a regional level with the acknowledgement that they may not always be achievable due to site-specific constraints, for example in areas of high amenity. Such constraints should be listed in the guidance note to foster consistency of application across the planning authorities. Local authorities should then specify minimum densities for areas in their development plans, taking into account local site constraints.

6.35. Ensuring developments are appropriately located is a necessary but insufficient condition to promote sustainable travel. Each individual development also needs to be designed according to integrated transport and land use principles if travel demand management is to be promoted. Paragraph 6.36 to 6.57 set out appropriate land use measures for travel demand management, once a location for a development has been decided upon.

²⁰ As set out in the DTO's strategy *A Platform for Change*

²¹ Accessibility measure based on existing and future population within a maximum public transport journey time, taking account of walk, wait and transfer time, and access delays that may occur due to lack of provision of sufficient public transport capacity.

Providing a mix of local services within walking distance of their surrounding neighbourhood

6.36. If local services (e.g. convenience store, crèche, primary school, pharmacy, doctor's surgery, community centres, post offices, pubs, etc.) are within walking distance, along a safe and well-designed route, many local trips can be made on foot. Most parts of Dublin's City Centre and its inner suburbs, as well as older towns and villages in the GDA, have local services that are only a short walk away. However, much of the new housing of the past 30 years has not been built with this in mind. Distance to local services is perceived as not conducive to walking and cycling, and as a result many local trips are made by car.

6.37. There is often a lengthy delay between new residential development, and the delivery of required neighbourhood facilities such as crèches/primary schools or medical centres. The Department of Education and Science and Department of Health and Children are responsible for the funding of these facilities. It is important that greater coordination takes place between local authorities and these government departments to ensure timely provision of the required facilities.

6.38. Where a new housing development is provided away from existing local services, it is critical that local services are provided as an integral part of that development. In existing residential areas where these services are not currently provided for, the planning authorities should seek opportunities for the provision of these services, having regard to their resource constraints.

6.39. The Local Area Plan is the most effective statutory planning instrument for the delivery of services at the local level, and can apply to both new and established areas.

Designing developments with walking, cycling and public transport in mind

6.40. For walking, cycling or public transport use to become popular choices, new developments need to be designed with non-car user needs in mind. If a journey on foot requires a circuitous route through a development (because of a long boundary wall surrounding the development site, for example) then it is much less likely to be made on foot. Furthermore developments that do not properly facilitate access to local bus stops and train stations on foot or by cycle will have an adverse impact on public transport use. Besides distance, other important considerations for an attractive route are quality and safety.

6.41. All new developments should be designed with ease and safety and security of access for pedestrians, cyclists and public transport users in mind. In addition, where serious barriers to movement currently exist, measures to provide more direct access should be actively considered. In some cases this may include re-development of sites that act as serious barriers.

6.42. Greater guidance on development design is required to ensure that development control and advice to encourage sustainable travel is undertaken consistently in all planning authorities.

6.43. Design considerations appropriate for large residential developments are set out in Table 6.1. They should be taken into account wherever possible. It is particularly important to design the layout of large-scale development in a public transport friendly manner.

Table 6.1: Design considerations for larger residential sites

Design Consideration	Description
New and Existing Routes and Desire Lines	Both within the site and across the whole of the site perimeter so that pedestrian movement is uninterrupted by vehicle based layout, cul-de-sacs or boundary walls.
Direct, Secure and Attractive Pedestrian and Cycle Linkages	Linkages to strategic, local and neighbourhood amenities and transport routes, shops, places of work, entertainment, schools and colleges.
Efficient and Attractive Public Transport	Connecting discrete communities and neighbourhoods to local and central facilities such as shops, places of work, entertainment, schools and colleges.
Safe Movement for all Modes of Transport	Motorised, pedestrian, cycle; pedestrian and cycle routes integrated with the mainstream of movement patterns, keeping cyclist and pedestrian movement as an integral part of road and street patterns. Public transport priority provided where advantageous for users.
A Quality Street Environment	Which helps to integrate the spatial needs of differing modes of movement, pedestrian, vehicular and cycle.
(Source: based on "Sustainable Residential Quality – Exploring the Housing Potential of Large Sites, Llewelyn-Davies, January 2000, page 53.")	

6.44. The above design considerations should also apply for "destination" developments, such as new workplaces, educational establishments and retail areas. In addition, it is highly desirable that the pedestrian entrances of buildings in these types of developments should be in close proximity to roads, or front directly onto them, particularly where public transport is provided along that road.

6.45. It is further recommended that local planning authorities prepare Integrated Development Briefs (IDBs) for strategically important residential or mixed-use sites in their area, where considered appropriate by the local authority. This would depend on developer cooperation with the process. Integrated Development Briefs, which should not be confused with Strategic Development Zones, would focus in particular on design around facilities for walking, cycling and public transport. These would provide the detailed site design requirements consistent with the local authority Development Plan and Local Area Plan objectives. Ideally, they would be prepared after the adoption of a Local Area Plan for a wider neighbourhood. Integrated Development Briefs would provide a valuable framework for developers

for planning application purposes, by setting out the desired design and layout of a development, from the local authority point of view.

6.46. A typical process for creating Integrated Development Briefs could comprise two stages. During the first stage, the policy context and design considerations would be defined and forwarded to the applicant by the Local Authority, in advance of a planning application. During the second stage, the developer could undertake consultation and prepare options for consideration by the local authority in advance of a planning application.

6.47. A modified IDB approach would also be appropriate for important non-residential sites in each local planning authority area. Such IDBs could set out a desired approach for grouping together common and complementary uses (e.g. clustering employment uses with local shops, cafeterias or child-care centres). This could make an important contribution towards reducing the need to travel, and studies²² have shown that levels of car travel to and from employment centres in particular tend to decline if designed in this manner.

Relating maximum permitted parking provision for new developments to public transport accessibility, and proximity to nearest centre

6.48. Parking supply acts as an important constraint on car travel, and there may be scope to reduce the parking provision in new developments, especially if they are well served by public transport. In addition, if a development is located close to or in a higher-order centre that can be easily accessed by other non-car modes, there is a case for providing less parking for that development.

6.49. Many current development plans specify residential and commercial parking standards that must be met by a developer, with the intention of providing fully for car demand. Parking supply at a destination is a key factor for many when deciding how to travel, especially for the journey to work.

6.50. In the City Council area, a maximum office-parking standard, based on public transport accessibility, of 1 space per 400 sq. m is applied in the City Centre, and other areas with good public transport accessibility, with 1 space per 100 sq. m applied in the least accessible areas. However, office parking standards in the GDA outside the Dublin City Council area are much more generous. They range between 1 space per 50 sq. m and 1 space per 20 sq. m gross floor area, and typically provide for the majority of the workforce to access the workplace by car. Some, but not all, parking standards outside the City Council area are expressed as maxima.

6.51. By comparison, office parking standards in Greater London are expressed as maxima across the region, and range from a maximum of 1 to 1000 sq. m. gross floor area in Central London to a maximum of 1 to 100 sq. m. gross floor area in Outer

²² One study (Davidson 1994, cited by the Victoria Transport Policy Institute) found that the presence of worksite amenities such as banking services, on-site childcare, a cafeteria, a gym and postal services reduced average weekday car travel by 14%, due to a combination of reduced errand trips and increased trip linking.

London²³. Outside Dublin City Centre, new retail parking provision is directly related to floor area. As the scale of some retail centres located close to the M50 grows, the ready supply of parking spaces, which are usually not charged for, has a significant impact on local road congestion, and congestion levels on the M50.

6.52. The DTO recommends maximum levels of permitted parking provision for new developments to restrain parking supply in the GDA.

6.53. It is further recommended that all parking standards currently treated as minima in local authority development plans, or not specified as minima or maxima, should be replaced by maximum parking standards. In determining appropriate parking levels, allowance is made for greater flexibility in special circumstances in certain parts of the Hinterland Area, on a case-by-case basis. Each case should be justified against the background of the general policy of relating development location to (existing and future) public transport accessibility.

6.54. It is recommended that parking provision for new developments in the GDA should not exceed the maximum standards set out in Table 6.2. It is recommended that the maximum standards set out in Table 6.2, or similar standards which may provide for less parking for certain uses, should be incorporated into local authority development plans. It would be appropriate to apply more restrictive maximum parking standards than the regional maximum in the Metropolitan area of the GDA and in areas with good public transport accessibility. For example, a more restrictive level than 1 space per 50 sq. m may be appropriate for office development within the Metropolitan Area.

6.55. A similar approach to this is in place in the UK where national maximum parking standards are defined in policy guidance (similar to those set out in Table 6.2), with more restrictive standards in many regions, and local authority areas, where transport choices are greater.

Table 6.2: Proposed Maximum Regional Parking Standards (non residential use)

	Maximum Parking Standard (per gross floor area unless otherwise specified)	Threshold from and above which standard applies (gross floor space)
Employment, including offices	1 space per 50 m ²	1,500 m ²
Food retail	1 space per 14m ²	1,000 m ²
Non food retail	1 space per 20 m ²	1,000 m ²
Cinemas and conference facilities	1 space per 5 seats	1,000 m ²
Higher and further education	1 space per 2 staff + 1 space per 15 students	2500 m ²
Stadia	1 space per 15 seats	1,500 seats

6.56. At the GDA local planning authority level, it is recommended that:

²³ Insufficient data on parking standards in other European cities is available to make a meaningful comparison

- Non-residential parking standards should be specified as maximum parking standards (already the case in some local authorities);
- More use-specific parking standards than those in Table 6.2 above should be specified (e.g. separate standards for office, industrial and warehousing use, and for different user types (e.g. staff, visitors, deliveries, etc.));
- Non-residential parking standards should be reviewed in the light of the regional maximum specified for each use, and amended as appropriate. Parking standards should be more restrictive than regional standards in certain areas, particularly within the Metropolitan area and where public transport accessibility is good;
- Residential and non-residential parking standards should be reviewed and amended to be similar to those in the City Council area for areas in other local authorities that have equivalent levels of public transport accessibility and provision of local services; and
- Consideration should also be given to capping the level of parking in major town centres outside the City Centre. (Charges could then be introduced by the town centre car park operator(s), to ensure a continuing balance between demand and supply of parking spaces, and to reduce local congestion caused by cars queuing to access a parking space); and
- Reduced residential parking provision (including “no car” residential development) should be permitted in certain circumstances, allowing for the following factors:
 - Whether the development proposes a type of housing that is characterised by low car ownership;
 - Whether the level of public transport access is high; and
 - Whether the proposed development is in an area with a residents’ parking scheme or other on-street parking controls.

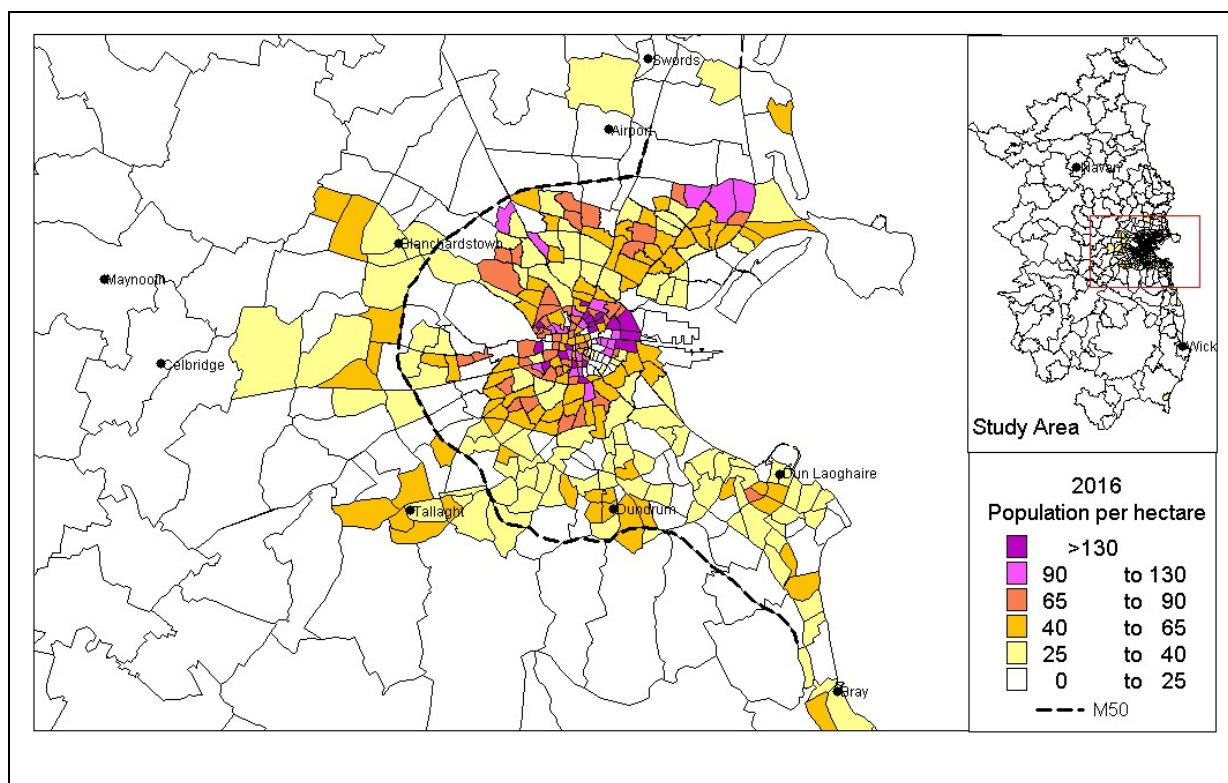
6.57. Notwithstanding the above, appropriate minimum parking standards for disabled car users will need to be specified by each local authority, and incorporated into the maximum permitted overall car parking standard for each land use.

Modelling the Potential Impact of Certain Land Use Measures

6.58. To provide a basis for the land use planning analysis, the DTO developed population projections for the year 2016, in consultation with the local authorities. These projections were compatible with the Strategic Planning Guidelines’ (SPG) forecasts at the county level but may require some revision in light of the adoption of the Regional Planning Guidelines. The data are presented in Appendix K.

6.59. Figure 6.1 shows the forecast population density (population per hectare) for most of the metropolitan area of the GDA in the year 2016, with the “base” scenario population projections. It indicates that, in response to recent changes in planning policy and practice, areas of high residential density are emerging – notably in the City Centre, Docklands, North Dublin and some other development sites.

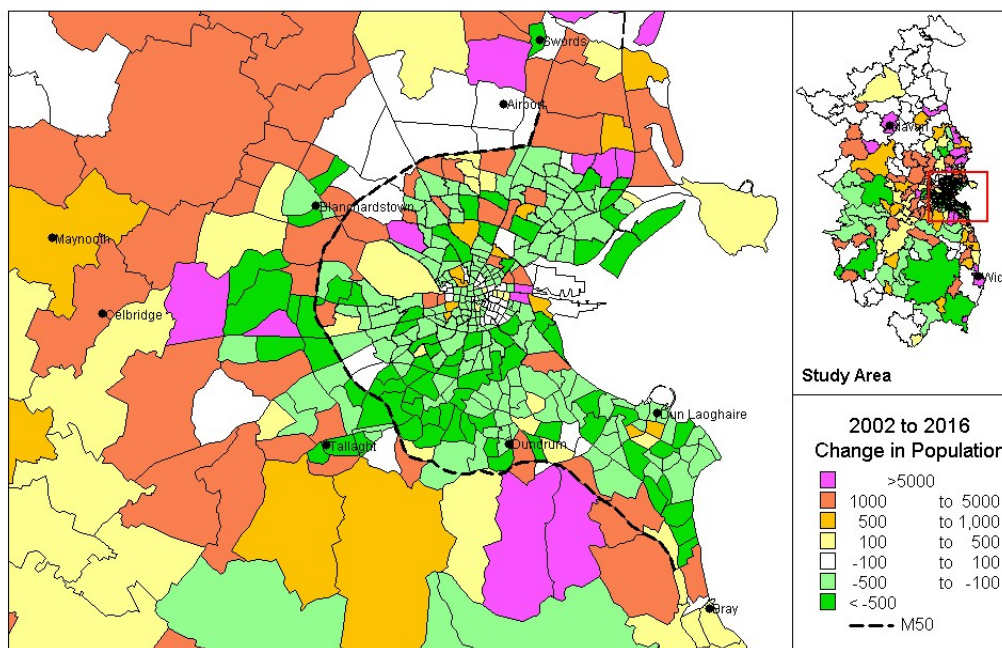
Figure 6.1: Projected Population Density in the GDA in 2016 (persons/hectare)



6.60. Overall, the population of the GDA is projected to grow by 18% in the period 2002 to 2016. The overall growth comprises areas of growth and areas of decline, as shown in Figure 6.2.

6.61. Increases in population are forecast to take place outside the M50, and where there is undeveloped land available along the M50. Large increases in population are forecast for the Development Centres in the Hinterland. Pockets of future residential development are also apparent on brownfield sites in dockland areas and to the west of the City Centre. There are also some greenfield opportunities within the existing urban area, more commonly to the north of the city.

Figure 6.2 Changes in Population in the GDA 2002 to 2016



Consolidation

6.62. A scenario for redressing population decline in established areas was developed for the purpose of assessing transport impact. This assumed that, by 2016, decline in those areas where decline is predicted would stabilise at 90% of the 2002 population. There would be a corresponding reduction in growth elsewhere as a lower level of new development would be required to accommodate the same overall population growth in the GDA. Areas of the GDA not currently served by suburban rail/DART were targeted for reduced growth. Details of the analysis are provided in Appendix K. The outcome from the scenario would be slightly increased growth in the City Council and South Dublin areas and slightly reduced forecast growth in the other counties. The analysis showed that, with no consolidation in established areas, some 55,000 of the growth in population to 2016 could be housed in areas that were poorly served by public transport, while the population level would decline in areas where investment in suburban rail/DART, Luas and bus services/routes, is occurring. With the suggested scenario, more growth could be accommodated within the rail, Luas and Metro corridors such that some 15,000 less people would be housed in areas poorly served by public transport, in the year 2016.

Intensified Development along Public Transport Corridors

6.63. A second scenario was developed which intensified development in the parts of the GDA that are best served by public transport. This redirected future population and employment growth in the period 2008 to 2016 away from areas that are poorly served into growth areas that are currently served by suburban

rail/DART. In other words, new residential and business development in rail corridors would be more intensive than envisaged in the “Base” scenario. Details of the analysis are provided in Appendix K. The outcome of the scenario would be that, over the period 2008-16, an additional 38,000 of the GDA’s future residents could be housed in areas with good public transport access. Similarly, some 9,500 more jobs could be located in areas with good public transport access.

Transport Impact

6.64. Table 6.3 shows the transport impact of the land use planning scenarios. By comparison with the base situation for 2016, the scenario of urban consolidation would reduce total morning peak hour (8am-9am) vehicle hours by 3% across the entire GDA, and vehicle-km by 2%. Intensifying development in rail corridors would reduce total morning peak hour (8am- 9am) vehicle-hours by 2% and vehicle-km by 1%. The effect is strongest outside the M50 where urban consolidation would reduce vehicle hours by 5% and vehicle-km by 2%, and intensification of development in rail corridors would reduce vehicle-hours by 3% and vehicle-km by 2%. The inner areas, particularly within the canals, are forecast to experience an increase in both vehicle-hours and vehicle-km under either scenario, as increased population and employment in those areas would result in some increase in car travel as well as travel by other modes. This effect is off-set by the wider reductions in vehicle-hours and vehicle-km in the GDA as a whole.

Table 6.3 Transport Impact of Land Use Planning Measures

Comparison with the base situation in 2016 during the AM Peak (8am – 9am)								
	All GDA		Inside Canals		Between canals and M50		Outside M50	
	Veh-hrs	Veh-km	Veh-hrs	Veh-km	Veh-hrs	Veh-km	Veh-hrs	Veh-km
2016 Base: No land use planning measures (see Table 2.3)	299,022	8,062,699	14,125	157,844	69,188	1,432,517	215,710	6,472,338
2016 with urban consolidation	289,355	7,893,517	14,549	159,150	69,386	1,421,101	205,421	6,313,266
Reduction	9,667	169,182	-423	-1,305	-198	11,416	10,289	159,072
% Reduction	3%	2%	-3%	-1%	0%	1%	5%	2%
2016 with intensified development in rail corridors	293,785	7,956,311	14,539	158,379	69,528	1,422,934	209,718	6,374,998
Reduction	5,237	106,389	-414	-534	-340	9,584	5,992	97,339
% Reduction	2%	1%	-3%	0%	0%	1%	3%	2%

Actions and Leading Agencies

6.65. The proposed measures to manage travel demand through the planning system could be implemented, in the first instance, through:

- A review of the appropriateness, from the point of view of public transport, of refining existing hierarchies of RPG and retail centres into a common hierarchy for Urban Centres (as defined in this report), covering employment, retail, and other service provision, related to their accessibility by public transport (led by RPG Implementation Steering Committee/Implementation Team);
- Reviews by the GDA local planning authorities of employment, retail, leisure and other services provision in higher-order Urban Centres (as defined in this report), and amendment of City and County Development Plans as necessary;
- Review by local planning authorities of current local retail and other commercial service provision, and amendment of Development Plan where appropriate to provide for additional local services;
- Preparation of a regional guidance note on minimum development densities related to public transport accessibility and proximity to nearest centre (with the proviso that they may not always be achievable due to site-specific constraints, for example in areas of high amenity or landscape value) (led by the RPG Implementation Steering Committee/Implementation Team);
- Subsequent translation by local planning authorities of guideline densities into more specific minimum development densities for areas defined in their development plans, taking into account local site constraints;
- The development of regional guidance/advice notes on the design of developments with walking, cycling and public transport in mind (led by RPG Implementation Steering Committee/Implementation Team);
- Preparation by local planning authorities of Local Area Plans for sites that are, or will be, highly accessible by public transport;
- Expansion of the use by local planning authorities of “Integrated Development Briefs” for key residential, mixed use or other sites in their functional areas;
- Active identification by local planning authorities of sites within built up areas, which have potential for intensification of development, and

of areas of poor quality open spaces that could provide opportunities for rationalisation, including development, combined with qualitative improvements in terms of urban design and local amenity provision;

- Promotion by local planning authorities of a greater mix of housing sizes in an area, through Local Area Plans, and other means;
- The adoption of maximum parking standards by all GDA local planning authorities ;
- The incorporation of maximum guideline parking standards (as set out in Paragraph 6.55 above) into local authority development plans ; and
- The adoption by the GDA local authorities of more restrictive location-specific maximum parking standards for the Greater Dublin Area, in particular the Metropolitan Area and areas of high public transport accessibility.

Glossary

Dynamic Cluster: A concept contained in the GDA Regional Planning Guidelines which can be summarised as a grouping of mutually dependent urban centres and associated settlements (as defined by the RPGs Section 7.6) within the Greater Dublin Area, with complementary functions.

Urban Centre: For the purposes of this report an Urban Centre is defined as the core commercial area of a city or town or village in the Greater Dublin Area. An Urban Centre will have a range of services, which may include retail, employment, institutional and other uses depending on its scale and function.

Retail Centre Hierarchy: Retail centres as defined in the GDA Retail Planning Strategy (November 2001) hierarchy of Retail Centres (Figure 5.1 and Table 5.2):

1. Dublin City Centre
2. Metropolitan Area: Major Town Centre. Hinterland Area: County Retail Centre
3. Metropolitan Area: Town and/or District Centres. Hinterland Area: Sub-County Retail Centres
4. Metropolitan Area: Neighbourhood Centres. Hinterland Area: Local Retail Centres.
5. Metropolitan Area: Corner Shops. Hinterland Area: Rural Villages/Shops

Transport Development Area: Defined by the UK RICS (Royal Institute of Chartered Surveyors) as 'An integrated land/use planning approach operating around urban public transport interchanges or nodal points well served by public transport in which a more specific relationship between development density and public transport service level is instituted.'

Public Transport Accessibility: Measure of ease of access to a defined destination (e.g. Urban Centre) based on the (existing or future) population within a defined public transport journey time. The measure takes account of walk time, wait time including boarding delays that may occur due to lack of provision of sufficient public transport capacity and transfer time.

7 Measures to Promote Travel Demand Management

Introduction

7.1. The application of incentives, marketing initiatives or other “soft” measures to promote travel demand management have been considered in terms of their potential to reduce car use for journeys to work and to education. They focus on the workplace, schools, ICT applications and the possible role of marketing.

Workplace Travel Plans

7.2. The rationale behind the focus on the commuter trip and the workplace has already been outlined in Section 3 of this report. In brief, for every car trip to school, there are four car trips to work²⁴, so it makes sense to tackle this demand as a priority.

7.3. Potential components²⁵ of workplace travel plans, or *Mobility Management Plans*²⁶, may include:

- Working with employees to address perceptions, fears and practical difficulties in overcoming car dependency;
- Establishing databases to assist ridesharing;
- Developing car pooling schemes;
- Providing shuttle services to nearby rail or bus services;
- Putting in place on-site²⁷ measures to make cycling and walking safer and more attractive, e.g. footpaths, cycle lanes, crossings, secure cycle parking;
- Providing incentives to use non-car modes;
- Introducing staggered or flexible working hours so that employees can avoid travel in the peak hour;
- Allowing compressed working weeks so that employees work a four day week, or nine day fortnight, but a longer day;
- Promotion of working at home, teleworking or working at another site to employers and assistance or technical support with implementation;

²⁴ CSO, Census 2002, Volume 9, Travel to Work, School and College. *Some of these are linked trips which include a school drop-off.*

²⁵ More details of component measures are provided in Appendices F, G, and H and in the Interim Report (May2003)

²⁶ The term *Mobility Management Plan* can be used generically to cover any situation e.g. office, shopping centre, school

²⁷ Outside the site, it will be the responsibility of the local authority to provide these facilities, possibly funded through developer contributions as part of the Planning and Development Act Section 48/49 Developer Levy Scheme.

- Reducing the amount car travel undertaken for work purposes by increasing the use of telecommunications;
- Introducing travel allowances and reimbursements that encourage non-car travel as a replacement for the current arrangements in some organisations which act as a financial incentive to unnecessary use of cars for commuting and business trips; and
- Restricting parking, e.g. giving priority for parking to car sharers or individuals with certain needs - many successful travel plans are driven by a shortage of on-site parking.

7.4. In the longer term, employers' recruitment policies can also be included in the workplace travel plan. For example, employers can target employment in local areas, particularly those served by public transport. A local workforce helps reduce overall commuting distances and is more likely to generate sustainable travel to work patterns. Employees can also be recruited with the understanding that free parking is not provided. Additionally, relocation policies can be incorporated in the long term workplace travel plan so that any relocation of the workplace is to a site that is accessible by non-car modes.

7.5. A workplace travel plan is, in effect, a site-specific (or multi-site in the case of some employers) demand management plan to which the packaging principles apply. Workplace travel plans can also cover more than one employer, for example, at the East Point Business Park, one plan serves all the employers located within the park.

Impact of Workplace Travel Plans

7.6. Research in the UK²⁸ has explored the potential impact of workplace travel plans on a national basis by considering firstly the individual impact of plans and secondly the rate of adoption of plans by companies.

7.7. In terms of the impact of individual plans, international experience shows that about a 15% reduction in car travel is achievable with a comprehensive plan, as shown in Table 7.1 which summarises the review of experience with workplace travel plans in the UK, the Netherlands and the US where plans have been operating for longer.

²⁸ *"Less Traffic where People Live: How local transport schemes can help cut traffic", Lynn Sloman, Transport for Quality of Life, April 2003*

Table 7.1 Effectiveness of Workplace Travel Plans

Country	No of. Travel Plans Reviewed	Results
UK	20	Reduced the number of commuter cars by more than 14 per 100 staff
Netherlands	40	Basic plans (e.g. car-sharing schemes): 6-8% reduction in vehicle-km Extensive plans (e.g. with measures such as works buses or parking restrictions): 15-20% reduction in vehicle-km
US	49	Average car trip reduction: 15%. Average car trip reduction from plans that: <ul style="list-style-type: none"> provided only information: no effect supplied alternatives to the car: 8.5% included a financial incentive: 16.4 % provided financial incentives and alternative services: 24.5%.
US and Netherlands	20 paired case studies	US: vehicle trip reduction rates: 6.4% - 49.4%, average of 19% NL: reductions in vehicle-km: 6% - 32%, average 19%.

Source: Sloman (2003), based on literature review undertaken for UK Department of Transport (Transport 2000, ESRC Transport Studies Unit and Adrian Davis Associates, 2002)

7.8. There has been a high rate of implementation of travel plans in the UK amongst public sector companies. Some 69% of local authorities and 62% of hospitals were reported to have a travel plan in place or to be actively developing a plan, as shown in Table 7.2. By contrast, only 7% of private sector businesses had a plan or were developing one. Size of company has a great influence on interest in travel plans and it is notable that local authorities and hospitals frequently have thousands of employees. Within the private sector, some 21% of businesses with more than 300 employees were reported to have a plan, compared with 2% to 4% of smaller companies.

Table 7.2 UK Employers with a Travel Plan, 2001

Type of Employer	Have a travel plan or are developing a plan	Have considered a plan but have taken no action, or are thinking about a plan	Not considering a travel plan
Local authorities	69%	22%	8%
Private Businesses	7%	4%	89%
Hospitals	62%	22%	16%
Third Level Education	52%	10%	38%
In addition to these employers, more than 1000 buildings occupied by government departments, executive agencies and regional government offices have drawn up travel plans			

Source: Sloman (2003) based on research for DTLR (Steer Davies Gleave, 2001) drawing on responses from 293 local authorities, 554 businesses, 45 hospitals and 29 colleges of higher education. Percentages may not total 100% due to rounding.

7.9. Sloman used this evidence to forecast that, by the year 2010, workplace travel plans might cover around 15% of the workforce in England and that these workplace travel plans would cut single occupancy car trips to work by an average of 14 per 100 staff. To deliver this scenario, a determined effort to roll-out current best practice would be required, facilitated by additional local authority travel plan co-ordinators, with continued government support. Sloman also outlined a more ambitious scenario where 30% of private sector companies were persuaded to

introduce travel plans by 2010 – possibly due to incentives (support from local authorities or fiscal incentives), regulatory change, or the introduction of a workplace parking levy.

Application in the GDA

7.10. The concept of workplace travel plans, or Mobility Management Plans (MMPs), has been in existence in the GDA for some time, and many plans have been devised in support of planning applications. A few successful plans are well known, notably the Eastpoint Business Park plan. Other major employers are interested in developing travel plans, typically driven by a shortage of on-site parking supply or local traffic congestion issues. Some plans that were devised at the planning stage have fallen short of expectation. In general, however, lack of formal monitoring has meant that little is known about the implementation of many of these plans.

7.11. In summary, the current proportion of workers in the GDA that is covered by a workplace travel plan is negligible and there are no signs that significant growth can be expected in the short term. In the longer term, with co-ordinated efforts to deliver plans, it may be that Sloman's forecast of 15% coverage of workers in the UK by 2010 would also apply in the GDA by 2016. In the shorter term, to 2008, a modest increase of up to 5% would be a potential target. It could be expected that each workplace travel plan would reduce the number of car trips to that workplace by 15%, in line with international experience.

Workplace Travel Plans within the Public Sector

7.12. A fresh impetus is needed if successful workplace travel plans are to be implemented more widely throughout the GDA. An important step in this direction would be overcoming the perception that workplace travel plans, or mobility management plans (MMP), apply to the private sector only. In the UK, as shown above, workplace travel plans are far more common in the public sector than the private sector, and within the private sector workplace travel plans are found mainly in the larger companies. In the GDA, no public sector bodies have a plan at present, although it is noted that the City Council already have taken measures to encourage cycling and teleworking and that Dun Laoghaire Rathdown Council provides bicycles for staff to borrow for business trips.

7.13. It is recommended that plans be established within each local authority, for its own workforce. This would achieve multiple objectives. Firstly, it would reduce travel demand and therefore reduce congestion locally, as each authority is a major employer in its own area. Secondly, it would set an example to other employers in its area and provide more leverage in negotiating plans with employers and developers. Finally, it would develop in-house experience in the implementation of workplace travel plans in order to provide practical guidance to employers in the area.

7.14. An efficient and practical approach may be for one authority to develop an initial travel plan. This could be used as a blueprint for others. Based on that experience, practical guidelines could be set out to complement the DTO guide²⁹. Nominated travel plan co-ordinators in other local authorities could then be trained. There would be several advantages in Dublin City Council acting as the lead local authority. Firstly, it is the biggest employer and consequently could have the biggest impact. Secondly, travel choices in the City Council area are more extensive, so a plan may be easiest to establish there and, finally, the commercial advantages in relinquishing parking supply may be greater in the city council area. Alternatively, another, smaller, local authority could be selected to lead the way, and other advantages can be identified. For example, South Dublin Co. Co. has already started to develop a plan, in response to the opening of Luas at its headquarters in Tallaght. Fingal Co. Co. could link its plan to the on-going relocation of staff. Dun Laoghaire Rathdown Co. Co. could establish a plan relatively easily as the offices are in accessible locations in both Dun Laoghaire and Dundrum.

7.15. Following this year's local elections, each local authority will need to prepare a Corporate Strategy Plan before the end of the 2004. This represents an opportunity to develop travel awareness and to commit to the introduction of a workplace travel plan.

7.16. For consistency and to show leadership, other public sector employers would also need to establish workplace travel plans. As a blueprint for wider action, workplace travel plans could be developed for the workforces in the agencies most directly involved in promoting sustainable transport choices, notably the Department of Transport and the DTO. The Department of the Environment would be another candidate agency for early adoption of a travel plan. It is also recommended that a blueprint travel plan be established in one of the public sector bodies that employ a large proportion of shift-workers, e.g. one of the CIÉ Group companies, RTE, the Gardaí or a hospital. Shift workers are typically more car dependent because they have less travel choice and consequently a travel plan is more important for these groups, albeit challenging to prepare.

7.17. Once the lead authority has an operational travel plan, travel plans would be instigated in the other authorities, and the lead authority would begin a campaign of encouraging employers to put in place travel plans in advance of the potential workplace parking levy and congestion charging measures. When the other authorities have their plans up and running, they should begin similar campaigns with local employers groups.

Car Allowances and Mileage Allowances

7.18. In many public sector organisations, the existing arrangements for car allowances and/or car mileage rates are such that it is financially rewarding to choose the car over other modes. It is recommended that these arrangements be

²⁹ "The Route to Sustainable Commuting": An Employers Guide to Mobility Management Plans, DTO, 2001

amended in favour of a mode-neutral travel allowance that allows employees to choose the most efficient means of travel for their work, without financial penalty.

7.19. Changes to the car allowance system should be incorporated in the workplace travel plan development. Complete achievement of these changes should not be seen as a necessary condition for a workplace travel plan because any robust plan should be capable of implementation in manageable stages.

Dynamic Process

7.20. All workplace travel plans, across all sectors, should be continuously evolving and improving in response to changing opportunities, changing traffic conditions, changing transport supply and in response to on-going monitoring of the plan. Travel plan coordinators should consider adding measures to the plan over time, or removing measures that are not successful. Research undertaken in the UK³⁰ has concluded that all employers, whatever their starting point, can achieve reductions in staff car use.

The Role of the Private Sector

7.21. Local authorities would continue to work with developers/employers to ensure that workplace travel plans are established as part of the planning process. Increased resourcing and experience should ensure improved enforcement and monitoring of plans once developments are operational.

7.22. Increased demand for workplace travel plans from existing private sector employers would be expected in response to travel awareness campaigns, increased pressure on parking and road capacity, and proposals for workplace parking levies and/or congestion charging. Local authorities would need to reach out to employers to offer assistance in developing plans, and this could be best achieved through Chambers of Commerce, IBEC and other business groups, stressing the benefits of a happier, healthier workforce.

7.23. Research in the UK found that the adoption of travel plans amongst private sector businesses is low overall, but that bigger companies are much more likely to have a travel plan, or to be developing one (31% of companies with over 300 employees as opposed to 2% of companies with less than 50 employees).

Third Party Agreements

7.24. It was reported during the consultation for this study that mobility management plans that had been negotiated between the developer/employer and the local authority as a planning condition had, in some cases, failed to materialise because the public transport had not been delivered. This situation represents a

³⁰ Sloman (2003), based on UK Department for Transport research (2002)

fundamental misunderstanding of the MMP, which is a contract/planning condition between the developer and the local authority and which is not enforceable if it involves a third party. If, for example, the agreed travel plan includes a shuttle bus from a local railway station to the site, the planning condition should require the employer/developer to provide a licensed bus service, at an agreed frequency, for an agreed length of time.

Resourcing

7.25. The introduction of effective workplace travel plans throughout the GDA would be a major effort, requiring resources which would include:

- Workplace travel plan co-ordinators in each local authority and Government Department to co-ordinate and monitor the internal travel plans; and
- Workplace travel plan units within each local authority or, alternatively, in a central agency such as the DTO, that work with developers and employers, advising on how to establish a plan, co-ordinating efforts throughout the area, and monitoring travel plans post implementation

7.26. At least one travel plan coordinator would be required within each local authority. More should be considered in the City Council and Dublin Counties. The Government could offer bursaries to local authorities for travel plan co-ordinators. This could function in a similar way to the financing of local environmental enforcement staff that are part funded by the Department of Environment Heritage and Local Government through the Environment Fund.

7.27. The costs of resourcing the workplace travel plan initiative have been taken into account in the overall economic and financial appraisal and are set out in Section 10 of this report.

Timescale

7.28. Although the implementation of workplace travel plans would be an on-going process, it is envisaged that within three years of obtaining the resources, all the main public sector organisations in the GDA could have a workplace travel plan in operation. It is also envisaged that the private sector, through IBEC, etc., would be involved in the initiative and that the local authorities would have the resources and expertise to assist the private sector in creating plans.

Traffic Engineering

7.29. In numerous locations throughout the GDA, employees cannot be expected to seriously consider walking or cycling to work until it becomes a safer, more attractive alternative. Retrofitting the road network to provide footpaths, pedestrian crossings, safe junction arrangements, etc. requires a great deal of traffic engineering

effort, the time and cost of which is typically underestimated. Guidance on how to approach such work is available in the *DTO's Traffic Management Guidelines Manual* (May 2003), and local authorities should aim to be improving the environment for pedestrians and cyclists as part of their overall work programme.

Risks to Implementation

7.30. Based on experience to date, there is a risk that adoption of workplace travel plans would be slow unless pro-actively encouraged. There is also the risk of underestimating the level of detail required, and consequently underestimating the resources needed. The introduction of workplace parking levies or other fiscal measures could reduce the risk of slow implementation. Additionally, in the longer term, the reduced workplace parking supply that will arise from the proposed changes to parking standards will generate demand for workplace travel plans.

School Travel Plans

7.31. School travel plans are school based implementation plans designed to overcome the barriers for pupils to walk, cycle or take public transport to school. School travel plans may include some or all of the following measures:

- Working with teachers, pupils and families to address perceptions, fears and practical difficulties in overcoming reliance on the car and agreeing a school policy to actively promote sustainable school travel;
- A toolkit of practical measures including walking, cycling, training, encouraging bus use, car sharing, incentive schemes, curriculum based promotion and managing parking and drop off; and
- Putting in place infrastructure to support the school travel plan and make the route to school safer to walk or cycle and creating a pupil centred front of school environment

7.32. Adjusting school hours to avoid commuter travel periods is another potential measure that may be worth consideration while noting that many families have complex travel arrangements involving siblings in other schools as well as parents at work.

7.33. The basic aim of school travel plans is to arrest the rapid growth in travel to school by car. Census 2002 reports that, in the GDA, the numbers of primary school children being driven to school has increased from 32% in 1997 to 50% in 2002 and from 15% to 30% for secondary school children. Paragraph 2.7 of this report discusses some of the other trends in travel to school.

Impact of School Travel Plans

7.34. As with workplace travel plans, the potential impact of school travel plans on a regional basis can be assessed by examining the impact of individual plans and the rate of adoption of plans throughout the region.

7.35. In the UK, the first pilot school travel plans (*Safe Routes to Schools*) were introduced in 1995. Recent research³¹ reported that 4% of primary schools, 4% of middle schools and 5.5% of secondary schools in the UK had implemented a school travel plan by 2001, and that a comparable proportion had a school travel plan “firmly planned.” The best school travel plans have shown substantial shifts in the number of journeys to school being made by car, but this is not always the case. Some schools do not have “before” data so the impact of their plans has not been measured. Nevertheless, the average car trip reduction in the UK is around 20% which relates to plans that concentrated on walking and cycling as this was the focus of the early projects.

Progress to Date in the GDA

7.36. The pilot Safe Routes to Schools Initiative, led by the DTO, started in 2000. Later this year (2004), the first report of the outcome of five pilot projects is expected, along with guidelines on implementation. Early results from the pilot in the Bray area suggested a 4% reduction in travel to school by car. More recent results, as shown in Table 7.3 and reported by the DTO, show a 22% reduction in car trips at Donabate SRTS pilot and 15% at the Bray pilot. These results are in line with the UK experience, but obviously only represent a sample of two.

Table 7.3 Results of Pilot Safe Routes to Schools Schemes in the GDA

Results of Pilot Safe Routes to Schools Schemes in the GDA	
Donabate	Bray
22% reduction in car use 11% increase in walking 8% increase in bus use 1% increase in cycling	15% reduction in car use 4% increase in cycling.

Source: DTO

7.37. Following the publication of the forthcoming report on the results of the pilot *Safe Routes to Schools* schemes, it would be sensible to consider a coordinated programme, with a five-year plan to introduce school travel plans throughout the GDA and appropriate funding.

7.38. As Table 7.4 shows, the majority of primary school trips, and around half of all secondary school trips, are less than three miles and therefore within walking or cycling distance for many pupils. In view of growing concerns regarding childhood obesity, the health potential for these trips to be undertaken by foot or by bicycle should be recognised. This could accelerate the introduction of school travel plans under Department of Health and Children and Department of Education policies.

³¹ Sloman, 2003 based on research for the DTLR (by TRL, 2001)

7.39. It is important that future school travel plans address public transport and ride-sharing, in addition to measures to make it safer to walk or cycle to school. The latest research in the UK³² found that improvements to public transport offer great potential to reduce traffic because most car mileage is on trips too long to be walked or cycled. The data shown in Table 7.4 suggest that the same would apply in the GDA where a substantial proportion of primary school children and about half of all secondary school children travel 3 miles or more to school. This data is in line with market research undertaken for this study which reported that 31% of people surveyed would not walk or cycle to school (or work) because the distance was too long.

Table 7.4 Distance travelled to school

County	Children between 5 and 12 years			Students between 13 and 18 years		
	Total trips	Trips of 3 miles and over		Total trips	Trips of 3 miles and over	
Dublin Co. and City	111,077	38,791	35%	79,705	37,118	47%
Kildare	19,786	7,055	36%	13,611	7,276	53%
Meath	16,313	6,762	41%	11,716	7,990	68%
Wicklow	13,563	5,291	39%	9,575	5,841	61%

Source: Census 2002, Volume 9, Travel to Work, School and College

Local Issues and Wider Multi-Agency Interest

7.40. It is not envisaged that school travel plans would be imposed upon a school. There are too many sensitive issues ranging from children's security to the lack of schools in some new housing areas. Take up would remain voluntary. Each school is different in terms of its pupils, staff and parents, as well as in its catchment and access arrangements. Attitudes towards car restraint will vary greatly between schools, and will not necessarily relate to traffic issues at the school. Nevertheless, a clear mandate from the Department of Education to the school principals may help in getting more school travel plans off the ground. There may also be opportunities to put school travel plans more firmly on the agenda through the City/County Development Boards.

7.41. A cross-department working group may also assist the implementation process, as several government departments have an interest in school travel plans:

- The Department of Health and Children – with the objective of improving children's health and fitness, and tackling the problem of obesity in children;
- The Department of Education – responsible for all schools, all issues "inside the school gate" and also for procurement of school bus services which operate outside the urban areas;
- The Department of Environment and Local Government/local authorities – undertaking the physical work "outside the school gate" such as footpaths, pedestrian crossings, cycle routes; and

³² Sloman (2003) based on Jones and Bradshaw (2000)

- Department of Transport/DTO – responsible for objectives to reduce travel demand and improve road safety

Resourcing

7.42. The school travel plans could draw upon some of the €12.7 million which was allocated to the Safe Routes to Schools programme in the National Development Plan.

7.43. Increased implementation effort will require more skills and experience, which would involve recruitment and training. The expertise could be held in a central organisation such as the DTO, or each local authority could have a school travel plan coordinator. Either approach has its benefits and the reports on the pilot schemes that are due later this year should inform the decision as to how best to organise resources in future. The result should be an intensive programme of work within the local authorities, which will require dedicated school travel plan coordinators and increased funding for small-scale street and junction improvements to support the school travel plan. The Department of Education could support initiatives to raise school involvement by funding measures inside the school such as cycle parking.

7.44. The costs of resourcing the school travel plan initiative have been taken into account in the overall economic and financial appraisal and are set out in Section 10 of this report.

Timescale

7.45. As with workplace travel plans, it is expected that three to four years of greatly increased activity in all agencies concerned would see a far greater number of plans in operation. Where cross-departmental agreement is achieved and both financial and personnel resources are dedicated to a school travel plan programme it should become more productive as the awareness spreads to schools/parents and expertise in LA's and other agencies develops. In that context, the DTO's aspiration is that the number of school travel plans should increase to 10 in 2005, 20 in 2006, 50 in 2007 and 80 in 2008.

Individual Marketing

7.46. Individual marketing provides transport advice and information to people, based on an understanding of their personal trip patterns. This involves one-to-one interviews. Travel information is then offered which has been individually tailored and which encourages modal shift away from the car. The individual marketing approach is effective because many people make journeys by car for which a reasonable alternative (public transport, walking or cycling) already exists, of which they are unaware.

Impact and Application

7.47. Individual marketing techniques have been applied in Germany, Austria, Sweden, Australia and the UK. Similar techniques have also been employed under the name Travel Blending. The largest individual marketing programme to date took place in a suburb of Perth, Western Australia and involved contact with some 15,000 households. The programme found that, although 80% of trips were made by car, adequate public transport alternatives existed for half of those trips. Households that were interested in using environmentally friendly modes were issued with personalised packages of information including timetables, free public transport test tickets and information about walking and cycling. Before and after surveys reported a 14% reduction in car driver trips as a result of the project, and a 17% reduction in vehicle kilometres. Following the success of the project, the government of Western Australia is planning a larger, city-wide programme of individual marketing. Over 10 years, the *TravelSmart* programme will be expanded to cover half of the 1.3 million people who live in Perth. The cost over 10 years is estimated at A\$29 million or A\$22 (€13) per person approached. If applied in Dublin, which is a higher cost location than Perth, the cost could be in the region of €22 per person.

7.48. Individual marketing is costly as it requires detailed one-to-one working with people, but it has been estimated that, in the UK, it could produce a 5% reduction in car travel within an entire urban area if it were focussed on that area³³. Around 70% of the behaviour change associated with individual marketing schemes is estimated to be for trips to shops, leisure facilities and other services. Consequently, if a scheme was implemented in an urban area that already had comprehensive workplace travel plans it would be expected to produce a 3.5% reduction in overall travel (i.e. 70% of 5%), much of which would take place outside the peak hour.

Application in the GDA

7.49. An individual marketing programme has never been considered in the GDA, but it may be worthwhile, particularly as public transport, pedestrian facilities and the cycle network have improved markedly in recent years and will continue to do so with the introduction of Luas, the DART upgrade, the Quality Bus Network and the expansion of the regional cycle network.

7.50. Costs of individual marketing schemes in the GDA may be of the following order:

- Entire GDA (assuming 50% of all residents contacted): €17 million;
- All Dublin City and County (assuming 50% of all residents contacted) €12.4 million; and
- Dublin City workforce (assuming 50% of all workers in the city council area contacted): €2.4 million

³³ "Less Traffic Where People Live: How local transport schemes can help cut traffic, Lynn Sloman", 2003

7.51. It would be advisable to start with a pilot individual marketing project in one area, as in Perth, before embarking on a large-scale programme. The pilot should be in a residential area, although there may also be merit in a project focussing on City Centre employees in the run up to a congestion charging scheme, if such a measure were to be implemented (see Section 8).

Information and Communications Technology Applications

7.52. Rather than changing the mode by which people travel, information and communications technology can be used to alter the ways in which people fulfil their aspirations for mobility and access to work, services and shopping. This is referred to as “virtual mobility”, a term that focuses on how activities can be undertaken without being dependent on physical mobility.

7.53. Information and communications technology (ICT) has the ability to reduce work-related travel through the following e-work applications, most of which could be addressed through workplace travel plans:

- Home-based work;
- Local office, e.g. telecentre, satellite office, local touch-down centre;
- Mobile working – on public transport, from vehicles, at hotels, airports, cafes, etc.;
- Working from client site; and
- Office-based e-work, i.e. not changing normal workplace but eliminating travel through practice such as online collaboration, videoconferencing, remote diagnostics and monitoring, etc

7.54. A fully e-working organisation will use a range of such practices, on the principle that work is undertaken where it is most productive, cost effective and satisfying. “Teleworking” is a word used to describe all of these by some commentators, but is popularly understood as applying primarily to the first three categories. “Telecommuting” is sometimes used to mean the same as teleworking, but generally it is taken to mean those practices that eliminate commute journeys wholly (by working from home) or in part (by working from a telecentre/local office, etc). The latter three categories of e-work listed above will largely have an impact on business travel.

7.55. Organisations usually introduce e-work for reasons such as enabling workers to become more productive, reducing property cost and promoting better work-life balance. Transport reasons are unlikely to be the main reason for an organisation to embrace e-work practices.

7.56. E-commerce and e-services could affect non-work travel and travel undertaken in the course of work and consequently would be expected to have little effect on the morning peak hour.

Experience and Application

7.57. The Eurobarometer³⁴ survey reported that, in 2000, 2.4% of the adult workforce in Ireland was teleworking regularly and 6.1% was teleworking occasionally. This compared with a European average of 5% for regular teleworking and 6.6% for occasional teleworkers. In Denmark, a country of similar population to Ireland which places a similar emphasis on developing a high-tech workforce and economy, the same survey found that 17.3% of the workforce were regular teleworkers.

7.58. In Ireland, the CSO³⁵ recently reported that the proportion of the workforce regularly or sometimes working at home as 4% in Dublin City and Counties and 4.5% in the hinterland counties. This compared with a proportion of 3.5% throughout Ireland as a whole.

7.59. An indicator of the potential rate of growth in teleworking is provided by the *UK Labourforce Survey* which showed that 7.4% of the workforce in 2001 were regular teleworkers, representing a 13% per annum growth in teleworking since 1997.

7.60. Most teleworking practice is part-time with people working on average 1.5 days per week away from the normal workplace, and this appears to be consistent across case studies in the UK, US and Europe.

7.61. Research indicates that, on balance, teleworking does reduce car usage amongst teleworkers; however, the debate about the potential role of teleworking in TDM is quite complex. For example, teleworking is most attractive to individuals with the most difficult trips to work. Often these are by public transport, not by car. Teleworkers, or other members of the households, may use the car to make other journeys during the day (for example, to schools, shops or sports centres) which may not have been made before, or were previously made as part of a linked trip to work. However, many of these new trips are likely to be local in nature and therefore shorter.

Application in the GDA

7.62. The following possible measures are recommended to promote virtual mobility as an alternative to physical mobility. All of the measures require working in partnership with other agencies and would not be promoted purely as travel demand management measures.

- Awareness campaigns both for organisations and for the wider public about the possibilities for reducing travel through virtual mobility, led by the DTO and the Information Society Commission;
- E-work pilots and programmes, promoting e-work amongst local organisations, including public sector organisations, with the

³⁴ Summarised in *eWork 2002 – Status Report on New Ways to Work in the Knowledge Economy*, published by the European Commission

³⁵ CSO Quarterly National Household Survey, Q3, 2002

development of flagship pilots and programmes led by the Information Society Commission with reference to the existing e-government initiative by the Department of the Taoiseach;

- Telework centres - developing “telework centres” as have been developed in and around some US cities. Local authorities in conjunction with Enterprise Ireland would be best suited to promote telework centres;
- E-commerce - promoting online shopping/home delivery amongst local firms and consumers, and ensuring that other demand management measures do not discourage them. This initiative should be promoted by private sector agencies such as IBEC and the Chambers of Commerce;
- E-services - continuing to promote the use of online services - government and local authority services, online learning, telemedicine, etc. - through the Department of the Taoiseach’s e-government initiative; and/or
- Development of “wired-up communities” - in collaboration with other stakeholders (public agencies, telecommunications companies, etc.) promoting “wired up communities” projects, to help overcome the digital divide, promote local work opportunities in less favoured areas away from the urban centre, and encourage use of online services. In this measure, there is a strong overlap with land-use planning proposals, and the local authorities would take the initiative, in conjunction with Enterprise Ireland

7.63. The virtual mobility measures are largely dependent on the activities of organisations outside the transport sector. It follows that the DTO and other demand management stakeholders will need to encourage, advise, liaise and monitor these activities. Organisations developing e-work, e-commerce and e-services are likely to be doing so primarily in pursuit of non-transport benefits. Movements in these directions are likely to happen over time with or without intervention. There are, however, several factors critical for the success of the measures set out the previous section of this report:

- **The success of the awareness-raising programme:** while to some extent e-work, e-commerce and e-services are developing anyway, the awareness programme is critical in two respects. Firstly, there is an identified need to accelerate the rate of development of these phenomena. Secondly, it is vital that these phenomena are developed in ways that maximise the potential to eliminate habitual but unnecessary travel movements. This would be a task for the DTO in conjunction with the Information Society Commission.
- **Effective inter-agency and partnership working:** the measures put forward cut across the traditional roles of a number of public agencies, and involve working closely with the private sector in

sometimes unfamiliar areas. This would also require effective leadership from the Regional Authorities and the City and County Development Boards.

- **Buy-in from employers:** enthusiastic support from both private and public sector employers in developing innovative solutions and cooperating with monitoring processes would be key to success. A high-level mandate from government sector employers to move fast on e-work solutions would be particularly helpful.
- **Acceleration of broadband roll-out:** high-speed telecommunications costs and access to broadband connection remains a significant obstacle on all fronts. Working with the telecommunications companies and gaining their support for these measures would be very important. This would be led by the Department of Communications, Marine and Natural Resources

Transport Impact of a Combination of Measures that Promote TDM

7.64. A combination of measures that promote travel demand management were tested for the morning peak hour (8am – 9am) in the year 2008 using the DTO model. All the measures included and their rate of take-up were considered practical and achievable by that year. The assumptions associated with the application of each measure are given in Table 7.5.

Table 7.5 Example Combination of Measures to Promote TDM by 2008

Measure	Assumptions
Workplace travel plans	14% ³⁶ reduction in car use with each plan 5% ³⁷ of workers in the GDA covered by a plan
School travel plans	20% ³⁸ reduction in car use with each plan 2% ³⁹ of school-goers covered by a plan
Teleworking/ working from home	Increase in the proportion of teleworkers: Dublin City and County: from 4% ⁴⁰ to 8.3% ⁴¹ . Hinterland counties: from 4.5% to 9.2% Each teleworker would telework on average 1.5 days per week
Individual marketing programme	Targeted at workers within the City Council area 3.5% reduction in car trips to the City area

7.65. The outcome of the test was compared with the situation in 2008 with no travel demand management is indicated in Table 7.6. It can be seen that the combined effect of all the travel plans would be to increase morning peak hour travel speeds throughout the GDA. The overall impact would be to remove over

³⁶ Average reduction in the UK, Sloman 2003

³⁷ Increase from negligible proportion at present

³⁸ Based on recent results of pilot schemes and UK experience

³⁹ About 20 school travel plans fully operational by 2008

⁴⁰ Current proportion of teleworkers provided in CSO Quarterly National Household survey, Q3, 2002

⁴¹ Assuming a 13% per annum increase in teleworking, based on UK experience 1997-2002 (UK Labour Force Survey)

100,000 vehicle-km from the GDA road network between 8am and 9am alone, which is both important and significant if the measures can be achieved.

Table 7.6. Transport Impact of a Combination of Measures to Support TDM

Comparison with the base situation in 2008 of a combination of measures to promote TDM				
	All GDA	Inside canals	Between canals and M50	Outside M50
Vehicle-km in base	6,553,167	179,437	1,151,621	5,222,109
Vehicle-km with measures	6,451,400	175,464	1,131,508	5,144,428
% reduction in vehicle-km	2%	2%	2%	1%
Vehicle hours in base	248091	17,607	64,281	166,203
Vehicle hours with measures	239,713	16,988	61,855	160,870
% reduction in vehicle-hours	3%	4%	4%	3%
Average speed in base	26.4	10.2	17.9	31.4
Average speed with measures	26.9	10.3	18.9	32.0
% increase in speed	2%	1%	6%	2%

7.66. Taken alone, these measures to promote TDM do have the effect of reducing travel demand, although without car restraint measures, for example road user charging, the benefits of the “soft” measures are liable to be eroded by induced traffic i.e. removing some trips from the network will result in faster journey times which may encourage others to drive who may have previously used public transport or another mode, driven at another time or on another route, or perhaps not travelled at all. Implemented in tandem with fiscal car restraint measures, and with complementary traffic management measures and measures to assist non-car modes, measures to promote travel demand management become powerful. With the introduction of other measures, people will need travel plans to assist them in changing travel habits. On the other hand, without restrictions on car use, the incentive to adopt travel plans is lessened and actual take-up and consequent change in behaviour may be less significant.

8 Fiscal Measures to Manage Travel Demand

Fiscal Measures Considered

8.1. The potential impact of three distinct categories of fiscal measure capable of implementation in the GDA in the short to medium term (by 2008) were considered:

- Road user charging (road pricing or congestion charging);
- Charges on free workplace parking; and
- Increased taxes associated with driving

8.2. The economic rationale for fiscal measures is that road users, particularly in the peak periods, are not currently paying the full socio-economic costs associated with their trips including congestion, environmental damage and accidents. Therefore transport system efficiency would be improved by aligning charges more closely with these costs.

8.3. Fiscal incentives to use public transport were also considered in the form of a fares rebate for trips that involve the use of more than one public transport service, so that the overall cost of the trip is reduced. Analysis of this scenario using the DTO model indicated that this measure would increase public transport boarding and would be of particular benefit to those living in the outer parts of the Metropolitan Area and the Hinterland. However, fares policy issues are under more detailed consideration by the Department of Transport's *Fare Policy Study* and, in any case, adjustments to fares and ticketing are more appropriately described as "Complementary Measures" rather than TDM measures (see Paragraph 9.14).

8.4. The assessment of potential fiscal measures focussed on those that were capable of implementation in the short to medium term (by the year 2008). In the longer term, fiscal demand management should still be considered to complement the major infrastructure improvements planned for the year 2016 in the DTO's strategy *A Platform for Change*. By then, there may be more proven methods available for the effective administration and enforcement of fiscal measures such as road user charging.

Increased Taxes

8.5. Increased car purchase and ownership taxes were rejected as potential measures early in the study (see Section 3) as these are already relatively high in Ireland and they could not be focused on the GDA.

8.6. It would also be difficult to focus on the GDA in terms of implementing an increase in fuel duty. However, as the cost of fuel is low by European standards, it was considered worthwhile testing the impact of an increase of around 25c per litre which would bring Irish fuel prices in line with the top end of the range of European prices. The result of the test within the DTO model showed that increased fuel duty would impact most strongly on the hinterland where journeys are longer but where

public transport options are scarcer more than the metropolitan area and where congestion may not be an issue. For this primary reason, and because the market research and consultation indicated increased fuel duty to be more unpopular than other fiscal measures⁴², this potential measure was not taken forward for detailed consideration. However, it is worth noting that, from a TDM perspective, there would be merit in reducing car ownership taxes and transferring them to use-related (fuel) taxes.

8.7. In the UK, the “fuel duty escalator” was introduced in 1993. It aimed to keep fuel prices high to discourage car travel and encourage manufacturers to design more fuel-efficient vehicles. The initial escalator put fuel prices 3% above retail inflation. In late 1993 the escalator increased to 5%, and in 1997 to 6%. It was successful in meeting its aim. The fuel increases applied from 1996 to 1999 were expected to save 1-2.5 million tonnes of carbon a year by 2010. Some £1.6 billion was raised by 1999 due to the fuel tax increase which was to be used to finance roads and public transport. However, the fuel duty escalator became deeply unpopular with the public, culminating in a “motorist’s revolt” in 2000 which led to a national fuel crisis. The fuel duty escalator was then abandoned, although fuel duties are still reviewed at each budget. It is noteworthy that UK fuel prices at the time of the fuel protest were much higher (over 25c per litre higher) than were Irish fuel prices at the time.

Congestion Charging

8.8. The first form of road user charging or “congestion charging” was introduced in Singapore in 1974. It took the form of a paper licence which drivers bought when they wanted to drive in the central area during the morning peak hours. Over time, the scheme gradually became more extensive and more sophisticated, developing into a full Electronic Road Pricing (ERP) system by 1998. ERP now operates for the whole day, but at variable charges. The second development in road user charging came in the early 1990s when the Norwegian cities of Oslo, Bergen and Trondheim introduced a charge to drive into the City Centre. Unlike the Singapore scheme, which had a TDM aim, the Norwegian schemes had the purpose of raising revenue to fund transport projects. The next major step in the history of road user charging came in 2003, when London’s “Congestion Charging” project began operation. This was preceded by a small-scale charging scheme in 2002 when the English city of Durham introduced a simple charge to enter the main street. Charging to certain areas in Rome was introduced in 2001. Further details of these examples are provided in the Interim Report. Many cities are actively pursuing congestion charging projects at present, notably Stockholm where operation is planned to start in spring 2005, and Edinburgh in 2006.

8.9. City Centre congestion charging is generally considered in terms of two options:

⁴² 70% of those surveyed said that they would prefer a road user charge or parking charges over increased fuel tax

- An area licence scheme, like that in London, where anyone driving in the charging zone during the hours of operation must possess a daily licence; or
- A cordon entry charge where drivers pay to enter a cordon around the City Centre. The charge would be in the inbound direction only and drivers would be charged each time they entered, although there could be a cap on the number of times they have to pay in any given period. There are variations on this option⁴³.

8.10. Both of these options were tested for a range of levels of charge. The area licence scheme appeared to be the more promising for Dublin and this was taken forward for more detailed examination as described in Paragraph 8.18 – 8.81 below. A drawback of the cordon entry charging option would be that it would not impact upon drivers leaving the City Centre or driving wholly within the City Centre. As discussed in Section 2 (see Table 2.5), it is forecast that these drivers will comprise a growing demand by 2008 and 2016, which it would be desirable to restrain.

8.11. The possibility of regional distance-based road user charging throughout the GDA was also considered as a long term option. This is described in Paragraph 8.62 of this report.

8.12. Options to charge for use of the M50 were considered. Very little reduction in car use was forecast at the lower level of charge (€5). At the higher levels (€10 and above), traffic was forecast to divert off the M50 resulting in significant increases in vehicle-km within the M50 as traffic would seek other routes through the city and suburbs. This would not improve the situation and for this reason, charging on the M50 was not further pursued as a travel demand management measure that would be appropriate in the short to medium term (to 2008). In the longer term, with improved rail services and orbital bus routes providing better travel choice, it may well be feasible. In addition, there may be sound traffic management reasons for introducing tolls on the M50, if demand exceeds capacity and the M50 is in danger of failing to operate in an efficient or safe manner.

8.13. An option was examined where drivers would be charged to enter the M50 area (i.e. a cordon placed just inside the M50). Two main effects were observed. Firstly, the overall impact was small because of the lack of a public transport alternative and/or an uncharged alternative route choice for many of the radial trips that originate outside the M50, or the orbital trips that use the M50. Therefore some drivers would have no choice but to pay (or not make the trip which is not a possible short term response within the model). Secondly, it would result in increased congestion within the City Centre because trips that formerly used the M50 to move around Dublin would go through the suburbs and City Centre instead, to avoid the

⁴³ For example, a two-way cordon where drivers pay in both the inbound and outbound directions resulting in a more complex system. This is similar to the area licence system, except (i) those driving within the City Centre only do not have to pay, and (ii) those making multiple trips may have to pay more than once, although the total paid in a day could be capped.

charge. The result of this would be increased congestion which would delay buses and Luas as well as general traffic. In summary, in the short to medium term situation, a M50 cordon charge would be less effective than a central area licence scheme, even in the wider modelled area. In the longer term, with improvements to improved public transport (e.g. improved radial bus and rail services), it may well be worth consideration.

8.14. In the case of tolls on the M50 or within the M50, if such measures were to be reconsidered in the longer term, peak period only tolls or tolls that vary by time of day, would be an option that would offer drivers with no other modes available the choice of making the trip at another time of day.

8.15. In the longer term, increased fuel duty, M50 charges and other measures which impact more upon hinterland drivers might influence individuals to move house, change jobs, change schools or move the location of their business in order to reduce travel costs.

Charges on Free Workplace Parking

8.16. Free workplace parking represents a significant incentive to drive to work. At present, some 75% of employees in the GDA do not pay for their workplace parking⁴⁴.

8.17. With the introduction of a workplace parking levy, or other forms of tax/levy, this incentive could be removed and a change in behaviour produced. This is a conceptually attractive measure that has some level of public support. Tests showed that it could result in a reduction in car use throughout the GDA (a 5% reduction in vehicle-km undertaken in the GDA during the morning peak hour (8am-9am)). Consequently it was considered worth taking forward as described in Paragraph 8.82 – 8.129 later in this section.

Structure of this section

8.18. The remainder of this Section of the report is divided into two sub-sections addressing the two proposed fiscal measures:

- Congestion Charging;
- Workplace Parking Levy

Congestion Charging

8.19. The proposed congestion charging area is the area within the North Circular Road and the South Circular Road/Grand Canal. It includes most of the area within the canals. It has a well defined boundary and the highest level of public transport provision in the GDA. Dublin City Council's Outer Orbital Route (see Figure 8.1)

⁴⁴ Based on household surveys undertaken for this study and on the DTO's parking survey for the City Centre

hours and an increase in average speeds, although these effects diminish further from the City Centre.

**Table 8.1 Impact of Congestion Charging
in the Morning Peak Hour (8am-9am) in the Year 2008**

Comparison with the base situation in 2008				
€5 congestion charge	All GDA	Inside canals	Between canals and M50	Outside M50
Vehicle-km in base	6,553,167	179,437	1,151,621	5,222,109
Vehicle-km with measures	6,518,860	158,120	1,120,417	5,240,323
% change in vehicle-km	1%	12%	3%	0%
Vehicle hours in base	248,091	17,607	64,281	166,203
Vehicle hours with measures	241,038	14,185	60,488	166,364
% change in vehicle-hours	3%	19%	6%	0%
Average speed in base	26.4	10.2	17.9	31.4
Average speed with measures	27.0	11.1	18.5	31.5
% change in speed	-2%	-9%	-3%	0%
€10 congestion charge	All GDA	Inside canals	Between canals and M50	Outside M50
Vehicle-km in base	6,553,167	179,437	1,151,621	5,222,109
Vehicle-km with measures	6,501,838	143,490	1,114,868	5,243,480
% change in vehicle-km	1%	20%	3%	0%
Vehicle hours in base	248,091	17,607	64,281	166,203
Vehicle hours with measures	238,679	12,247	60,639	165,793
% change in vehicle-hours	4%	30%	6%	0%
Average speed in base	26.4	10.2	17.9	31.4
Average speed with measures	27.2	11.7	18.4	31.6
% change in speed	-3%	-15%	-3%	-1%

8.22. The €10 charge would have a substantially larger effect than the €5 charge in reducing car use across the GDA, as illustrated in Figures 8.2 and 8.3.

Figure 8.2 Impact of Congestion Charging Options in Changing Vehicle-km in the Morning Peak Hour (8am-9am) across the GDA in the Year 2008

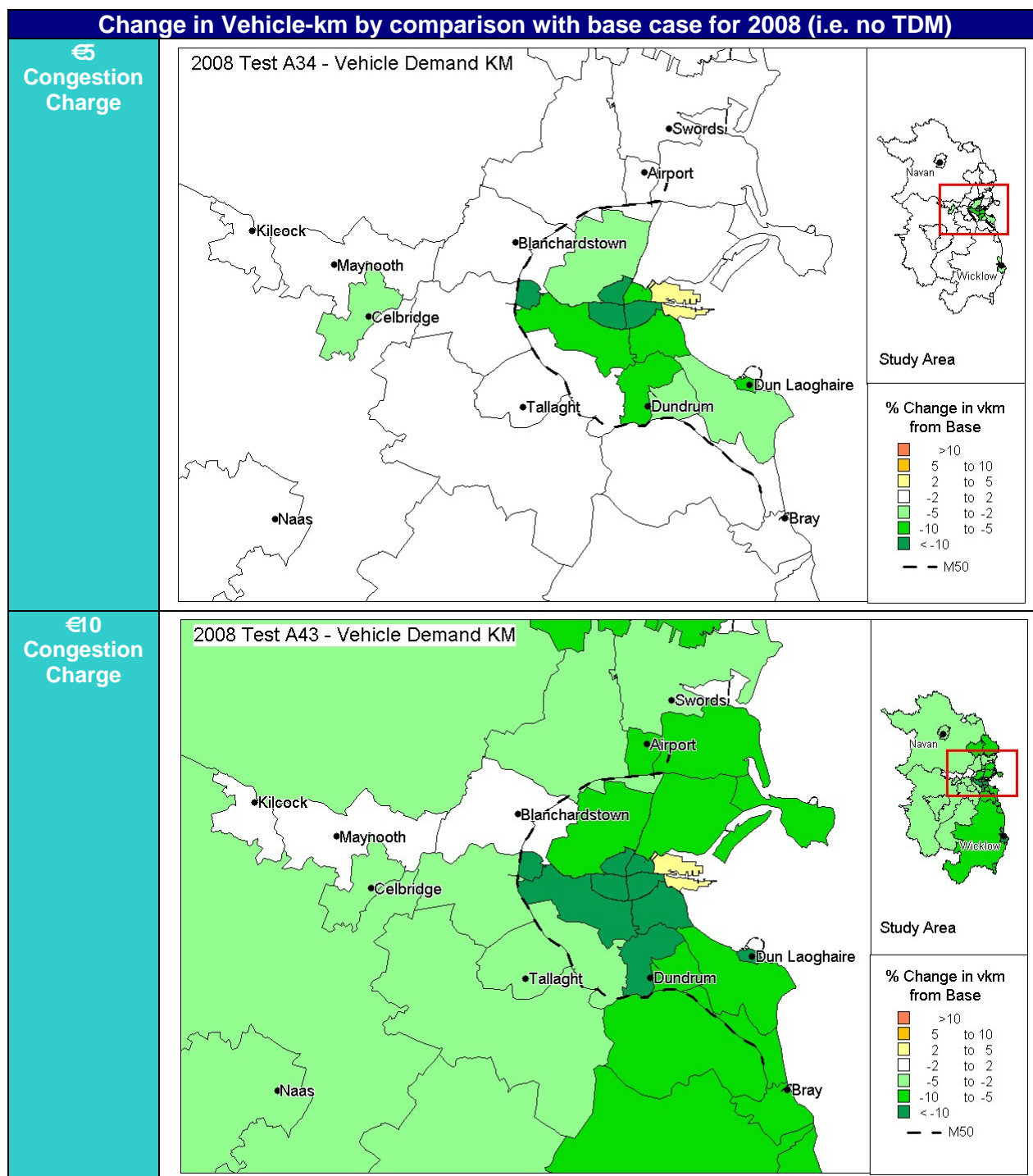
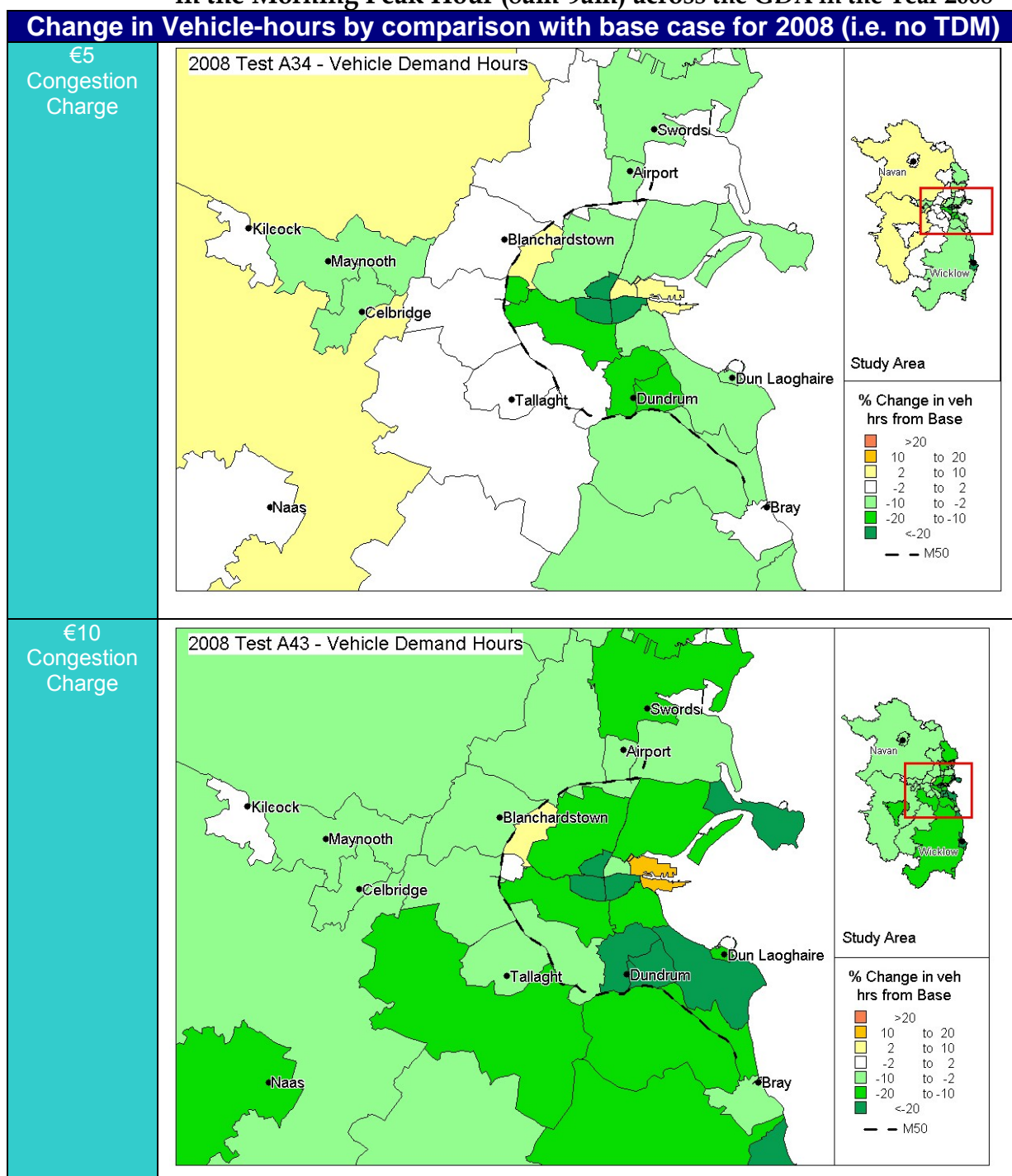


Figure 8.3 Impact of Congestion Charging Options in Changing Vehicle-hours in the Morning Peak Hour (8am-9am) across the GDA in the Year 2008



8.23. If the congestion charge were implemented in conjunction with the combination of measures to promote TDM described in the previous section, the impact would increase slightly, as shown in Table 8.2.

Table 8.2 Impact of the Congestion Charge combined with Measures to Promote TDM

Comparison with the base situation in 2008				
€5 charge + measures to promote TDM	All GDA	Inside canals	Between canals and M50	Outside M50
Vehicle-km in base (see Table 2.3)	6,553,167	179,437	1,151,621	5,222,109
Vehicle-km with measures	6,434,458	156,790	1,108,185	5,169,483
% reduction in vehicle-km	2%	13%	4%	1%
Vehicle hours in base (see Table 2.3)	248091	17,607	64,281	166,203
Vehicle hours with measures	235,347	14,140	59,015	162,193
% reduction in vehicle-hours	5%	20%	8%	2%
Average speed in base (see Table 2.3)	26.4	10.2	17.9	31.4
Average speed with measures	27.3	11.1	18.8	31.9
% increase in speed	4%	9%	5%	2%
€10 charge + measures to promote TDM	All GDA	Inside canals	Between canals and M50	Outside M50
Vehicle-km in base (see Table 2.3)	6,553,167	179,437	1,151,621	5,222,109
Vehicle-km with measures	6,414,318	142,565	1,100,998	5,170,756
% reduction in vehicle-km	2%	21%	4%	1%
Vehicle hours in base (see Table 2.3)	248,091	17,607	64,281	166,203
Vehicle hours with measures	232,877	12,144	59,224	161,509
% reduction in vehicle-hours	6%	31%	8%	3%
Average speed in base (see Table 2.3)	26.4	10.2	17.9	31.4
Average speed with measures	27.5	11.7	18.6	32.0
% increase in speed	4%	15%	4%	2%

Who would pay the congestion charge?

8.24. The results of the analysis of the congestion charge in 2008, using the DTO Transportation Model, show that some 80% of car trips on the GDA road network in the morning peak hour would be completely outside the proposed charging area and therefore would be unaffected by the charge.

8.25. For those that are affected, the possible responses to the central area congestion charge within the transport model⁴⁵ are either to:

- Pay the charge and continue to drive to, through or within the charging zone; or
- Divert around the charging zone to avoid paying the charge; or
- Transfer to public transport

8.26. Drivers choosing to change route or change mode can only do so if those choices are available. The proportion of people in any geographical area that would pay the charge depends firstly on the proportion that make a trip to, through or within the charging zone, and secondly on the proportion that have an alternative route or an alternative mode. Figure 8.4 shows the proportion of total car and public transport trips originating in each geographical sector that pays the charge.

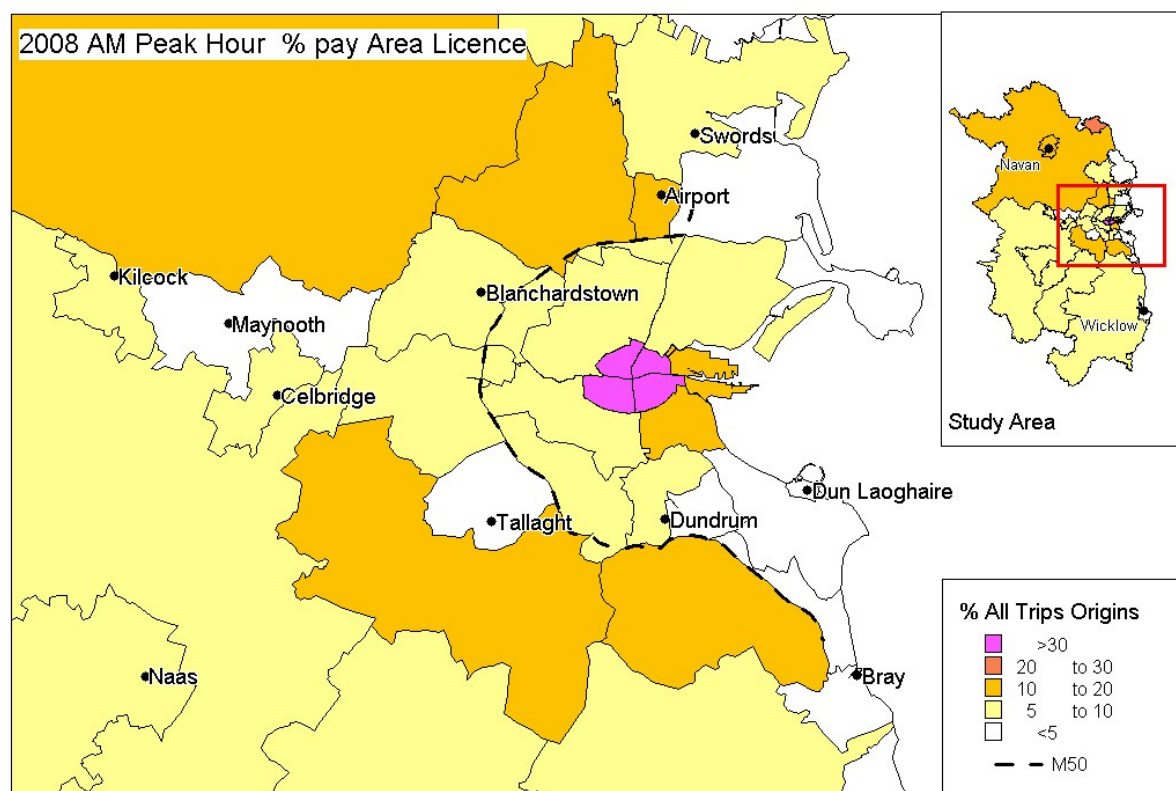
8.27. All of the car trips originating in the charging area, equivalent to over 30% of all trips (car and public transport) originating in the charging area pay the charge. About half of these trips drive over the canals to destinations elsewhere in the GDA and about half are travelling to work within the charging area. Many of the people forecast to drive within the charging area could choose to walk instead. However, if residents were to get a large discount and possibly an annual pass, there would be very little marginal cost on driving, and with improved traffic flow there would be more incentive to drive than before.

8.28. Within the sectors that are well served by public transport, a very small proportion (less than 5%) of originating trips by car and public transport pay the area licence. By comparison, some of the sectors outside the M50 that are less well served by public transport have a larger proportion of originating trips that buy a licence. Some zones within the M50 show a higher proportion of people buying a licence than zones further out on Luas and rail corridors. This is probably because those people would benefit from improved road conditions that have occurred as a result of people further away transferring to public transport (which may be overcrowded by the time it reaches zones closer to the city).

8.29. In practice, other factors, such as people's income or ability to pay will influence the decision to pay the licence.

⁴⁵ See Section 9 for discussion of responses that are not modelled

Figure 8.4 Proportion of Originating Trips by Car and Public Transport in the morning peak hour in 2008 that would pay the City Centre Area Licence



Benefits to the City

8.30. The slow traffic speeds which occur within the City Centre have a negative effect on business efficiency, increasing operational costs which are in turn passed to the consumer. Increased costs of running a business in the City Centre encourage businesses to look at alternative locations outside the City Centre in locations which are, for now, less congested. The effect of the proposed TDM package would be to reduce traffic flows in the City Centre and therefore improve speeds. Businesses could then make and receive deliveries more efficiently. Access to the City Centre would improve by all modes. Improved speeds would not only occur within the proposed charging zone, but also outside the area, particularly on the radial approaches to the canals where queues would be reduced. All businesses within the canals have good public transport access which would improve due to faster, more reliable, bus and Luas speeds, and improved conditions for pedestrians walking to or from railway stations and bus and Luas stops. It would also be faster for customers, business visitors and employees to drive within the City Centre, although those who chose to drive within the charging hours would need to buy a licence.

8.31. The benefits of reduced traffic flows would be far more significant in the City Centre than in any of the suburban or other centres, simply because of the sheer volume of people that are drawn to the City Centre's unique offerings of employment, services, retail, history, culture and so on. The majority of these people are not car users and they would all benefit from reduced traffic flows in the form of

improved air quality, reduced accidents and a generally more pleasant environment. Making the city a more pleasant location could assist the renewal of the entire City Centre, spreading more widely the regeneration benefits that have occurred in some locations over the last 15 years or so.

Diversiónary Routes and Boundary Effects

8.32. The boundary of the proposed charging area essentially follows the City Council's Outer Orbital Route (OOR), but modified to allow access to Macken Street Bridge. The Outer Orbital Route would therefore be the diversionary route.

The Cordon and the Outer Orbital Route

8.33. As a complementary measure to congestion charging, traffic management on the OOR would need to be reviewed, including the banned turns and signal settings. Additional junction movements may need to be allowed at many junctions, but more priority need not necessarily be given to traffic circulating on the ORR. It may be more important than before to ensure that delays to buses and other non-car modes on the radial routes are minimised.

8.34. Adequate advance signage and public information would be needed to ensure that drivers should have plenty of advance warning about the charging zone. Most should have decided their response before getting to the boundary.

8.35. Experience in London is that there has been a reduction in congestion on the Orbital Route compared to pre-charging levels, reflecting better operational management.

8.36. The City Council would have an important role in this task of reviewing the junctions on the Outer Orbital Route. The initial purpose of the exercise would be to demonstrate to the City Council members and stakeholders/consultees (including businesses and residents) how the charging scheme would work in practice.

8.37. Complementary measures that might be considered in the boundary areas (i.e. those areas just outside the charging zone) include:

- traffic signs and road markings to identify the charging zone;
- traffic signal retiming, review of banned turns and lane operation on the Outer Orbital Route;
- on-street parking controls – additional controls, extended hours of operation, increased charges;
- traffic calming / traffic management to deter diversionary traffic rat-running in residential streets in the boundary areas;
- higher capacity, more frequent bus services on existing routes;
- new bus routes between and within the central area and the inner suburbs;

- lower bus fares for people in the boundary areas to offset other impacts, e.g. amended fare bands;
- extended bus priority;
- improved bus stop environment – seating, shelter, passenger information, pedestrian crossings, quality of footway etc; and
- improved pedestrian and cycle network – improved footways, improved and additional crossings, bridges over canals, additional pedestrian and/or cycle only routes.

Area to the East of the Proposed Charging Zone

8.38. The North Wall/East Wall/Ringsend/Irishtown area is the only sector that is expected to experience additional traffic flows as a result of the proposed congestion charging. Some or all of the above complementary measures may need to be considered.

8.39. The strategic arguments for excluding Macken Street Bridge from charging are twofold. Firstly, it provides an untolled route to the east of the city. Secondly, it provides an alternative if Eastlink Bridge was raised.

Hours of Operation, Exemptions and Discounts

8.40. The stakeholder liaison process indicated a strong preference for a “morning peak only” scheme (7am to 10am) which would target commuters without affecting shoppers, business visitors or other visitors. Less favourable options include a “peak hours only” scheme (for example, 7am to 10am and 4pm to 7pm) or an all day scheme (the scheme in London operates from 7am to 6:30pm). In all cases, it is assumed that charging would not apply on bank holidays and at weekends.

8.41. The issue of exemptions and discounts are related to the hours of operation. Shorter hours of operation imply fewer concessions, if any, would be justified because many more drivers have the choice to postpone their trip in order to avoid the charge.

8.42. No exemptions or discounts are proposed at this stage. Stakeholder perception is that some discounts and exemptions would be required if the scheme were to be accepted, so it is useful to examine experience elsewhere.

8.43. As originally envisaged, the London congestion charging scheme did not allow many discounts and exemptions. These were negotiated nearer to implementation. The larger than expected number of drivers claiming discounts or exemptions is considered to be one of the reasons why the outturn net revenues in London are about 50% less than the forecast revenues. Residents’ discounts are now a key issue in plans to expand the London zone westwards – the number of people with discounts could rise greatly, reducing both revenues and effectiveness. By comparison, there are virtually no exemptions in the Singapore scheme, and the LTA

(Land Transport Authority) in Singapore claims this as one of the reasons for the success of the scheme. Table 8.3 below shows the different approaches taken in London and Singapore. Interestingly, when the Singapore scheme was first introduced in 1974, exemptions were granted to many road users including high occupancy vehicles, goods vehicles, etc. These exemptions were found to be open to misuse and have gradually been phased out as the scheme has developed.

Table 8.3 Exemptions and Discounts in the London and Singapore Charging Schemes

London	Singapore
<ul style="list-style-type: none"> • Daily charge £5 • 90% discounts: <ul style="list-style-type: none"> ○ Residents of zone • 100% discount <ul style="list-style-type: none"> ○ Blue badge holders:100% ○ Alternative fuel vehicles ○ Breakdown vehicles ○ Emergency services ○ Vehicles with 9 or more seats registered as buses ○ Certain vehicles used by local authorities and other services • Exemptions, including: <ul style="list-style-type: none"> ○ Taxis ○ Buses ○ Motorcycles ○ Any vehicles exempt from Vehicle Excise Duty • A 100% reimbursement of the congestion charge applies for certain journeys undertaken by fire-fighters, NHS staff and certain NHS patients: <ul style="list-style-type: none"> ○ Vehicles used by fire-fighters for operational journeys between fire stations ○ Vehicles used by NHS staff on certain operational journeys when carrying bulky, heavy or fragile equipment, confidential patient notes, controlled drugs, etc. or responding to emergencies when on call ○ Vehicles used by certain patients when attending NHS appointments. • The congestion charge would have to be paid for these vehicles by the individuals concerned and then claimed back from their employer or the relevant NHS body. TfL would then refund the charges incurred to these organisations. 	<ul style="list-style-type: none"> • Graduated charge depending on level of congestion and distance travelled • Charge varies by vehicle type in the following proportions: <ul style="list-style-type: none"> ○ Cars (1) ○ Motorcycles (0.5) ○ Lorries and buses (1.5) ○ Large vehicles (2) • No exemptions

8.44. In summary, while it appears that discounts and exemptions should be avoided if possible, it is easier to gain acceptability for a congestion charging scheme if they can be offered, at least in the short term.

8.45. The financial implications of offering residents' discounts, exemptions and reduced hours of operation are discussed in Section 10 of this report which deals

with the business case associated with the implementation of congestion charging in the GDA.

Technology

8.46. There are currently two options for the collection and enforcement of the congestion charge. Firstly, there is the London model where the driver purchases a daily licence and which is then entered in a database of valid licences for the day. Enforcement is by automatic number plate recognition (APNR) which compares the number plates of cars driving in the charging zone with the database. Secondly, there is electronic charging using a prepaid smartcard which is debited using either satellite positioning systems (e.g. GPS) or DSRC (dedicated short range communications, i.e. microwave). ANPR systems are used in parallel to capture cars without a valid smartcard (or “tag”). Electronic charging is in operation in Singapore and on various motorway tolling schemes throughout the world. Table 8.4 below provides a fuller comparative description of each system. Figures 8.5 and 8.6 show the equipment on the boundary of the London and Singapore schemes respectively.

8.47. If congestion charging were to be implemented in Dublin within the short to medium term timeframe set out for this study (i.e. by 2008), it is considered that the London type scheme would be feasible. With a longer horizon, the choice of technological options could, and should, be left open.

Table 8.4 Comparison of Charging Systems

London-type system	Electronic charging system
<p>How it works</p> <p>Payment in advance or up until (say) 10pm on the day of travel by telephone, online, text message, at retail outlets or by post. Enforcement by automatic number plate recognition (ANPR) and comparison against database of cars with licence.</p> <p>Implementation Issues</p> <p>Technology: The technology had not been used in this application before, but introduction in London was successful</p> <p>Infrastructure: Infrastructure requirements would be low. Only ANPR cameras would be required at the edges of the cordon and within the zone. No in-vehicle equipment would be necessary.</p> <p>Operation and Administration: This type of system relies on high levels of back office processing.</p> <p>Flexibility of Scheme: The technology necessary for this type of implementation would not be capable of being used to deliver other services or provide for variable tariffs. Although this may be seen as a disadvantage, it ensures simplicity is therefore more transparent and easier to implement.</p> <p>Speed of introduction: As the technology is simple and there are minimal infrastructure requirements the timescale should be short, approx 24 months, once there is definite agreement to proceed, following consultation, scheme design etc</p> <p>Cost Issues</p> <p>Scale: The number of cameras required is directly related to the size of the charging zone. The back office requirements are related to the number of cameras, and also volume of traffic, and needs to be able to cope with peaks.</p> <p>Technology: ANPR technology for enforcement is proven in operational situations and several suppliers are available to provide competition. The back office systems can be developed using open architecture applications, and are open to competitive out-sourcing. Infrastructure costs would be minimal. If the scheme is not successful, any cameras are still useful for traffic management and therefore have a high residual value.</p> <p>Standardisation: Standards for road pricing systems using this technology are not in place, although the EU White Paper on Interoperability requires it. However, due to its simplicity and lack of need for in-vehicle equipment interoperability should not be a problem.</p>	<p>How it might work</p> <p>Prepaid smartcard, which is debited using either GPS (global positioning system, i.e. satellite) or DSRC (dedicated short range communications, i.e. microwave) technology. ANPR cameras still required for enforcement i.e. to capture cars without valid tag (unless barriers used)</p> <p>Implementation Issues</p> <p>Technology: The DSRC technology has been used elsewhere, and is proven. GPS systems are partially used for HGV tagging in Switzerland, are proposed for the planned HGV distance charging scheme in Germany which has major difficulties in implementation. GPS systems for charging in urban areas are unlikely to be considered a mature technology in the short to medium term.</p> <p>Infrastructure: With both DSRC and GPS an in-vehicle unit is required. DSRC requires significant roadside infrastructure for the communication system i.e. gantries which would be unacceptable in many sensitive city locations (rejected in London).</p> <p>Operation and Administration: Back office processing will be minimal as some functionality is contained within the in-vehicle units / roadside system.</p> <p>Flexibility of Scheme: The technology allows for varied degrees of flexibility. GPS offers significant possibilities in varying the tariff calculation and both GPS and DSRC have the capability of providing value added services.</p> <p>Speed of introduction: To implement DSRC, including roadside infrastructure and a complete roll out of in-vehicle units would take over 24 months plus. Planning applications for gantries can take a significant time. GPS would require a shorter timescale as there is no roadside infrastructure needed, but is unproven.</p> <p>Cost Issues</p> <p>Scale: The size of the cordon determines the cost. The bigger the cordon, the more gantries needed for DSRC. In-vehicle units will also need to be fitted (current cost of unit with fitting in Singapore is S\$150 (about €75 euro)). A GPS solution will require additional in-vehicle units at a cost of approx €150 euro each. A major decision would be whether the use of in-vehicle units is mandatory or optional.</p> <p>Technology: DSRC requires significant investment in gantries and in-vehicle units. GPS requires in-vehicle units and relies on the GSM network to transmit data, operational costs may be significant unless GPRS is used</p> <p>Standardisation: DSRC Standards for road pricing systems have been developed. GPS system standards are not well developed; but favoured by EU Interoperability initiative.</p>
<p>Summary</p> <ul style="list-style-type: none"> Simple and proven, possible in short-term Low flexibility No in-vehicle equipment required Low infrastructure costs Unobtrusive roadside infrastructure High operating costs 	<p>Summary</p> <ul style="list-style-type: none"> Choice of technology: DSRC or GPS Either represent a longer term solution Both offer flexibility Both offer potential cost effectiveness Both require an in-vehicle unit DSRC is proven, but requires gantries, etc. which are obtrusive GPS not proven but no roadside infrastructure

Figure 8.5 Equipment at Boundary of Congestion Charging Zone in London



Figure 8.6 Roadside Equipment used to Support Singapore Electronic Road Pricing



Costs

8.48. The London congestion charging scheme cost in the region of £60 million to establish and currently costs an estimated £97 million per annum to operate. It is expected that operating costs will be lower in future years, in the region £60-70 million per annum. This is a function of the relatively complex payments mechanism in place which involves payments to the operator based on the volume of transactions, the number of enquires to the call centre and the number of penalty charge notices collected.

8.49. Due to commercial sensitivities, a detailed cost breakdown for the various elements of the London congestion charging scheme is not available, but the various elements are listed below. It is worth noting that the system is very labour intensive and involves daily transmission of hundreds of thousands of analogue camera images via the telecommunications network, which is costly. Transport for London (TfL), the procurer, is currently exploring possibilities to automate the process which may reduce costs.

8.50. Operation of the London scheme comprises:

- Providing sales channels (retail outlets, websites, text messaging, post, fax, telephone call centre);
- Discount processing and finance processing (clearing house, banking etc.);
- Image processing (from 203 enforcement sites, 64 monitoring sites and 10 mobile patrol units);
- Validation of images against database;
- Customer services (24 hours a day, 7 days a week, several languages);
- Issue of penalty charge notices and enforcement;
- On street enforcement; and
- Prosecution, bailiffs, etc

8.51. Details of the potential costs of the proposed congestion charging scheme which were assumed for the purpose of this assessment are provided in Section 10, Table 10.4.

Lower Cost Alternatives

8.52. The simplest possible area licence system would be a paper licence with manual enforcement by the Gardaí. Some features of this option include:

- Driver would buy and display paper licence;
- Driver would need to go to a retail outlet in advance of driving into the area because a physical licence would be needed;

- Garda would check that vehicles driving in the charging zone have a valid licence (a change in legislation would be required if other enforcers were to be allowed stop moving vehicles);
- Checking/enforcement would involve some stopping of vehicles, which would be costly and disruptive in central Dublin. Permanent stopping bays could be established to avoid queues building behind stopped vehicles, but suitable sites could be hard to identify;
- At best, enforcement would be quite basic, with quite a small chance of detection (estimated at 1 in 5 for London with 400 enforcement officers and 150 stopping bays);
- Given the difficulty of enforcement, large fines could be required as a deterrent against non-compliance, and might be controversial;
- Although the set-up costs would be low (estimated at £5-£15m for Central London in the ROCOL⁴⁶ studies – this would equate to about €5-€15m for Dublin where the proposed charging zone is about two-thirds the size of the London zone), the running costs would be high (As stated above, the ROCOL studies estimated that some 400 enforcement officers would be required for the London zone. This might equate to some 265 officers for a similar operation in Dublin, with costs in the region of €15-€20 million pa); and
- “Smart” paper licences may improve enforcement but would increase costs. Options include perforated paper which could be read by hand-held camera, RFID encoded paper which could be read by an electronic device or bar coded paper which could be read by an infra-red device.

8.53. In summary, compliance with this option is likely to be difficult and costly to enforce, which is likely to result in lower effectiveness and lower revenues. Additionally, the requirement to stop vehicles to check for compliance is unlikely to be acceptable.

Lower Operating Cost, Higher Capital Cost

8.54. At the other end of the spectrum, a more sophisticated option than ANPR would be an electronic system. Electronic options would cost more in set up costs than an ANPR system because of the roadside and in-vehicle infrastructure required. In Singapore, the Government fitted some S\$100 million (€50 million) worth of in-vehicle units in the 10 months before the scheme (now drivers must pay S\$150 for a unit). A further S\$100 million was spent on the roadside infrastructure. Operating costs, however, may be lower with an electronic system because camera generated images would only need to be processed for violators, not all users of the system. Also, the functionality of the roadside and in-vehicle infrastructure could reduce

⁴⁶ Studies commissioned by the Government Office for London to support the ROCOL (Review of Charging Options for London) Working Group (Halcrow Fox et al, February 2002)

some of the back office processing requirements. Without specifying a system in some detail, costs would be difficult to estimate, but it is worth noting that the Singapore Electronic Road Pricing (ERP) system has very much lower operating costs than the London scheme – it costs about S\$16 million (€8 million) per annum to maintain and operate.

8.55. There are a number of factors why the Singapore situation is quite different to the Dublin situation (which is considered closer to the London situation). Firstly, Singapore has a history of some form of road pricing since 1974 leading to the gradual introduction of ERP in 1998. Secondly, Singapore possesses a modern road network comprising high capacity links which can accommodate large gantries (see Figure 8.6). Finally, there is a tradition of extremely high fines which act as an effective deterrent to non-compliance and therefore reduce the need for enforcement.

Cordon Entry Charge Only

8.56. The distinction between an area licence and a cordon charge becomes blurred once the details of enforcement policy are developed, e.g. What level of enforcement?, Where should enforcement be concentrated? Do residents pay the full charge? If not, what discount should be applied?, etc.

8.57. Features of a simple cordon entry charge scheme include:

- All trips entering the area during the charging hours would pay to cross the cordon;
- Enforcement could be manual, electronic plus ANPR, or ANPR only;
- Enforcement need only take place on the cordon, and therefore might be a slightly less costly task by comparison with an area licence;
- The cost savings would be offset by a reduction in revenue because all trips starting within the area would not be charged and drivers could enter the cordon before charging started and then drive around for free during the charging period;
- Trips starting within the area but with destinations outside could possibly be captured on the return trip if the cordon charge operated all day or during both peak periods; and
- Vehicles that make multiple entries across the cordon during the charging period would need special consideration. A simple system would charge them each time. A more sophisticated system, akin to the area licence, would only charge for the first entry.

8.58. As discussed in Paragraphs 8.9 and 8.10, the main drawback of the cordon charging option is that it does not impact upon the growing demand for car use by two groups: those driving outbound from the City Centre (see Table 2.5) and those driving wholly within the City Centre during the morning peak hour. A two-way

cordon would tackle the first group but, is not, at a strategic level, significantly different to an area licence scheme (see Paragraph 8.10). The area licence scheme will tackle the second group, although this effect would be diluted by the introduction of concessions for residents, as discussed earlier in this Section. In essence, the distinction between an area licence and a cordon charge becomes blurred once the necessary policies are developed, e.g. the level of enforcement, the type of enforcement and where it is concentrated, the system of discounts and exemptions, etc.

8.59. In London, over 80% of the enforcement effort is undertaken on the boundary of the charging zone. This suggests that a cordon only scheme may not be significantly cheaper to operate than an area licence and certainly would generate less revenue as less drivers would be eligible to pay. If the cordon charge applied in both directions, it would also need to be enforced in both directions, possibly requiring up to 80% more enforcement effort, but it still would not generate revenue for internal traffic.

8.60. A cordon charge scheme which only charged for the first entry vehicle each day or which capped the total charge payable for the day would have greater functional complexity and therefore may have higher capital and operating costs than a simple cordon charge.

Future expansion of the congestion charging scheme

8.61. There are a number of ways in which the congestion charging scheme could be expanded in future. At its simplest, it could be extended to cover neighbouring areas with congestion, for example, Ballsbridge, Fairview, Ranelagh or Phibsborough. In the short to medium term, it would be difficult to make a case for congestion charging schemes for other centres within the GDA (e.g. Blanchardstown Swords) because access by alternative modes to those centres is currently relatively poor, and most lack a natural boundary within which to apply a charge.

8.62. In the longer term, distance-based road user charging might be considered throughout the GDA. This would be subject to availability of a suitable administration and enforcement technology. Satellite Positioning System (SPS) technology, using either GPS or the forthcoming *Galileo* system in Europe, currently appears to be the most likely candidate, but current trials suggest that no firm date can be established for when the technology is likely to be ready. (DSRC technology is not suitable for a regional scheme as it would not be practical or cost-effective to introduce roadside beacons/gantries on such a widespread scale). There are moves towards an SPS-based road user charging throughout Europe in future, with the intention that the charge would be offset by the removal of fuel duty and the abolition of road tax.

8.63. Future area-based systems envisage the ability to vary the charge, for example, by time of day, by level of congestion, by distance and/or by vehicle type.

8.64. There are some other factors regarding any area-wide road user charge:

- An in-vehicle device in each car would probably be mandatory;
- As a regional scheme would cover several local authorities, a single agency would need to be nominated, or specially established, to take responsibility for the scheme; and
- In the UK, legislation allows local authorities to operate road user charging or workplace parking levies as travel demand management measures. There is a presumption against both measures being applied together. Consultation undertaken for this study suggests that there would be a similar presumption in the GDA. In that case any future workplace parking levy would need to be abolished before a regional road user charge was put in place.

8.65. Despite these complexities, a regional road user charge could be a flexible and sophisticated tool for demand management over the whole area. It should be borne in mind as a longer term measure. European initiatives in this regard should be monitored.

Administration and Legislation

8.66. The proposed central area road user charging scheme falls entirely within the Dublin City Council area. It follows that the City Council would be a major player in the decision to proceed. Under current institutional arrangements, the City Council would most likely be the authority responsible for implementation⁴⁷. Whether the City could fund the capital costs through borrowing or a private finance initiative or whether they would be funded centrally - as is the case for the London scheme and the proposed Stockholm scheme - would need to be determined.

8.67. Changes to primary legislation would be needed to enable the Council to charge for the use of roads that were previously free of charge. Appropriate legislation could potentially be incorporated in the comprehensive regulatory reform legislation currently being considered by the Department of Transport, or within the forthcoming Finance Act 2005.

8.68. As the details of the scheme emerge, secondary regulations to establish implementation would be needed.

8.69. The net revenue generated by the charging scheme could be divided between the City Council for expenditure on complementary measures and the Department of Transport for expenditure on public transport improvements. This would require a revenue allocation agreement, possibly similar to existing arrangements for road tax.

⁴⁷ Alternative arrangements have been proposed in the "New Institutional Arrangements for Land Use and Transport in the Greater Dublin Area", Department of the Environment and Local Government and Department of Public Enterprise, March 2001 but would not necessarily alter the above

8.70. For any system involving ANPR, the Vehicle Registration Department of the Department of Environment, Heritage and Local Government would need to be brought on board at an early stage in the scheme design.

Scheme Design

8.71. During the scheme design stage, the following issues would be developed:

- Acceptability – through market research and consultation with stakeholder groups, backed up by extensive traffic flow data across the canal cordon by time of day and time of year – to refine proposals for:
 - Level of charge;
 - Discounts and exemptions; and
 - Hours of operation;
- Payment administration and technology;
- Enforcement administration and technology;
- Complementary measures:
 - Increased bus capacity;
 - Bus network enhancement;
 - Traffic management;
 - Traffic calming;
 - Parking controls;
 - Amenity, e.g. improvements for pedestrians and cyclists; and/or
 - Other, e.g. marketing campaign to ensure City Centre retains its position for retailing and other activities

8.72. Once the decision to proceed with congestion charging is agreed in principle, there would be no need to consult on the overall scheme; however, consultation on the local traffic management and parking control elements of the scheme design would be advisable.

Timescale

8.73. In London, congestion charging was implemented within two years of the decision to proceed⁴⁸. At that stage, there was firm political commitment, the

⁴⁸ Congestion charging had been mooted in London since the 1960s. The decision to proceed was based on much research, notably the London Congestion Charging Research Programme in the early 1990s and the ROCOL studies in the late 1990s.

enabling legislation was in place and the scheme was designed to a sufficient level of detail to give decision-makers confidence (e.g. the payment and enforcement technology, the location of the cordon, the level of charge and much of the complementary measures package had been decided). A similar timescale should be achievable in Dublin following approval to proceed based on the scheme design. The key items at the implementation and procurement stage would include:

- Information campaign – it would be important to start informing people early on that congestion charging is coming, where it will apply, how much the charge will be, etc⁴⁹;
- Detailed design of elements of the scheme and the complementary measures;
- Implementation of the complementary measures; and
- Procurement: there is a range of potential procurement options from traditional publicly funded public sector procurement to a full PPP solution. Table 8.5 describes the role of the contractor in the London congestion charging scheme and also outlines how the City of Edinburgh Council is proposing to procure its proposed congestion charging scheme.

⁴⁹ *The information strategy would be purely factual with the aim of ensuring that the introduction of the charge goes smoothly and all concerned know what they must do. It should not be confused with any general travel awareness campaigns, marketing strategies or consultation that would be required as part of the general travel demand management initiative.*

Table 8.5 Examples of procurement

London	Edinburgh
<p>Capita Business Services has been contracted by Transport for London to provide core, retail and image management services (known collectively as combined services) for the Congestion Charging Scheme. This includes:</p> <ul style="list-style-type: none"> • Management of the sales channels (i.e. retail outlets) • Discount processing and finance processing, including all the back office functions • Validation of driver details against images • Customer service and data storage, including operation of the contact centre • The bulk of the enforcement, including the technology to underpin enforcement operations and the Penalty Charge Notice (PCN) system • Automatic Number Plate Recognition (ANPR) system, including the processing of images and storage of images for cross-checking/appeals 	<p>In Edinburgh, a company called Transport Initiatives Edinburgh (tie) was formed to deliver major transport projects for the City of Edinburgh Council (CEC). It is a private limited company, wholly owned by the CEC. The board includes senior figures from the business community as well as three CEC councillors. The company is a non-profit making organisation which provides the procurement, project management and finance management capability to ensure that a number of major transport related projects are delivered including the West Edinburgh Bus System and the proposed tram lines. The company is also responsible for the further refinement of the proposed congestion charging scheme which is expected to fund the transport projects.</p> <p>In procuring the proposed congestion charging, tie is proposing two pilot schemes, which would be let by competitive tender. The CEC wish to encourage innovation and the choice of technology will be up to bidders to decide. The outcome of the pilots would inform the decision on the payment and enforcement technology for the eventual scheme.</p>

Risks to Implementation

8.74. The introduction of congestion charging in London shows that it is technically possible to implement. Consultation and market research undertaken for this study indicated some level of acceptability for congestion charging in the City Centre, conditional on provision of satisfactory public transport.

8.75. Transport for London report that congestion charging has been popular in London and most observers regard it to be reasonably successful. Nevertheless, congestion charging is a radical measure, and many lessons can be learnt from the London experience. Overall the indications for a scheme in Dublin are promising, but a few key issues need to be borne in mind:

- Almost 90% of commuters entering the charging zone in London travelled by public transport prior to congestion charging. By comparison, Census 2002 reported that in Dublin the public transport mode share is 37%, with 22% walking or cycling and 41% entering the proposed charging zone by car. Therefore a greater proportion of people would be negatively affected by the charge;
- The Mayor of London was elected with a mandate to implement the charge, and with the regulatory back up; and
- The Mayor's Transport Strategy provides London with a coherent policy framework into which the congestion charging fits.

8.76. There will be “lessons to learn” from the proposals to introduce a charge in Edinburgh, where the City of Edinburgh Council is committed to holding a public referendum before proceeding to implementation. More immediately, Stockholm is proposing to introduce a scheme in 2005, as described below.

Proposed Stockholm Scheme

Trial scheme proposed from 12th June 2005 until 31st July 2006

Referendum on whether to make the scheme permanent proposed for 17 September 2006

Objectives:

- To reduce traffic volume by 10-15% on the most heavily used routes
- To increase the average speed on roads
- To cut emissions of health damaging pollutants and carbon dioxide
- To improve the urban environment
- To provide more resources for public transport.

Charges will vary by time of day with a range SEK10 to SEK 20 (about € 1 to €2) up to a maximum of SEK60 (about €6) per day

Hours of operation: 6am – 6.30pm, Monday to Friday except bank holidays and the day before bank holidays

DSRC based advanced payment system

Exemptions being considered include:

- Emergency vehicles
- Vehicles with disability permits
- Certain vehicles whose owners are exempt from taxation in Sweden
- Buses with a total weight of at least 14 tons
- Low polluting cars
- Taxis
- Transport services for the disabled
- School buses
- Motorcycles

Other Risks to Implementation Programme

8.77. Lack of political consensus or acceptance of the principles set out in this report and subsequent difficulties in adoption of appropriate legislation.

8.78. If, as an interim measure, a City Centre workplace parking levy were to be considered, provision may need to be made for that levy to be removed in the event of congestion charging being introduced at a later date.

Impact of delays or failure to implement

8.79. If the proposed central area congestion charging measure were not to proceed, the workplace parking levy measure could be extended to cover the area within the canals. The resulting benefits for all within the canals and within the M50 more generally, would be lower than with the central area road user charge.

Next Steps in Implementing a City Centre Congestion Charge

8.80. The first step would be to undertake further investigative work to assist (political) decision-makers on the introduction of congestion charging:

- A travel survey to provide information on trip frequency, modal share, trip purpose and trip length variations by time of day
- A stated preference survey, to enable determination of elasticity of travel demand with respect to a congestion charge. It may be worth combining SP survey work and derivation of elasticities with the incorporation of these elasticities into the DTO model as one contract
- Qualitative surveys with selected groups to gauge the acceptability of a congestion charge and to inform design parameters (level of charge, precise boundary, exemptions, etc.);
- Definition of a scheme (e.g. area licence for within the canals at €10, as proposed in this report) to be worked up in further detail for illustrative purposes (it will help decision-makers if they can visualise a possible scheme) and to inform demand and cost modelling; and
- Meetings with Transport for London and Transport Initiatives Edinburgh and Stockholm City Council to discuss congestion charge scheme costs in these cities

8.81. The above tasks would enable details of the outline scheme proposed in this study to be considered, including:

- The precise charging boundary;
- Whether the charge should be cordon or area based;
- Appropriate technology (paper based or electronic);
- Appropriate enforcement/compliance strategy (related to technology);
- Levels of charge;

- Times of operation;
- Impact of exemptions or discounts;
- Complementary measures (e.g. additional buses, traffic management measures);
- Capital and operating costs; and
- Forecast revenues.

8.82. The detailed design of any scheme would proceed only if a positive political decision to implement a scheme was made.

Charges on Free Workplace Parking

Rationale

8.83. A charge on free workplace parking is proposed as a measure that would be more effective across the entire GDA than the measures to promote TDM because, as shown in Section 2, demand is growing rapidly in non-central areas. Technically, restraint on this growing demand could be achieved by tackling free workplace parking. Feedback from consultation and market research suggested that this approach is also a relatively acceptable option in principle, as discussed in Section 4. In practice, as discussed in Section 3, measures which aim to significantly increase the cost of car use are generally only applicable in medium to large size centres where non-car travel options are available. Consequently, there would be areas within the GDA where the charge would not apply.

Workplace Parking Levy or “Benefit in Kind” Taxation?

8.84. Free workplace parking could be tackled either by a workplace parking levy or “benefit in kind” taxation policy. With a levy, the employer would pay in the first place and then choose whether or not to pass onto the employee. With a taxation policy, the parking space would be declared by the employer and/or employee as a benefit in kind and paid by the employee. Both of these options have advantages and disadvantages, as shown in Table 8.6. The workplace parking levy, however, is considered likely to have the greater impact and it therefore the preferred option. Its advantage is that it can be applied to a specific geographical area, at a chosen rate. It also provides an incentive to the employer to reduce parking. By comparison, benefit in kind taxation does provide a disincentive to an employee, but the value of the benefit in kind would be hard to identify in many cases and the sums paid in taxation may not be sufficient to change behaviour. Nevertheless, benefit in kind taxation would be a good “second best” option, and much better than doing nothing.

Table 8.6 Comparison between workplace parking levy and benefit in kind taxation

Levy	“Benefit in kind” taxation
<ul style="list-style-type: none"> • A single rate can be applied to a geographically specific area. • Levy can be set at full value of parking spaces in the area. • Options to implement through the rates system or the Revenue Commissioners. • Employers must register spaces which is an incentive to reduce the number of spaces. • Option for employer to pay on employee's behalf, or for employee to pay. • Legislation would be required. 	<ul style="list-style-type: none"> • Tax on the individual employee • It would be applied nationally but the value of the benefit would vary by location. There could be a threshold below which the income valuation is not applicable. • The benefit would likely be assessed by the Revenue Commissioners in terms of the income that accrues as a result of the employee having the space. This may be based on the capital value associated with the space or the rent paid by the employer for the space. • Tax is paid on the value of the benefit, so the sum paid will be less a levy based on market value, so is less likely to change behaviour. • Targets employee more directly than levy, although employees may seek financial compensation if they have to pay the tax. • Legislation would be required.

Outline of the Proposed Workplace Parking Levy

8.85. An outline of the proposed workplace parking levy is set out in Table 8.7.

Table 8.7 Outline of the Proposed Workplace Parking Levy

Feature	Working Assumption	Options
Area	Dublin City, except the congestion charging zone. All Fingal, South Dublin and Dun Laoghaire-Rathdown Development Centres in Kildare, Wicklow and Meath	Expansion or reduction of the proposed area
Level of charge	Determined locally to reflect rateable valuation and also the cost of publicly available parking in the area	Revenue Commissioners or local authorities take a view on an appropriate level of charge.
Administration	Local Authority	Revenue Commissioners
Frequency of payment	Annually	Daily, weekly, monthly
Responsibility for payment	Occupier of the building	
Time	Only spaces used Monday-Friday, working hours	Spaces used at any time
Enforcement	Local Authority	Valuation Office Third Party
Complementary measures	On-street parking restrictions and residents' parking schemes required to prevent displacement of parking.	Improvements for buses, cycling, walking and/or other measures to improve acceptability or effectiveness

8.86. The price of the workplace parking levy would be set by the local authority. It would be informed by the commercial value of the space, as determined by the

Valuation Office, and by the price of parking locally. Likely levels of charge, based on current parking costs, are set out in Table 8.8.

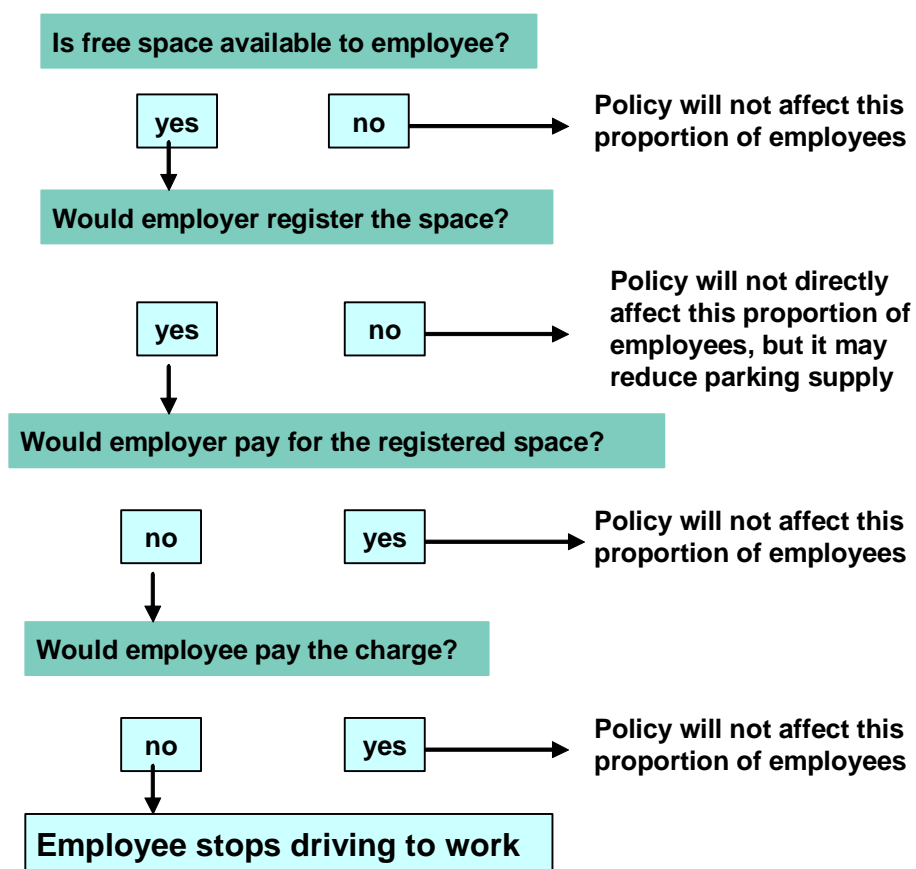
Table 8.8 Cost of Parking in the GDA

Local Authority	Approximate current cost of parking	Annual equivalent
Dublin City	60c – €2.50 per hour	€1,000 - €4,500
South Dublin Fingal Dun Laoghaire Rathdown	€2.50/day – €1.50/hour	€600 - €3,600
Kildare Meath Wicklow	€1.50/day – 50c hour	€350 - €900

Transport Impact of a Workplace Parking Levy

8.87. The assessment of the likely impact on behaviour involves consideration of a hierarchy of decisions, as set out in Figure 8.7.

Figure 8.7 Considerations in Assessing the Impact of a Workplace Parking Levy



8.88. The forecast response to each of the questions raised in figure 8.7 was based on research undertaken in the UK⁵⁰ which assumed a cost of levy in line with all day on-street parking or commercial off-street parking costs in the local area. That is, for the current study it was assumed that drivers in the GDA would respond to a workplace parking levy set in line with current parking costs in their areas (see Table 8.8) in the same way that drivers in the UK stated that they would react to a workplace parking levy set at a price in line with existing parking prices in their area.

8.89. Analysis of the proposed workplace parking levy was based on the following assumptions:

- Some 75% of people that drive to work regularly in the GDA have a free parking space, based on research undertaken for this study⁵¹ and the DTO workplace parking survey 2003.
- The cost of the levy would be sufficiently high to change behaviour (in line with the current costs outlined in Table 8.8).
- The levy would not apply to the rural hinterland (i.e. the parts of Counties Meath, Kildare and Wicklow that are outside the Metropolitan Area and the Hinterland Area Development Centres).
- If congestion charging were implemented, the workplace parking levy would not apply within the proposed congestion charging zone, i.e. within the canals.
- Some 75% of existing free workplace parking spaces would be registered for the levy. Some 80% of registered spaces within the City Centre would be paid for by the employer on the employee's behalf. Elsewhere, 65% of registered spaces would be paid for by the employer⁵².
- Of those employees that would have to decide whether to pay the levy from their "own pocket" or change behaviour, 35-40% were assumed to pay⁵³, based on the research undertaken for this study as well as the UK research which gave similar results.

8.90. Based on the above assumptions, the workplace parking levy may produce a 4% reduction in vehicle-km and a 9% reduction in vehicle-hours across the entire GDA, as shown in Table 8.9 and Figure 8.8. This assumes that no other TDM measures would be in place, other than local parking controls to deter employees parking on-street to avoid the levy. The impact would be slightly less within the City Centre because a lower proportion of workers in that area drive to work.

⁵⁰ ROCOL Studies (Halcrow Fox et al, 2000)

⁵¹ Greater Dublin Area Travel Demand Management Consultation Report, June 2003

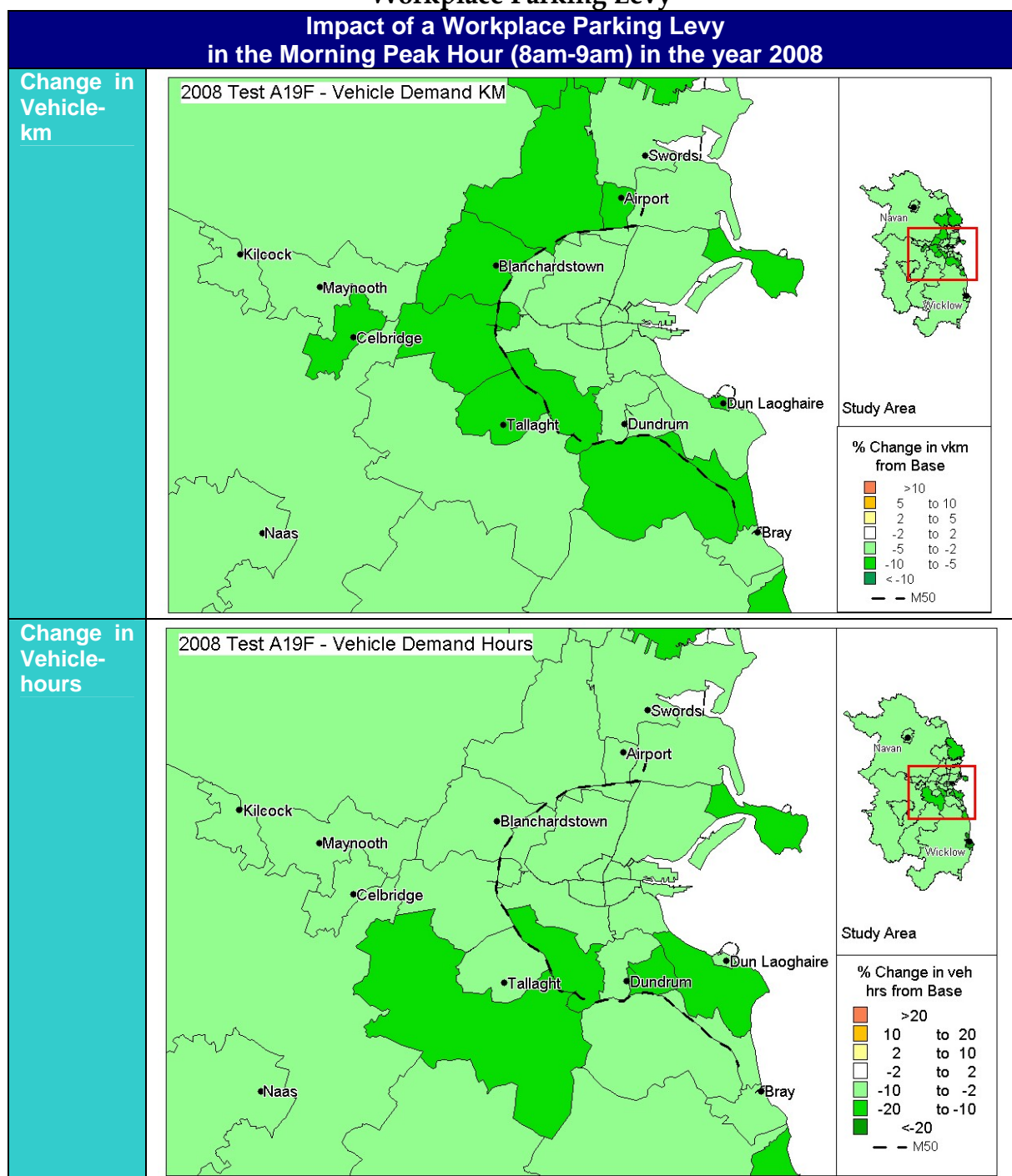
⁵² ROCOL Studies (Halcrow Fox et al, 2000)

⁵³ ROCOL and research undertaken for this study (as reported in the Consultation Working Paper, June 2003)

Table 8.9 Impact of a Workplace Parking Levy

Comparison with the base situation (no TDM) in 2008				
Workplace parking levy	All GDA	Inside canals	Between canals and M50	Outside M50
Vehicle-km in base (see Table 2.3)	6,553,167	179,437	1,151,621	5,222,109
Vehicle-km with measures	6,277,139	171,788	1,098,143	5,007,208
% reduction in vehicle-km	4%	4%	5%	4%
Vehicle hours in base (Table 2.3)	248,091	17,607	64,281	166,203
Vehicle hours with measures	226,676	16,381	58,516	151,780
% reduction in vehicle-hours	9%	7%	9%	9%
Average speed in base (Table 2.3)	26.4	10.2	17.9	31.4
Average speed with measures	27.7	10.5	18.8	33.0
% increase in speed	5%	3%	5%	5%

Figure 8.8 Change in Morning Peak Hour Vehicle-km and Vehicle-hours due to Workplace Parking Levy



8.91. A workplace parking levy would preferably be implemented in conjunction with workplace travel plans. Consequently, it is useful to examine the potential impact of the levy with the combination of measures to promote TDM described in Section 7 (of which workplace travel plans are a key component). As shown in Table 8.10, the impact of the workplace parking levy would be greater if applied with the measures to promote TDM. The overall impact of the two strategies together would

be less than the theoretical sum of the individual strategies due to double-counting⁵⁴ and also due to induced traffic (some people switch back to car from public transport for some trips to take advantage of improved car journey times due to fewer cars on the road).

Table 8.10 Impact of the Workplace Parking Levy in combination with Measures to Promote TDM

Comparison with the base situation (no TDM) in 2008				
Workplace parking levy with measures to promote TDM	All GDA	Inside canals	Between canals and M50	Outside M50
Vehicle-km in base (see Table 2.3)	6,553,167	179,437	1,151,621	5,222,109
Vehicle-km with measures	6,214,280	170,149	1,084,728	4,959,402
% reduction in vehicle-km	5%	5%	6%	5%
Vehicle hours in base (Table 2.3)	248,091	17,607	64,281	166,203
Vehicle hours with measures	222,432	16,082	57,530	148,820
% reduction in vehicle-hours	10%	9%	11%	10%
Average speed in base (Table 2.3)	26.4	10.2	17.9	31.4
Average speed with measures	27.9	10.6	18.9	33.3
% increase in speed	6%	4%	6%	6%

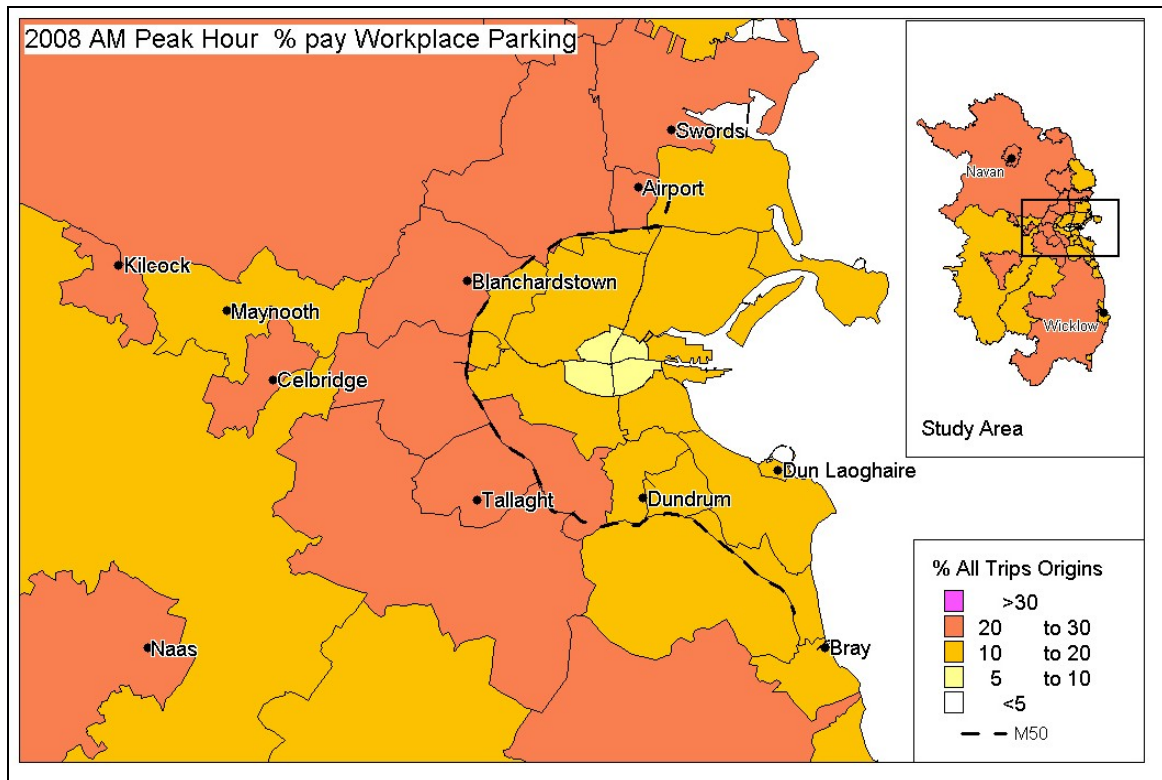
Who would pay the workplace parking levy?

8.92. The proposed workplace parking levy would apply to car trips to work in an area where a levy is proposed. The cost of the levy would vary depending on where the workplace is located. Zones where a high proportion of residents drive to work would have the greatest proportion of people that pay the levy.

8.93. Figure 8.9 shows the proportion of originating trips in each zone that pay the levy. It is based on the scenario where there would be congestion charging and therefore no levy in the City Centre. In the City Centre, a lower proportion of originating trips are also by car. For these reasons, only 5-10% of trips originating in the City Centre pay the levy. This rises to 10-20% for most of the area within M50, and most of the development centres in the hinterland. In some of the outer parts of Fingal and South Dublin, and parts of the hinterland, 20-30% would pay the levy.

⁵⁴For example, some drivers that had changed behaviour as a result of the workplace travel plans or other measures to promote TDM would no longer be affected by the workplace parking levy

Figure 8.9 Proportion of Originating Trips that pay the Parking Levy



Effect of a Lower Cost Levy

8.94. The analysis undertaken has been based on a levy of a comparable cost to local parking charge. In the absence of specific research, it is difficult to speculate on the likely impact of a low-cost levy, although the Australian levies appear to have had no effect in reducing traffic. Limited research in the UK⁵⁵ suggested that the great majority of employees or employers would simply pay the levy if it were set at a low rate (around £1000 per year in Central London). However, a low-cost levy could have the following effects:

- Awareness would be raised amongst employers and employees;
- Large employers, particularly in the public sectors, would review their parking provision and consider reducing the size of their car parks;
- There would be the potential to increase the level of charge in future years; and
- Revenue would be generated which could fund complementary measures such as additional bus services.

⁵⁵ RCOL Studies (Halcrow Fox et al, 2000)

Refining the Transport Impact Assessment

8.95. If the workplace parking levy proposal were to be progressed, further research with employers and with employees would be required to develop a more detailed picture of the likely response. Potential research topics are set out in Tables 8.11 and 8.12.

Table 8.11 Research Topics with Employers, and likely Issues

Research topics with employers	Typical issues for employers
<ul style="list-style-type: none"> ▶ Number of spaces, way in which spaces are used, pooling of spaces ▶ Inventory information <ul style="list-style-type: none"> — Number of spaces — Usage of spaces — Pooling of spaces — Operational need for parking ▶ Attitude towards registration of spaces <ul style="list-style-type: none"> — Likelihood of registering some or all of the spaces — Influence of level of charge — Likelihood of paying for the charge on the employees behalf, influence of level of charge 	<ul style="list-style-type: none"> - Need to recover additional costs – potential to pass cost onto customers - Maintaining staff terms and conditions - Pooled spaces, visitors spaces, spaces for people with disabilities, spaces used by staff that need a vehicle to carry out their job - Pressure to register a reduced number of spaces to support policies to restrain car trips and in order to limit expenditure (especially public sector employers) - Exemptions for a certain level of parking essential for the business– this could result in the need to agree a regional minimum functional level of parking for workplaces - Existing cost of car parking e.g. already paying for staff car parking through rent - Level playing field with workplaces with paid on-site parking (e.g. new car park at St Vincent's hospital) - Access to premises for registration and inspection - Need for a period within which they could review their parking policy before deciding how many spaces they would register - Benefits from scheme – reduced congestion

Table 8.12 Research Topics with Employees, and likely Issues

Research topics with employees	Typical issues for employees
<ul style="list-style-type: none"> ▶ Research with employees <ul style="list-style-type: none"> — Current all-day travel patterns — Likelihood of paying the levy if employer would not pay — Influence of level of charge on behaviour — Likely response if not paying the charge 	<ul style="list-style-type: none"> - Availability of an acceptable public transport alternative - Need car for non-work purpose e.g. school pick-up/drop-off - Benefit from scheme - reduced congestion - Benefit from complementary measures - Other incentives that may help to change behaviour

Frequency of Payment

8.96. It has been assumed the levy would be paid annually, in line with business rates. This option would minimise administration. Also, payment of a large levy in one lump sum may be the most effective incentive to relinquish a parking space. A potential disadvantage is the possibility that once the levy is paid, there would be an incentive to use the car regularly.

8.97. An alternative option would be to charge the levy on a daily basis, offering employees the opportunity to question their travel behaviour every day and to make changes when possible. Employers too may be more likely to favour a pay-as-you-go system rather than a once-off annual cost. Research and consultation with employers groups would be important in informing decisions on these issues.

International Experience

8.98. International experience with workplace parking levies is limited. Parking levies have existed since 1992 in various business districts in Sydney, Australia. They are of the order of €500 per annum and are used to fund non-car transport improvements. Although the stated aim of the levy in Sydney is to reduce traffic, there is a question over its effectiveness⁵⁶. Perth, Western Australia has had “parking licence fees” for many years. They are currently of the order of €100 per annum. Nottingham City Council in England is proposing a City Centre levy of £150 pa rising to £350 pa. A public inquiry on the proposal prior to implementation is due to be held in Spring 2005.

8.99. Workplace parking levies were considered and rejected in London and Edinburgh. By comparison with congestion charging, they were predicted to be less effective in reducing congestion and to have more issues in implementation that would take longer to resolve.

8.100. The lack of international experience from which the GDA could learn means that original research within the GDA will be essential to assess the likely response as well as the practical issues associated with implementation.

Administration and Legislation

8.101. Two mechanisms for implementing the levy were considered: through the local authority rates system or through the Revenue Commissioners.

Implementation through the Local Authority Rates System

8.102. It would be possible to “piggyback” on legislation to reform the rates system which is currently being prepared acting on foot of recommendations of the *Working Group on the Review of Rating Law*, in order to allow car parks to be valued separately, and to allow rates to be charged on a daily basis, and to allow differential rates⁵⁷. It

⁵⁶ The levy is currently A\$840-420 (€250-500), so it is not priced sufficiently high for significant impact. The cost of the levy has increased fourfold since it was introduced in 1992, and employers now feel that it has become a burden. They also consider that it has failed to achieve its stated aim of traffic reduction as the number of spaces has not been reduced and traffic flows have not decreased, although no monitoring takes place. The levy has collected \$216 million since it was introduced, but only A\$84 million has been spent. This has been on parking and ferry facilities but not on public transport.

⁵⁷ Without differential rates, workplace parking charges through the rates system would be a very nominal sum.

is recommended that the DTO make a formal submission the Working Group on this issue.

8.103. If the necessary legislative changes are made, there would be advantages to the implementation of a workplace parking levy through the rates system. A system of inspection and valuation is already in place so there would be no need to create a new organisation. Indeed, the Valuation Office is due to undertake a comprehensive valuation of all buildings in the State in the next few years. If the Valuation Office were mandated, it would be a relatively simple task for the Office to include an assessment of the value of a building's parking spaces as a separate item. The Valuation Office would inform the local authority of the values, as it does now for business rates.

8.104. As with rates, the local authority would issue a bill to the property occupier, and the local authority would have the ability to vary the levy in accordance with local circumstance (e.g. cost of public parking) and need, as with, for example, the Development Levies at present.

8.105. The proposed administrative system should not require significantly increased resources in either the Valuation Office or the local authorities. Estimated set-up and running costs are described in Table 10.4.

Implementation through the Revenue Commissioners

8.106. A workplace parking levy could also be introduced through the Revenue Commissioners. A minor disadvantage would be the need to establish a new unit within the Revenue Commissioners to administer the levy.

8.107. The necessary changes to primary legislation to enable the introduction of a workplace parking levy is being examined for incorporation, among other changes, in the comprehensive regulatory reform legislation currently being drafted by the Department of Transport. It is recommended that the DTO liaise with the Department on the progress of this initiative.

8.108. Alternatively, primary legislation to enable the levy could possibly be introduced within the Financial Act 2005.

8.109. How a space would be valued, particularly with the benefit in kind taxation option is an issue, as outlined in Table 8.6. Alternatively, under either option, the Revenue Commissioners could take a view on how much to charge. This occurs in some Australian cities where a levy on each workplace parking space in designated business districts is charged to the employer, and where workplace parking is also taxed as a benefit in kind.

Hypothecation of Monies Raised through the Parking Levy Scheme

8.110. Whether the proposed workplace parking levy was collected through the rates system or the Revenue Commissioners, arrangements could be established for the

funds raised to be hypothecated to public transport improvements, via the Department of Transport. An example of successful hypothecation of taxation is the application of the plastic bag levy. This is collected by the Revenue Commissioners and hypothecated to the Environment fund, which in turn is used to fund staff to enforce environmental legislation. Others are currently under discussion, notably in the health sector. Some funds would also need to be allocated to the local authorities for measures to complement and support the workplace parking levy and the parallel workplace travel plan campaign.

Introduction of Residents' Parking Schemes and Other Parking Controls

8.111. Before a workplace parking levy is introduced, the areas within which the levy will apply need to have parking controls put in place. Otherwise, commuters would simply park within walking distance in residential streets or in other spaces that would be better used by shoppers or other visitors. In other words, parking controls are an essential prerequisite without which a workplace parking levy cannot be introduced. These parking schemes may or may not generate revenue for the local authorities, depending on how much space is priced at commercial rates and how much is reserved for residents and other permit holders. For the purpose of this study, it has been assumed that any parking control schemes introduced to complement the workplace parking levy would be revenue-neutral.

8.112. Outside the City Council area, parking controls are only slowly being introduced at present. Within the indicative implementation programme (see Section 9 of this report), some four years have been allowed in the implementation programme for sufficient parking controls to be put in place. This is considered ambitious given the stages involved: scheme design; consultation; consideration of objections; scheme refinement, detailed design and amendment to traffic regulations; further consultation; implementation; and procurement of enforcement contractors.

Details to be resolved

8.113. Subject to approval and agreement on how the levy is implemented, issues to be resolved would include, amongst others:

- Whether employer registration will result in a good level of compliance, or whether an inventory/database will need to be developed;
- Enforcement system for ensuring the number of spaces registered is correct, which will entail gaining access to private property;
- Treatment of shared spaces and spaces for visitors, customers, deliveries, people with disabilities, pooled cars, company cars and cars/vans used for employers' business;
- Possible exemption of small car parks, e.g. under 5 spaces; and

- Treatment of spaces on a daily basis (i.e. if not all spaces are used every day).

Employer Notification and Review Period

8.114. Notification to employers of the impending levy would be a lengthy process and would probably need to be by individual letter. Employers would then need a period within which to review their parking situation before determining how many spaces they would register for payment either by themselves or by their employees.

8.115. Employers would have many concerns regarding the introduction of a workplace parking levy (see Tables 8.11 and 8.12). It is important that these concerns are aired early on with employers' groups as part of the general travel awareness process, and the process of putting in place workplace travel plans. During the employer review period, practical guidance and possibly other incentives to establish workplace travel plans should be offered to all employers.

8.116. Employers who successfully implement workplace travel plans would be indirectly rewarded because they would require fewer parking spaces and consequently would pay less in levies. The option of some additional "bonus" for employers with successful workplace travel plans could also be considered.

Timescale

8.117. The task of introducing parking controls is on the critical path for the implementation of the workplace parking levy. All other tasks associated with the proposed levy, including the drafting of legislation, could be achieved relatively quickly, given approval, but parking control schemes generally take about two years to be put in place successfully, although experience varies from place to place.

Risks to the Implementation Programme

8.118. The main risks to the implementation of the workplace parking levy that have been identified include:

- Lack of political consensus or acceptance of the principles set out in this report and subsequent difficulties in adoption of appropriate legislation;
- Resistance to the introduction of a levy at the high levels envisaged for travel demand management;
- Potentially low levels of registration, especially if self-declaration without an inventory is adopted; and
- Parking controls not fully in operation.

Other Issues for Consideration before Implementation

8.119. The exemption of workplaces in the rural hinterland from the levy is practical and would assist in gaining acceptability. However, it could be seen as financial encouragement to locate in rural areas which would undermine wider sustainable planning efforts. This potential difficulty could possibly be overcome by applying the levy to new development in the rural areas, or a workplace above a certain size, or by stronger regional planning guidance.

8.120. While the strategic transport and socio-economic benefits of the proposed workplace parking level have the focus of this study, there will be other effects which can only be assessed by bottom-up consultation with those affected. There is a concern that the existence of a workplace parking levy in a particular area may discourage employers from locating in that area, or encourage existing employers to relocate out of the area. This concern is most prevalent in the hinterland Development Centres where there is a need to attract employment to balance recent rapid housing growth. Research with employers groups (see Table 8.11) would be advisable to assess whether the concern is well founded.

8.121. Under the Development Levy scheme, a developer may have paid a once-off parking levy and may therefore challenge an annual levy.

8.122. In the UK, legislation allows local authorities to operate road user charging or workplace parking levies as travel demand management measures. There is a presumption against both measures being applied together. It is sensible to assume that there would be a similar presumption in the GDA, particularly given the potency of the “double taxation” perception argument as shown in the “bin tax” protests. While the proposed package described in Section 9 mostly avoids charging individuals twice by excluding workplaces within the charging zone from the levy, residents of the charging area with a workplace outside the charging area would be liable to pay both the area licence charge and the levy. People working outside the city who drive into the city for business may also be liable for both charges.

8.123. In the longer term, a presumption against having both a workplace parking levy and a road user charge would mean that, if the charging area were to be expanded in future, the levy would need to be abolished in the expanded area.

8.124. If the proposed central area congestion charging measure were not to proceed, the workplace parking levy measure could be extended to cover the area within the canals.

8.125. If, as an interim measure, a City Centre workplace parking levy were to be considered, provision would need to be made for that levy to be removed in the event of congestion charging being introduced at a later date.

8.126. Benefit in kind taxation is an alternative to a workplace parking levy which should not be ruled out. It is likely to be less effective than a full cost levy, but would still lead individuals to question their travel behaviour. It is also noted that

workplace parking is taxed as a benefit in kind in Australia, even in parts of Perth and Sydney where workplace parking levies also apply.

Impact of Delays or Failure to Implement

8.127. If the workplace parking levy is not implemented at the level of charge and/or the coverage envisaged, the overall package would be less effective.

8.128. If the levy is delayed, postponed or rejected, there could be less urgency to implement workplace travel plans and other “soft” measures to promote TDM. Most of the GDA outside the City Centre would then have to rely solely on traffic management and public transport supply to deal with travel demand. Bus operations and passengers would suffer as a result of slower operating speeds and greater unreliability.

8.129. Failure to implement the levy may give rise to objections that the introduction of a congestion charge in the City Centre is inequitable. On the other hand, the implementation of congestion charging may be simpler if it were the only fiscal measure on the agenda.

Next Steps

8.130. Further investigative work is recommended to inform (political) decision-makers in relation to the introduction of workplace parking charges, as follows:

- Research into likely employer and employee reaction to parking levy or benefit-in-kind taxation of parking space (see Tables 8.11 and 8.12);
- Information on all day travel behaviour, perhaps by commissioning travel diary surveys;
- Research to determine elasticity of travel demand with respect to workplace parking levy, perhaps by commissioning stated preference surveys;
- Data analysis and extensive DTO model work to enable the above information to be included in the model and for workplace parking levies to be modelled;
- Analysis of model outputs to better determine the degree to which a workplace parking charge would contribute to TDM objectives and to define areas most likely to benefit from reduction in car travel and road congestion due to the charge;
- Further consideration of the mechanism for administering the charge – through the rates system (preferred option) or through the Revenue Commissioners, or perhaps by some third party; and
- Refine scheme set-up and operating costs including enforcement costs.

8.131. If following this work a positive decision is made to proceed, it is recommended that an economic impact assessment of the proposed charge is undertaken.

9 Package of TDM Measures

Packaging of Measures

Principles

9.1. TDM measures are best implemented as 'packages' of measures that reinforce each other rather than as individual measures. This recognises, among other factors, the need to provide both 'carrots' and 'sticks' (incentives and disincentives) to motivate and sustain travel behaviour change, and the fact that different measures will reinforce the benefits of other measures thereby achieving a greater impact than that which would be achieved if the measures had been implemented on their own. It also recognises that one measure on its own will not be able to cover all travel needs and transport types.

9.2. The main principles for developing a package of TDM measures are summarised below.

Address all Travel Change Aspects

9.3. To be successful, a TDM package should attempt to cover all seven aspects of travel change, as set out below. If only some of these travel change aspects are addressed, the results may be substantially lower than those which could have been achieved and may not be long lasting. For example, measures which aim to reduce car use need to be implemented in conjunction with measures to encourage alternative travel modes to ensure that any reductions in car use achieved are sustained.

Types of Travel Change sought by TDM Programmes

Trip reduction – to reduce the need to travel and thereby reduce overall travel demand.

Reduce vehicle use – in particular, to reduce the amount of car travel.

Increase vehicle occupancy – to reduce the amount of single occupancy car trips, and increase car occupancy.

Increase travel by alternative modes – this includes measures to encourage public transport use, walking and cycling in preference to car.

Trip retiming – to encourage travel at less congested times.

Alternative destinations – to encourage travel to destinations that are closer, and that lead to less overall congestion.

Reduction in trip length – by planning for the provision of employment, retail and other services closer to where people live.

Include a Mix of Integrated Measures

9.4. A properly integrated TDM package will carefully weigh the interactions between different TDM measures and will include measures which:

- Reinforce benefits - some TDM measures strengthen the effects of other measures thereby increasing the total benefit achieved; for example, financial incentives for car-poolers will reinforce the benefits of carpooling and ride-matching schemes.
- Mitigate adverse effects – it is possible to mitigate, to a certain extent, the adverse effects of certain TDM measures by implementing complementary measures. For example, a cordon road-pricing scheme could result in cars being parked just outside the cordon zone to avoid the road pricing charge. Instituting a parking restraint scheme (e.g. Controlled Parking Zone) could mitigate this effect by prohibiting non-residents from parking in that area

Contain a Mix of Incentives and Disincentives

9.5. International experience has shown that all TDM programmes which have been successful in changing travel behaviour have contained a mix of incentives (carrots) to reduce car travel or change to alternative travel modes, and disincentives (sticks) to continue travelling by car. Generally, the 'carrot' and 'stick' must be used together to achieve a significant and lasting change. This would mean, for example, accompanying parking restraint with incentives to use public transport or to carpool.

Strategic Issues

9.6. In addition to applying the TDM packaging principles identified above, there are a number of strategic issues which need to be addressed in designing a TDM package:

Geographical

9.7. Although many transport issues apply throughout the GDA, the intensity of the problem differs between areas and centres. In addition, the characteristics of centres vary markedly. This means that TDM measures which may be applicable in certain areas and centres will not be applicable in others. The TDM package (and implementation programme) will therefore need to take this geographical element into account.

Temporal

9.8. It also needs to be recognised that the characteristics of areas and centres, and the transport issues they are facing, will change over time. This is particularly the case in the GDA at this time given the rapid pace of population and employment growth over the last five years or so. The way in which a TDM package is applied will need to allow for change over time, and include an ability to phase measures in line with area/centre characteristics and issues being faced.

Staged

9.9. As indicated above, many TDM measures are complementary and will be most effective when implemented in tandem. In addition, disincentives (sticks) should not be introduced on their own, but rather in conjunction with incentives (carrots). This is particularly the case for measures that directly increase the cost of car travel such as off-street parking charges and road pricing. These latter measures would ideally be implemented in tandem with, or just following, significant improvements to public transport services, for example, new light rail lines or major rail upgrades.

Trip Market

9.10. The trip market being tackled by any TDM package needs to be considered in terms of purpose (work, school or recreation) and time of day (peak or off-peak). As outlined in Section 3, tackling peak hour trips to work will result in the greatest impact. It may be less desirable to tackle other markets, for example, City Centre traders would typically be concerned that measures designed to reduce commuter traffic did not also discourage off-peak shoppers.

Measures Included in a Preferred Package

9.11. Based on the analysis discussed in Sections 6, 7 and 8 of this report, a Preferred Package of travel demand management measures that could be implemented in the short to medium term would include the following:

- Land use planning measures:
 - Consolidation of residential population in existing built up areas in the GDA region, where accessibility to work, leisure and other destinations by foot, cycle and public transport is generally better;
 - Location of major trip-intensive land uses in areas well served by public transport;
 - Grouping of key trip destinations (employment, retail, leisure and other services such as hospitals) in defined district or town or city centres (higher order Urban Centres);

- Relating the scale of district and town centres to their public transport accessibility;
- Providing a mix of local services within walking distance of their surrounding neighbourhood;
- Designing all new developments with walking, cycling and public transport in mind;
- Relating the density of new developments to public transport accessibility, and proximity to nearest centre; and
- Regional maximum parking standards, with further restrictions in maximum permitted parking provision for new developments, related to public transport accessibility, and proximity to the nearest Urban Centre.
- Measures to promote TDM:
 - Workplace travel plans;
 - School travel plans;
 - Individual marketing; and
 - Virtual mobility.
- Fiscal measures:
 - Workplace parking levy; and
 - Central area road user charging

9.12. In addition, the existing strategies relating to bus priority, walking measures, cycling measures, traffic management measures and integration measures need to continue to progress in support of travel demand management.

Fitting together the Package

9.13. In fitting together the package, a few key points apply:

- Best practice in land use planning, as described in Section 6 of this report, underpins the strategy in the long term;
- Work-related measures are the most powerful of the measures to promote travel demand management, and the planning system can ensure these measures are put in place for future development;
- School travel plans are important, but have a smaller overall role;
- There is a direct synergy between the workplace travel plans (and other work-related measures) and the workplace parking levy. Workplace travel plans would make it easier for employees that have to pay a levy to give up driving;
- Workplace travel plans and school travel plans may assist those wishing to change mode as a result of the congestion charge but are

less important as the City Centre is already well served by public transport;

- Including both the congestion charging and workplace parking in the package achieves balance because all the urban areas would be subject to a fiscal measure. In the Preferred Package, there would be no workplace parking levy in the proposed charging zone to minimize double charges but it would not be possible to totally eliminate double charging. Drivers that have workplaces outside the charging area but who travel to or from the City Centre during the hours of operation of the congestion charging scheme would pay both charges. In theory, both the workplace parking levy and the congestion charge can be implemented together or independently. In practice, introducing two fiscal measures simultaneously would be challenging

Complementary Measures

9.14. “Complementary measures” are measures that support TDM or that make TDM measures possible to introduce. They would provide some of the detail upon which the TDM measures will stand or fall, by making the TDM measures acceptable, and/or effective.

9.15. Examples of potential complementary measures that may be required to make the TDM measures **effective**:

- City Centre congestion charging will be more effective if traffic signals on the junctions on the Outer Ring Route are adjusted;
- For the workplace parking levy to be effective, on-street parking controls will be required in all areas where the levy is applied; and
- For school travel plans or workplace travel plans to be effective, investment in, for example, footpaths on the approaches to the site may be required if footpaths are not already provided or are of a poor standard.

9.16. Examples of complementary measures which may be required to make the TDM measures **acceptable**:

- Traffic management measures in residential areas (or other sensitive areas) to deter through traffic diversion as a result of congestion charging;
- Parking measures in areas on the congestion charging zone boundary to deter “informal park and ride” or park and walk; and
- Reward for employers in the hinterland development centres e.g. financial support for a travel plan which would off-set the workplace parking levy and provide a level playing field with employers outside the workplace levy area

9.17. The above examples are all directly related to the proposed TDM measures, and probably would not take place otherwise. Other complementary measures are

perhaps less specific. As discussed in Section 4, the proportion of survey respondents who supported fiscal measures increased if the money raised was used to fund public transport improvements. Of those who made written submissions, most required improved public transport, park and ride, walking and cycling facilities. Many made a point that they would oppose congestion charging in advance of improved public transport. Many of these “supply-side” measures are included in *A Platform for Change* and are therefore not specifically related to the TDM measures. They may or may not proceed regardless of the introduction of travel demand management, and should not be budgeted for under the TDM initiative. However, it would be wise to assume that if demand management were to be introduced, a budget for complementary measures would be required to bring forward supply-side measures which would not otherwise be implemented within the TDM programme, or which would not be covered by existing proposals.

9.18. The following list includes candidate complementary measures which may need to be funded in order to implement the proposed TDM package:

- Additional buses (over and above those which Dublin Bus/Department of Transport intend to provide to deal with growing demand and improving accessibility):
 - To carry the extra passengers transferred from car;
 - To make bus services more attractive; and
 - To demonstrate that monies raised from fiscal measures would be used to improve public transport.
- Additional priority given to buses (beyond current QBN proposals):
 - To make bus travel faster (although bus speeds would increase anyhow due to the TDM package); and
 - To demonstrate that monies raised from fiscal measures would be used to improve public transport;
- Lower public transport fares:
 - To make public transport more attractive: and
 - To “give back” something in return for charging;
- Park and Ride facilities (in addition to any current commitments by local authorities or other agencies):
 - To improve access to public transport for people not within walking distance;
- Better integration of public transport :
 - Integrated ticketing, so that no more than one ticket is required, regardless of the number of service changes (as being developed by the RPA on behalf of the Department of Transport);
 - Integrated fares, to avoid penalising for changing services; and

- Integrated travel information across all public transport, including real time passenger information;
- Pedestrian improvements, or other amenity (in addition to any current commitments by the local authorities):
 - Space released as a result of less traffic demand can be reallocated to pedestrians. For example, Trafalgar Square in London was partially pedestrianised shortly after congestion charging was introduced. It is noted that City Centre organisations which were consulted would like to see improvements to the pedestrian environment in the centre of Dublin;
- Traffic management and local road improvements (in addition to current commitments by the local authorities):
 - Junction improvements, traffic signal adjustment etc. to deal with changed traffic patterns, e.g. on the North and South Circular Roads if an area licence was introduced;
- Parking controls (in addition to current commitments by the local authorities):
 - May be needed around the edge of an area in which road users are charged, or in an area in which workplace parking levies apply;
- Off-setting reductions in other charges or taxes; and
- Non-transport measures, for example,
 - A marketing initiative to ensure the City Centre remains a vital and vibrant centre for shopping and cultural activities.

9.19. The assessment of the impact of the proposed measures discussed in Section 10 of this report does not include specific complementary measures, such as additional bus services or traffic management measures, as specific measures were not identified during the study. The complementary measures may have positive or negative transport impacts, in addition to the impacts of the preferred package discussed later in this Section of the report. The assessment does, however, include all measures which are included in the 2008 DTO model (see Section 2), some of which will complement TDM, although not specifically proposed as such.

9.20. As complementary measures are integral to the proposed TDM package, the cost estimate described in Section 10 of this report (see Table 10.4) includes a budget for complementary measures. In general terms, this budget is intended to cover the following items from the above list, all additional to any current commitments by local authorities:

- Pedestrian improvements, or other amenity;
- Traffic management and local road improvements; and
- Parking controls around the edge of an area in which road users are charged and in the areas in which workplace parking levies apply.

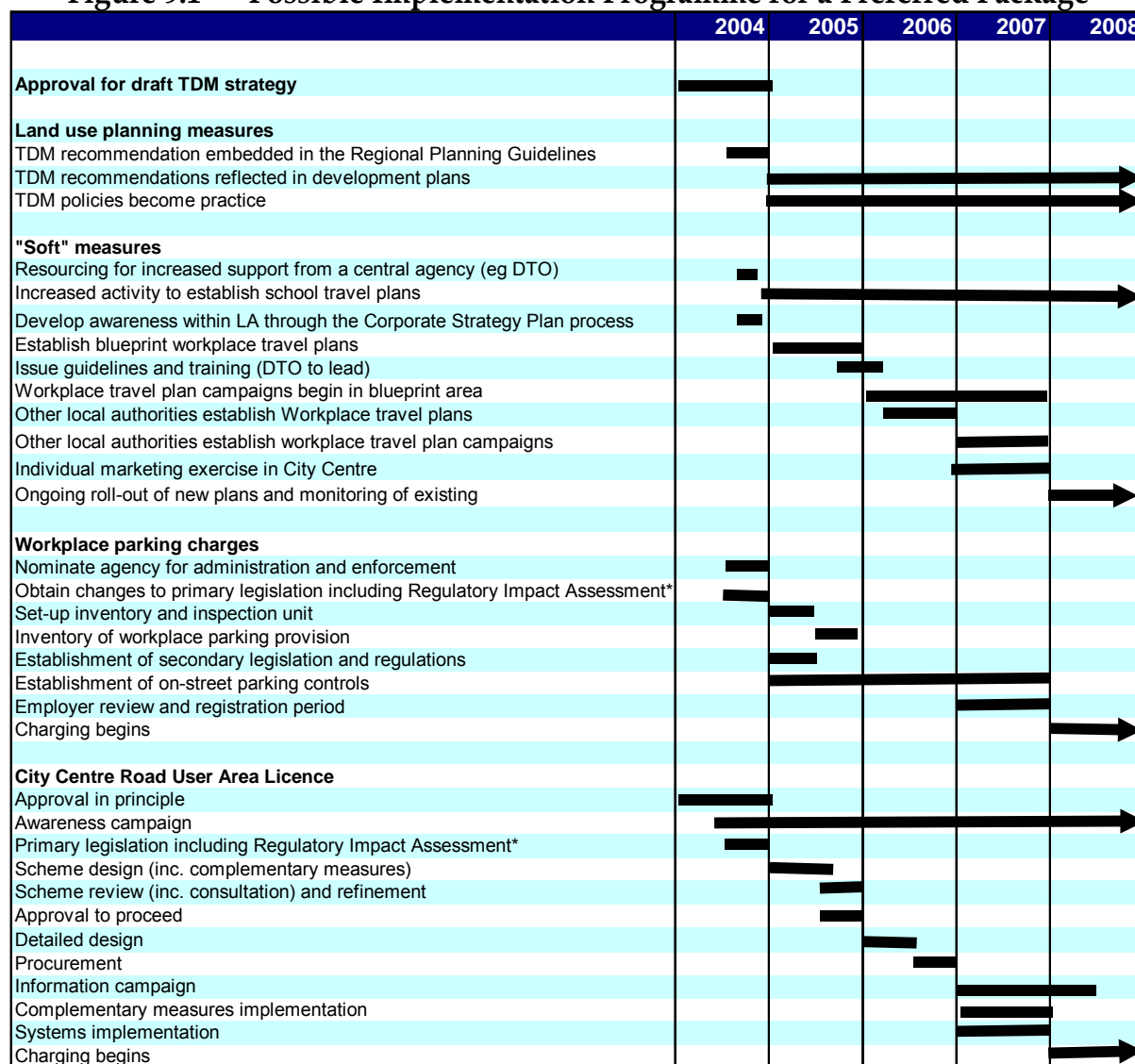
9.21. The other two categories of complementary measures which would be appropriate to finance from the TDM budget include:

- Non-transport measures, for example, marketing initiatives to ensure the City Centre remains a vital and vibrant centre for shopping and cultural activities; and
- Additional buses.

The Overall Programme

9.22. For the purpose of appraisal a possible annual programme for the implementation of a Preferred Package of TDM measures by the year 2008 was developed, which is shown in Figure 9.1. This is a work programme which would be technically possible although other considerations might extend it. Issues of implementation for each category of measure are described in previous sections of this report.

Figure 9.1 Possible Implementation Programme for a Preferred Package



* In accordance with *Regulating Better: A Government White Paper setting out six principles of Better Regulation*, Department of the Taoiseach, January 2004

Transport Impacts

9.23. Due to the introduction of Luas and improved suburban rail services, the public transport offering in 2008 will be very different to now. In the morning peak hour (8am – 9am), the number of peak rail boardings is forecast by the DTO model to increase from some 30,000 to over 47,000. Luas is forecast to carry almost 27,000 passengers during the morning peak hour in the year 2008.

The progressive impact of the measures

9.24. Table 9.1 shows the impact of the Preferred Package in reducing overall morning peak hour vehicle-hours in the year 2008 and the contribution of each of the individual components. It can be seen that:

- The congestion charge is the most powerful measure within the M50;
- The measures to promote TDM and the workplace parking levy have a smaller effect, but it is spread more consistently⁵⁸; and
- The effect of the package is less than the sum of individual measures due to double counting effects (e.g. people who have already stopped using the car due to the levy and to measures to promote TDM would not be affected by the congestion charge), some induced car traffic (for some trips, car travel would become more attractive as travel speeds improve so people will switch back to car) and possibly some peak hour contraction (due to improved travel times some people will now be able to complete their journey with the 8am-9am period whereas previously their journeys were taking longer)

Table 9.1 Progressive Impact of Measures in the Morning Peak Hour (8am –9am) 2008

TDM Option	Reduction in Vehicle Hours compared with base 2008			
	All GDA	Inside canals	Between canals and M50	Outside M50
Vehicle-hours in base (see Table 2.3)	248,091	17,607	64,281	166,203
Measures to promote TDM	239,713	16,988	61,855	160,870
% reduction	3%	4%	4%	3%
Congestion charge at €10	232,877	12,144	59,224	161,509
% reduction	6%	31%	8%	3%
Workplace parking levy	226,676	16,381	58,516	151,780
% reduction	9%	7%	9%	9%
Preferred package (all of above but no levy within canals)	218,302	11,704	55,586	151,012
% reduction	12%	34%	14%	9%

⁵⁸ In common with most transport planning models, the DTO Model is more detailed in the central area and becomes less detailed further from the centre, so that the areas outside the metropolitan area are modelled in outline only. The greater the level of detail, the greater the level of certainty regarding the model outputs.

9.25. In practice, the measures to promote TDM should ideally accompany the introduction of either congestion charging or a workplace parking levy.

Reduction in the Growth Rate of Overall Travel

9.26. Without demand management measures, private car trips are forecast to grow at 2% per annum between 2001 and 2008⁵⁹. The introduction of the Preferred Package would be equivalent to a reduced rate of growth of 0.5% per annum over the seven-year period.

Transfer from Private Car

9.27. As shown in Table 9.2, the Preferred Package is expected to remove almost 25,000 private vehicle trips from the GDA road network in the morning peak hour, which is equivalent to around 10% of total private vehicle trips in the year 2008. Almost 25,000 car drivers and passengers would transfer to public transport as a result of the Preferred Package. Increased bus speeds would be a factor in attracting more passengers to public transport, as bus speeds are forecast to increase from 14.3kph to 16.5 kph with the Preferred Package.

Table 9.2: Effects of the Preferred Package on Mode Choice in the Morning Peak Hour (8am-9am)

Comparison with base case in 2008		
	Private vehicle trips in AM peak hour	% Reduction
Preferred package	212,829	10%
No demand management	236,972	
	Public transport trips in AM peak hour	% Increase
Preferred package	158,882	19%
No demand management	134,054	
	Average AM peak hour bus speed (kph)	% Increase
Preferred package	16.5	15%
No demand management	14.3	

Public Transport Capacity

9.28. The effect of the TDM package is to increase public transport patronage throughout the GDA. Examination of the future public transport network in 2008 showed that some 50 bus routes, distributed throughout the network, would suffer from overloading in the morning peak hour in 2008, even with the rail improvements and the introduction of Luas. The impact of additional public transport passengers would worsen any forecast overcrowding, but no specific areas

⁵⁹ From DTO model number of car trips

were identified that were forecast to suffer a significantly greater impact than others as a result of the TDM package. In other words, overloading is forecast to be spread around the network, with or without TDM.

9.29. Any shortage of public transport supply in 2008 as a result of the TDM package could be resolved by increasing bus capacity throughout the network. Some increased capacity required should arise as a result of increased bus speeds which should result in better fleet utilisation. This is also true for Luas, especially the Tallaght line, as the trams would also have faster speeds where they run on-street.

Other Behavioural Responses

9.30. In common with most transport planning models, not all potential behavioural responses to the congestion charge are included within the forecasting model⁶⁰. The possible responses are:

- Trip retiming and trip suppression;
- Change of trip origin or destination; and
- Transfer to modes other than public transport such as cycling and walking which are not modelled

9.31. These responses are discussed in detail in Appendix L. Briefly, it is estimated that, based on the London experience, the forecast reduction in traffic entering the canals might be underestimated by some 15-25% (relative to total trips) as a result of the following responses:

- Transfer to other forms of transport (motorcycle⁶¹, cycle or car share);
- Switch to walking; and
- Reduction in the number of trips made to the charging zone (either suppressed or diverted to other destinations).

Reduction in Congestion

9.32. The Preferred Package would remove some 30,000 vehicle-hours from the network in 2008, representing an overall 12% reduction in total vehicle-hours and resulting in very significant travel time savings. As Table 9.3 and Figure 9.2 show, the reduction, at 34%, would be greatest in the City Centre, where congestion is greatest, and less in the outer areas.

⁶⁰ They are implicitly included in the policy model which calculates the car trip reduction due to the workplace parking levy and the measures to promote TDM

⁶¹ Motorcycles do not pay the congestion charge in London. It is proposed that they are exempted from the forthcoming charge in Stockholm. Motorcycles do not currently pay at the Eastlink toll bridge in Dublin.

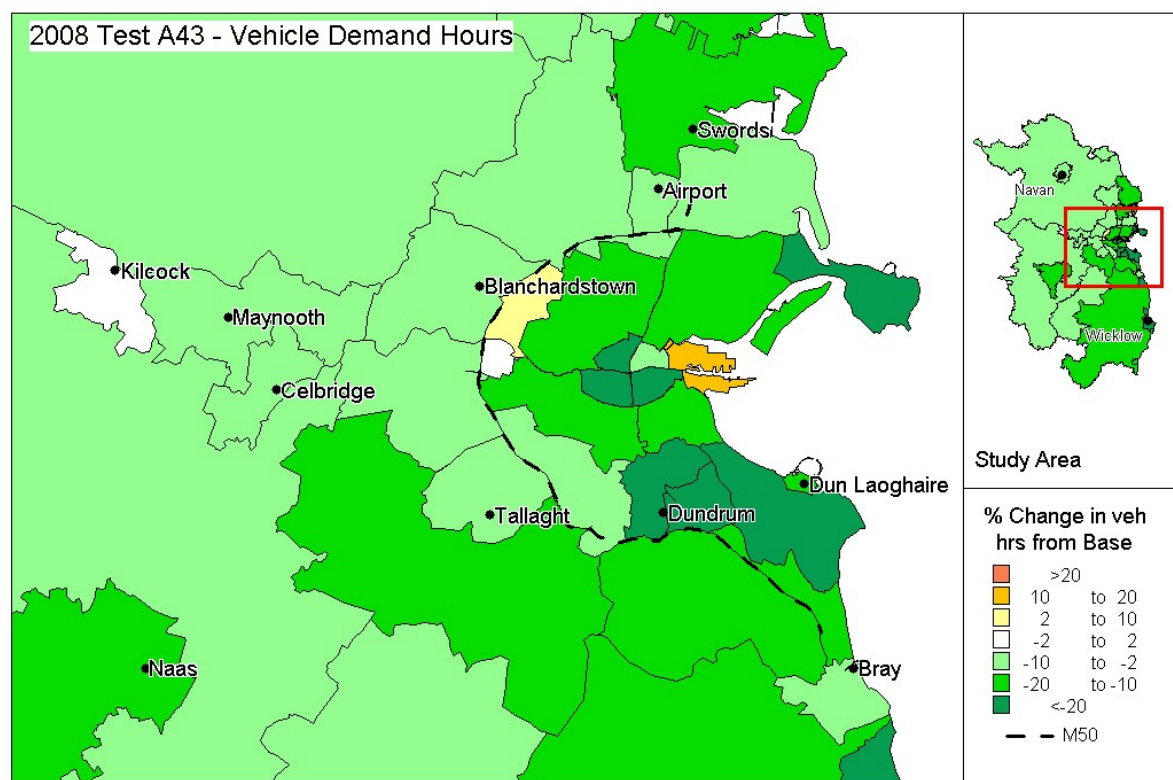
Table 9.3 Total 2008 AM Peak Hour Vehicle-Hours
Comparison with the base situation in 2008

Preferred Package	All GDA	Inside canals	Between canals and M50	Outside M50
Vehicle hours in base (see Table 2.3)	248,091	17,607	64,281	166,203
Vehicle hours with measures	218,302	11,704	55,586	151,012
% reduction in vehicle-hours	12%	34%	14%	9%

9.33. Figure 9.2 shows that the reduction in vehicle-hours would be greatest in the City Centre, and the southeast. Vehicle-hours are forecast to increase to the East of the City Centre, due to traffic diverting onto Macken Street Bridge and Eastlink. Some increased vehicle-hours would also be expected on parts of the M50.

9.34. The fact that the reduction in vehicle-hours is greater than the reduction in the number of vehicle trips is accounted for by the non-linear relationship between vehicle flow and speed. As traffic flows increase, speeds fall disproportionately until a point when traffic flow becomes unstable and traffic may stop moving. Conversely, a small reduction in traffic flow may produce a relatively large improvement in traffic speeds. Much of the GDA road network is over loaded in the morning peak hour, with unstable flow conditions. Therefore, removal of some trips from the network results in a disproportionate reduction in vehicle hours.

Figure 9.2 Change in Vehicle-hours in the Morning Peak Hour (8am-9am) in the Year 2008 with a Package of TDM Measures



9.35. As Table 9.4 shows, average car speeds across the entire GDA would increase from 26.4 kph to 28.5 kph as a result of the Preferred Package, an improvement of

8%, which would result in shorter travel times for commuters. Within the canals, average speeds would increase from 10.2 kph to 11.9 kph, an increase of 16%.

Table 9.4 Forecast Change in Car Speeds in the Morning Peak Hour (8am-9am) in the Year 2008 with a Package of TDM Measures

Comparison with the base situation in 2008				
Preferred Package	All GDA	Inside canals	Between canals and M50	Outside M50
Average speed in base (see Table 2.3) (kph)	26.4	10.2	17.9	31.4
Average speed with measures (kph)	28.5	11.9	18.5	33.2
% increase in speed	8%	16%	3%	6%

Reduction in Vehicle-km Travelled

9.36. As Table 9.5 and Figure 9.3 show, the Preferred Package would remove over 335,000 vehicle-km from the road network in the morning peak hour in 2008; this is equivalent to a 5% reduction in overall vehicle-km. The reduction in vehicle-km within the canals would be 23%, and 8% within the M50. Outside the M50, a smaller reduction in vehicle-km of 4% is forecast which should be regarded as indicative as the model is much less detailed in most of the area outside the M50.

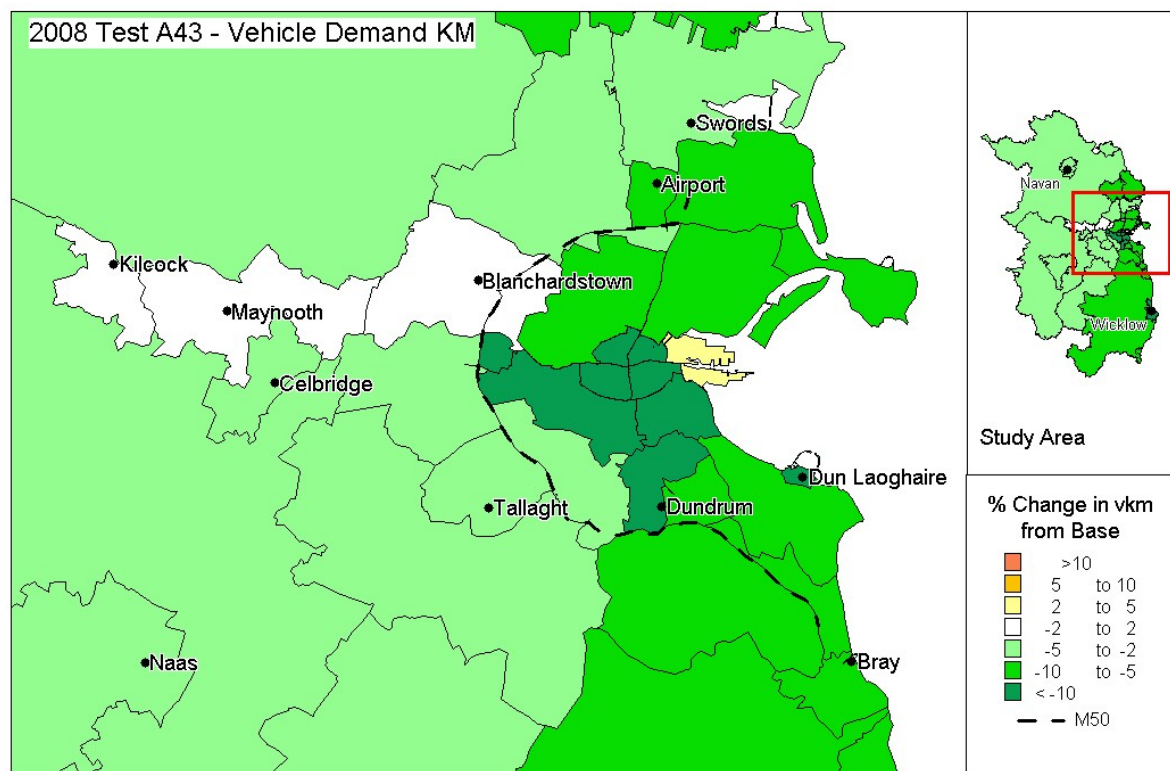
9.37. Figure 9.3 shows the forecast reduction in vehicle-km across the GDA. Reductions are greatest within the M50 and in the rail corridors. Increased vehicle-km are expected in the area to the east of the City Centre as traffic would divert onto the Macken Street Bridge and Eastlink.

9.38. The overall reduction in vehicle-km is less than the overall reduction in vehicle trips or vehicle-hours. This is primarily because some of the traffic remaining on the road network will seek longer routes to avoid the congestion charge.

Table 9.5 Total Vehicle-km in the AM Peak Hour, 2008

Comparison with the base situation in 2008				
Preferred Package	All GDA	Inside canals	Between canals and M50	Outside M50
Vehicle-km in base (see Table 2.3)	6,553,167	179,437	1,151,621	5,222,109
Vehicle-km with package	6,217,577	138,987	1,060,952	5,017,638
% reduction in vehicle-km	5%	23%	8%	4%

Figure 9.3 Change in Vehicle-km in AM Peak Hour (8am-9am) in 2008 with a Package of TDM Measures



10 Appraisal of a Package of Measures

Overview

10.1. The approach to appraisal of the TDM measures is detailed in Appendix M. In summary, the economic and financial costs and benefits associated with a Preferred Package have been identified and quantified. This package consists of a City Centre congestion charge of €10 per day, a workplace parking levy and a set of measures to promote travel demand management.

The Preferred Package

- Land Use Planning Measures
- Measures to Promote Travel Demand Management
- A City Centre Congestion Charge of €10/day applicable within the canals
- A workplace parking levy in the rest of the Metropolitan Area and the Development Centres set at market rates for parking in the local area

10.2. An appraisal of a package without the workplace parking levy has also been undertaken (“Reduced Package 1”), and an appraisal of a package with no levy and the congestion charge set at €5 (Reduced Package 2”). Other variations have also been examined and will be discussed later in this section under the piece on sensitivity analysis.

10.3. The economic and financial analysis results are presented separately.

Assumptions

10.4. The economic and financial appraisal is based on a series of assumptions, which are set out below, relating to the following:

- The transport and environmental benefits;
- Capital and operating costs; and
- Revenues.

10.5. The transport and environmental costs and benefits include:

- A reduction in car operating costs associated with those trips diverted to public transport;
- A reduction in road traffic accidents due to a reduced volume of traffic (as measured by millions of vehicle kilometres on the road network);
- Environmental benefits from reductions in emissions and noise impacts from car traffic;

- Value of time benefits to existing road users associated with a reduction in private car hours on the road network;
- Road decongestion benefits to non car users (pedestrians, cyclists and bus passengers) associated with reduction in traffic on a congested network;
- Increased public transport subvention associated with increased public transport trips; and
- Reductions in bus operating costs due to improved operational speeds on the network.

10.6. Cost parameters adopted for the appraisal include:

- Value of time (non-working time) €6.89 per hour⁶²;
- Vehicle operating costs of €0.1825 per kilometre derived from analysis of AA Ireland and GDA car fleet sourced from Department of Environment & Local Government - *Irish Bulletin of Vehicle and Driver Statistics 2002*, (2003);
- Traffic decongestion benefits valued at 0.119 cents per kilometre based on UK research undertaken by the Strategic Rail Authority;⁶³
- Estimated levels of public transport subvention in the GDA of €1.29 per passenger for rail and €0.38 per passenger for bus (based on analysis of Iarnród Éireann and Bus Átha Cliath data);⁶⁴
- Cost parameters adopted for the appraisal include:

10.7. Other assumptions include:

- Average car occupancy rate of 1.23 as derived from the canal cordon counts (2001);
- Road traffic accident data and values derived from the accident rates reported by the NRA⁶⁵ on the GDA national roads (N1, N2, N3, N6, N7 and N11) of 7.3% fatal, 13.8% serious injury and 78.9% minor injury; on all roads 1.4% fatal, 25.6% serious injury and 73% minor injury and accident costs of €1,453,871 (fatality), €180,473 (serious) and €17,288 (minor);

⁶² Based on "CBA Parameter Values and Application Rules for Transport Infrastructure Projects"- Report to the TAP Steering Committee by the External Evaluator by DKM Ltd Economic Consultants Feb 1994. Updated to 2004 values for the current study. As 80% of trips in the modelled period are travel to work trips, 15% are travel to education and 5% are "other" trips, it is reasonable to apply the value of non-working time generally for the appraisal. Travel to work is conventionally regarded as non-working time.

⁶³ Decongestion benefits are those accruing to non-car road users as a result of reduction in traffic on a congested network. These are additional to the savings that apply as a result of vehicle-hours removed from the network (i.e. journey time savings).

⁶⁴ Includes data from annual reports of the CIÉ subsidiary companies and data contained in the Strategic Rail Review (Feb. 2003).

⁶⁵ Road Accidents Facts Ireland 2002, NRA, November 2002.

- Road user congestion charge applies Monday to Friday only, excluding bank holidays, i.e. 252 days per year;
- 2008 market shares in the GDA for rail and bus of 43% and 57% respectively based on DTO modelling analysis;⁶⁶
- The congestion charging revenues collected in the 8am-9am period modelled, are factored by 2.2 to represent revenues collected during the rest of the operating period (7am-10am). This is slightly less than the factor of 2.3 applied to the benefits because vehicles only need to pay once, but can make multiple trips;
- The benefits accrued in the 8am-9am period modelled are factored by 2.3 to represent benefits accrued during the rest of the morning peak period. This factor was derived from the canal cordon count for 2003. The benefits are also factored by two to represent the return trip in the PM peak period; and
- The key assets associated with the Congestion Charge scheme have an economic life of 12 years, thereafter requiring complete renewal.

10.8. Air pollution and noise impacts are an area not well developed in Ireland vis-à-vis transport appraisal. However, there has been some work undertaken for the Cork Suburban Rail project⁶⁷ which provides a useful resource. Specific research was undertaken to assess emissions from road transport in the Irish context to develop emission rates per vehicle kilometre.⁶⁸ For this study, the value of air pollution benefits was obtained by multiplying the reduction in car kilometres on the road network by the estimated values per tonne. The emission rates and values that have been adopted for this study are a mixture of “local” air pollutants and greenhouse gases.

⁶⁶ Where rail includes DART, Luas and suburban IE services.

⁶⁷ Cork Suburban Rail Feasibility Study – Final Report, Faber Maunsell, December 2002.

⁶⁸ This involved use of the COPERT III model developed by the European Environmental Agency as an aid to Member States in calculating emissions from road transport. Faber Maunsell calibrated the model to Irish conditions and derived estimates of volumes per vehicle kilometre and values were estimated based on a literature review of undertaken by ECMT and conversion of these to Irish prices.

Table 10.1 Emission Rates from Road Vehicles and Emission Values (2004 prices)

Emission Type	Tonnes per Million Vehicle Kilometres (2000)	Value of Emissions in €per Tonne (2004)
Carbon Monoxide (CO)	5.99	n.a.
Oxides of nitrogen (NO _x)	0.81	6,827
Non methane volatile organic compounds (NMVOC)	1.16	6,827
Methane (CH ₄)	0.07	n.a.
Nitrous oxide (N ₂ O)	0.03	n.a.
Free Ammonia (NH ₃)	0.06	n.a.
Carbon Dioxide (CO ₂)	169.80	65
Sulphur dioxide (SO ₂)	1.16	1,092

10.9. Noise pollution impacts are a problematic area of assessment due to the differences between localized nature of many impacts and the influence of population dispersal. However, the approach adopted was to apply standard per vehicle kilometre values derived from ECMT research.⁶⁹ A per million-vehicle kilometre noise pollution cost of €24,633 has been adopted.

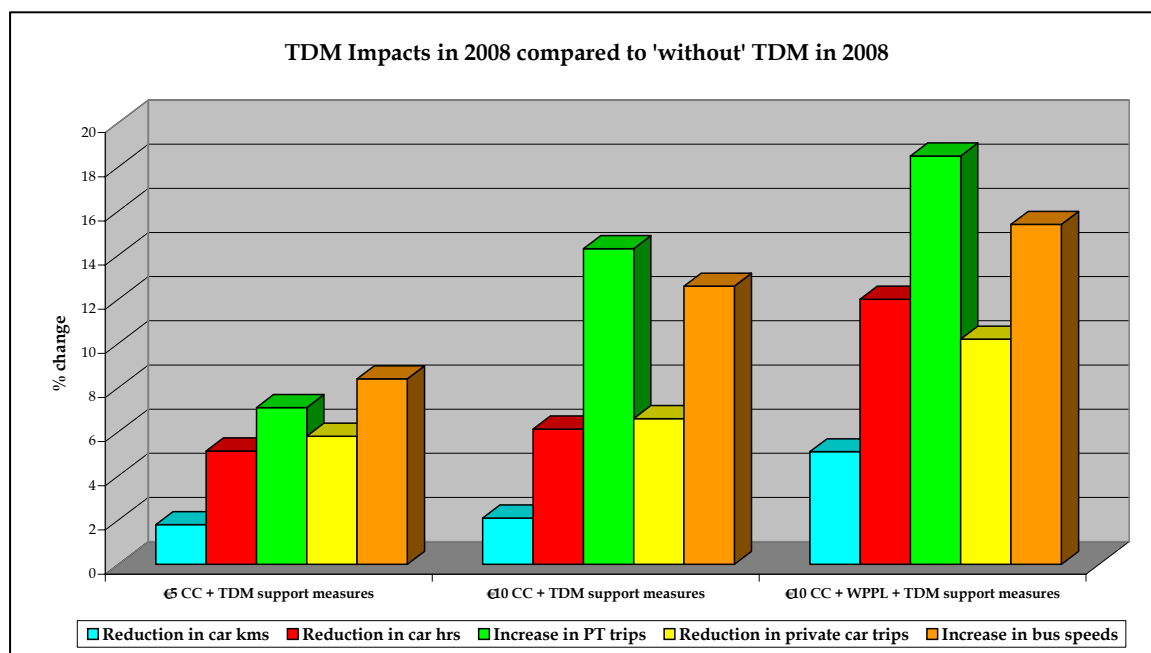
10.10. The modelling output data has been used in the estimation of costs and benefits is shown in Table 10.2, and graphically in Figure 10.1.

⁶⁹ This research was sourced from the Cork Suburban Rail study cited earlier.

Table 10.2 Summary of Transport Impacts used in Estimation of Costs and Benefits

Package	2001 AM Peak Hour	2008 AM Peak Hour with no TDM	2008 AM Peak Hour with TDM	Change	% Change
Vehicle-km			Reduction		
Preferred Package €10 Congestion Charge, workplace parking levy + TDM support measures	4.33 million	6.55 million	6.22 million	335,590	5.1%
Reduced Package 1 €10 Congestion Charge + TDM support measures	4.33 million	6.55 million	6.41 million	138,849	2.1%
Reduced Package 2 €5 Congestion Charge + TDM support measures	4.33 million	6.55 million	6.43 million	118,709	1.8%
Vehicle-hours			Reduction		
Preferred Package €10 Congestion Charge, workplace parking levy + TDM support measures	146,433	248,091	218,302	29,789	12.0%
Reduced Package 1 €10 Congestion Charge + TDM support measures	146,433	248,091	232,877	15,215	6.1%
Reduced Package 2 €5 Congestion Charge + TDM support measures	146,433	248,091	235,347	12,744	5.1%
Peak hour public transport trips			Increase		
Preferred Package €10 Congestion Charge, workplace parking levy + TDM support measures	115,415	134,054	158,882	24,828	18.5%
Reduced Package 1 €10 Congestion Charge + TDM support measures	115,415	134,054	153,202	19,148	14.3%
Reduced Package 2 €5 Congestion Charge + TDM support measures	115,415	134,054	143,628	9,574	7.1%

Figure 10.1 Impacts in 2008 compared with Base



Cost Assumptions

10.11. The capital and recurrent cost streams have been estimated for the following:

Congestion Charge:

- Capital costs of establishment of the scheme – video cameras, street / roadside furniture, signage etc;
- Area-wide education / awareness programme;
- Complementary traffic management measures;
- Administrative costs; and
- Scheme operation costs.

Work Place Parking Levy:

- Inventory and database development costs;
- Education / marketing / awareness programme;
- Scheme administration; and
- Complementary traffic engineering works.

Measures to promote TDM:

- Establishment costs;
- Scheme launch costs;
- On-going and follow-up promotion and monitoring; and
- Complementary traffic engineering works.

10.12. These costs include a number that would be 'one-off' costs and others that would be annually recurrent costs. Expenditure profiles have been estimated for

some of the items as, for all measures, it would be necessary to incur some costs prior to implementation.

Revenue Assumptions

10.13. Revenues associated with the packages would come from:

- Congestion charge fees for travel across and within the zone bounded by the canals; and / or
- Graduated levies on employer provided car parking spaces across the GDA

10.14. Table 10.3 indicates the number of trips for which a congestion charge is paid.

Table 10.3 Trips for which the congestion charge is paid (year 2008)

	Non-resident cars entering or passing through canals / cordon in peak hour*	Cars originating within the congestion charging zone*
Preferred Package €10 Congestion Charge, workplace parking levy + TDM support measures	25,968	16,949
Reduced Package 1 €10 Congestion Charge + TDM support measures	26,135	16,949
Reduced Package 2 €5 Congestion Charge + TDM support measures	28,578	18,738

*Based on the DTO model for the year 2008 which is projected from the 2001 DTO Model where figures for trips to work in the City are based on a DTO sample employment survey and estimate of number of workplaces

10.15. Workplace parking levy revenues were calculated as follows:

- The number of car work trip destinations in a levied zone in each local authority area in the year 2008 was identified from the DTO transportation model as follows:
 - Dublin City Council: 38,120
 - Dun Laoghaire – Rathdown: 19,062
 - Fingal Co.Co.: 30,098
 - South Dublin Co. Co.: 16,008
 - Kildare Co. Co.: 8,305
 - Meath Co. Co.: 1,008
 - Wicklow Co.Co.: 6,121
- 75% of these trips were assumed to have free workplace parking (refer to Paragraphs 8.8 of this report);
- 75% of the spaces that are currently free were assumed would be registered for the levy which would then be paid by either the employer or the employee (refer to Paragraphs 8.8 of this report); and

- An average levy⁷⁰ for each local authority was assumed as follows (see Table 8.8):
 - Dublin City Council area: € 2,000 per annum
 - Dublin Counties € 1,000 per annum
 - Hinterland Counties⁷¹ € 500 per annum

Economic Appraisal

Costs and Benefits associated with the Preferred Package

10.16. The estimates of costs associated with the Preferred Package for the first full year of implementation (2008) are set out in Table 10.4. Further background to the costing assumptions, including assumptions related to complementary measures, is given in Appendix N.

Table 10.4 Costs Associated with Preferred Package

Item	€million
Capital Costs	
<i>Congestion Charge</i>	
System set-up – over 3 years	50
Complementary traffic management measures – over 2 years	44
Education / awareness programme – one-off	5
<i>Work Place Parking Levy</i>	
Inventory & database development – one-off	1
Complementary traffic management measures – over 3 years	25
Education / awareness programme – one-off	1
<i>TDM Support Measures</i>	
Establishment costs – one-off	2
Complementary traffic management measures – over 3 years	25
Launch costs - one-off	1.5
Total Capital Costs (over 3 years)	154.5
Recurrent Costs	
<i>Congestion Charge</i>	
Scheme administration – recurrent	5 pa
Scheme operations – recurrent	60-120 pa
<i>Work Place Parking Levy</i>	
Scheme administration – recurrent	1.3 pa
<i>TDM Support Measures</i>	
Scheme administration – recurrent	1.0 pa
Total recurrent costs	67-127 pa

10.17. Establishment costs of the congestion charging scheme represent approximately two-thirds of the total capital expenditure associated with the Preferred Package (€99 million out of €155 million). Furthermore, the annual operating costs of the congestion charge far outweigh those associated with the other

⁷⁰ The actual levy would be in line with the market value of parking in the local area

⁷¹ Applies to development centres in the Hinterland only

measures combined and are likely to account for over 95% of the annual operating costs of the Preferred Package.

10.18. The cost estimate assumes that the economic-life for the congestion charging equipment is 12 years thereafter renewal is required. Given the total recurrent cost range of €67 – 127 million per annum, we assumed a mid range estimate of €97million per annum for the purpose of the appraisal.

10.19. The annual operating cost (recurrent cost) of the scheme has been based on the scheme currently operating in London. The actual annual operating cost will be a function of various factors including:

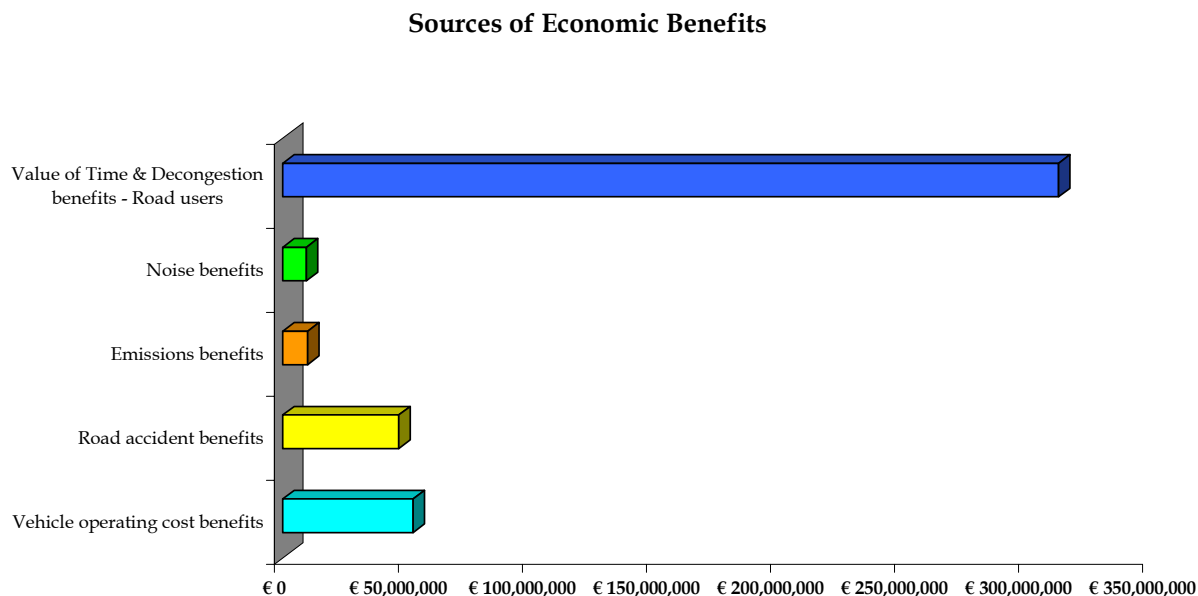
- the number of cameras used;
- the number of entry points to the charging zone;
- the supporting roadside facilities and street furniture used;
- the peak volume of transactions and other data to be processed (a function of vehicle flows)
- the hours of operation;
- the administration and enforcement technology and level of automation;
- the enforcement and penalty regime adopted;
- the customer interface system implemented; and
- the contractual mechanisms adopted for system operation.

10.20. The data currently available indicates a ‘best estimate’ of annual operating costs of €97.5 million with a ‘lower’ range of circa €60 million and an ‘upper’ level of around €120 million. Extensive research efforts are underway in London and in mainland Europe to identify more efficient mechanisms for collecting road user charges in urban areas, so it is possible that evolving technology and wider system application will lead to lower operating costs for congestion charging schemes. Given the level of uncertainty associated with operating costs, these have been subjected to sensitivity analysis for both the economic and financial aspects of the appraisal.

10.21. Table 10.5 and Figure 10.2 show that the major source of economic benefits associated with the Preferred Package are those derived from travel time and traffic decongestion benefits for existing road users (cars, buses, cyclists and pedestrians) associated with an enhanced road network. Important positive externalities are also achieved via a reduction in road traffic accidents and reductions in air pollutions and noise impacts.

Table 10.5 Unpriced Benefits Associated with Preferred TDM Package (Annual)

Item	€million
Benefits	
Vehicle operating cost savings (cars only)	53
Road traffic accident savings	47
Environmental benefits	20
Travel time savings & road user decongestion (car, bus, cycle and walk)	313
Increased public transport subvention	-22

Figure 10.2 Sources of Economic Benefits of the Preferred Package

10.22. Although the increased use of public transport is mainly a positive outcome, it will necessitate some additional funding for annual operations. This cost is reflected in the €22 million increase in public transport subvention indicated in Table 10.5. The figure is calculated by applying current levels of subvention per passenger (see Paragraph 10.7) to the number of additional public transport passengers generated as a result of the TDM package. Increased bus speeds as a result of reduced congestion are taken into account in the model; however, any reduction in operating costs or fleet sizes is not taken into account in the calculation of the additional bus subvention required.

10.23. It is possible to make an indicative assessment of the potential fleet size reduction. Previous studies⁷² suggest that some 5.5% reduction in bus fleet could be achieved for each for each 1kph increase in morning peak operating speeds. As the proposed TDM package is forecast to increase bus speeds from 14.3kph to 16.5kph (see Paragraph 9.27), it could be inferred that the total bus fleet required in 2008 with the TDM package could be reduced by 12%. Assuming operating costs are directly related to both peak hour patronage and to fleet size, the net effect of an 18.5% increase in peak hour patronage (see Table 10.2) and a 12% reduction in fleet size, would be a 4.3% increase in operating costs. A 4.3% increase in annual operating cost for Dublin Bus would be around €9 million, based on an annual operating cost of €207 million⁷³. This cost increase is considerably less than the €22 million increase in subvention which has been allowed for in the appraisal, and it goes to show the

⁷² "Bus Strategy Network Appraisal for the Greater Dublin Area", Scott Wilson Report, 1999 on behalf of CIE

⁷³ Dublin Bus Annual Report 2003

importance of taking advantage of the opportunities for cost efficiencies which will be presented by the TDM package.

10.24. Revenues generated by additional bus passengers are not taken into account in the economic appraisal as they are balanced by the costs to the user (i.e. the fare paid).

Net Environmental Benefits

10.25. It is estimated that the implementation of the packages would lead to significant reductions in environmental externalities associated with emissions of pollutants (greenhouse gases and local air quality pollutants). There would also accrue significant societal benefits from a reduction in road traffic accidents (RTAs) each year in the GDA. Table 10.6 summarises the net environmental benefits.

Table 10.6 Environmental Benefits associated with the Preferred Package

Potential no. of RTAs avoided	70
Potential no. of fatal or serious RTAs avoided	15
Tonnes of local air pollution not produced	1,805
Tonnes of CO ₂ not produced	33,027

Discounted Cash Flows

10.26. In order to assess the longer term economic and financial worth of the Preferred Package, discounted cashflow analysis using a 5% real discount rate has been undertaken. The discount rate and the twenty-five year evaluation period have been adopted in accordance with the general practice for transport projects in Ireland⁷⁴. The following assumptions have been used in the extrapolation of 2008 data and forecasts forward twenty-five years:

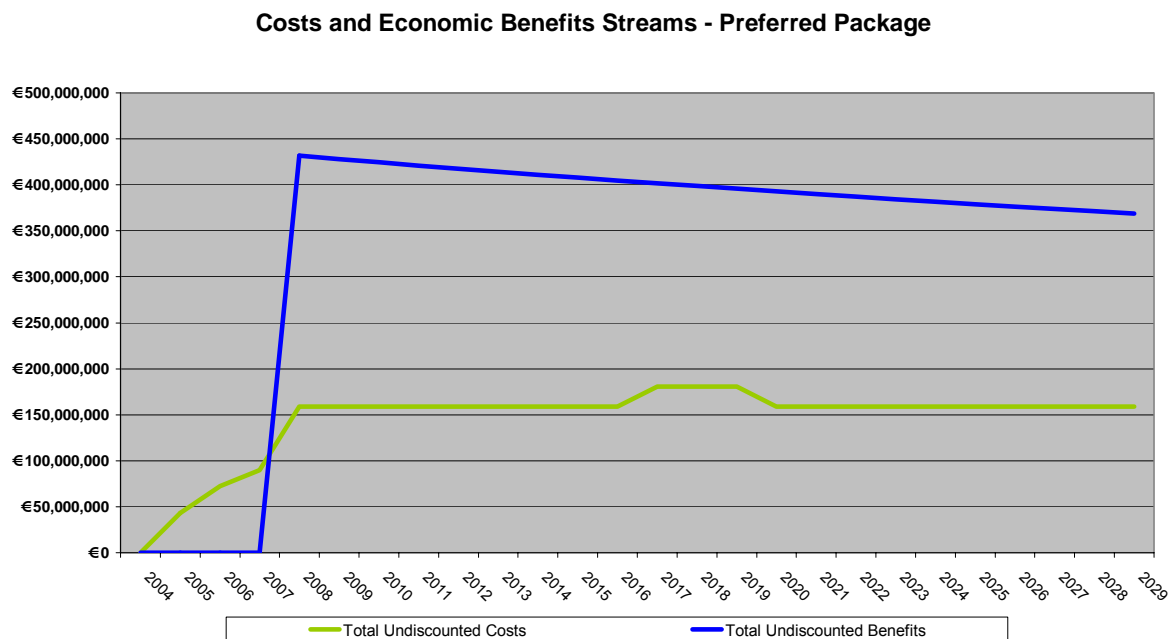
- GDP growth of 3.5% p.a. 2004 to 2008, 2.5% p.a. thereafter and population growth of 1.9% p.a. (used in Value of Time calculations⁷⁵);
- Reduction in benefits associated with reduced vehicle kilometres and vehicle hours of 2% p.a. to reflect underlying traffic growth eroding benefits of TDM measures. This is a conservative assumption, but not unreasonable given the rapid growth in traffic generation in the GDA; and
- Revenue streams from Congestion Charges and Work Place Parking Levies held constant in real terms

10.27. As Figure 10.3 shows, the benefits associated with the Preferred Package would greatly outweigh the costs over the 25 year period.

⁷⁴ CBA Parameter Values and Application Rules for Transport Infrastructure Projects, DKM Economic Consultants, Report to the TAS Steering Committee, February 1994. Note that 5% is a relatively high discount rate.

⁷⁵ Value of time is a per capita measure thus 'future' VoT, which is based on future GDP, must be adjusted by the difference between GDP and population growth

Figure 10.3 Costs and Benefits Streams – Preferred Package



10.28. The results of the economic appraisal discounted cashflow analysis are presented in Table 10.7. In order to test the sensitivity of results to changes in key assumptions a number of sensitivity tests have been undertaken on the Preferred Package and these are also presented in Table 10.7.

**Table 10.7 Total Costs and Benefits Discounted over a 25 Year Period
for the Preferred Package**

Package	Present Value Costs (€ billion)	Present Value Economic Benefits (€ billion)	Benefit Cost Ratio
Preferred Package €10 Congestion Charge, workplace parking levy + package of measures to promote TDM.	1.62	4.59	2.84
<i>Sensitivity analysis</i>			
1. 30% less vehicle kilometres saved than forecast	1.62	4.12	2.55
2. 30% less vehicle hours saved than forecast	1.62	3.79	2.35
3. 30% more vehicle kilometres saved than forecast; ⁷⁶	1.62	5.07	3.14
4. 30% more vehicle hours saved than forecast;	1.62	5.40	3.34
5. 50% increase in capital and operational costs	2.30	4.59	2.00
6. Congestion Charge annual operating cost at 'lower' end estimate;	1.27	4.59	3.63
7. Congestion Charge annual operating costs at 'upper' end estimate	1.95	4.59	2.36

⁷⁶ One of the key findings to emerge from the London situation has been the underestimation of the quantum of transport operational impacts / benefits.

10.29. The results of the analysis show a very robust economic case for the Preferred Package, even if the capital and operating costs were 50% more than forecast, or if the congestion charging scheme's annual operating costs were at the higher end of the scheme.

Costs and Benefits Associated with Reduced Package 1

10.30. Reduced Package 1 differs from the Preferred Package in capital and operating cost terms in that the costs associated with the car parking space levy scheme are removed. The estimated benefits associated with the reduced packages for the first full year of implementation (2008) are set out in following sections.

10.31. Removal of the workplace parking levy would result in the removal of the associated capital and annual operational costs. It would also result in reduced benefits. These are shown in Table 10.8.

**Table 10.8 Annual Unpriced Benefits associated with Reduced Package 1
(€10 Congestion Charge + Measures to Promote TDM)**

Item	Million €s
Benefits	
Reduced package – €10 Congestion Charge + measures to promote TDM	
Vehicle operating cost savings (cars only)	22
Road traffic accident savings	19
Environmental benefits	8
Travel time savings & road user decongestion	164
Increased public transport subvention	-17

Net Environmental Benefits

10.32. Although substantially less than with the Preferred Package, the reduced package would lead to significant reductions in environmental externalities associated with emissions of pollutants (greenhouse gases and local air quality pollutants). There would also accrue significant societal benefits from a reduction in road traffic accidents (RTAs) each year in the GDA under the options, as shown in Table 10.9.

Table 10.9 Environmental Benefits associated with the Reduced Package 1

Potential no. of RTAs avoided per annum	29
Potential no. of fatal or serious RTAs avoided per annum	6
Tonnes local air pollution not produced per annum	747
Tonnes of CO ₂ not produced per annum	13,665

Discounted Cash Flows

10.33. The results of the economic appraisal discounted cashflow analysis for Reduced Package 1 are presented in Table 10.10. In order to test the sensitivity of results to changes in key assumptions a number of sensitivity tests have been undertaken on Reduced Package 1 and these are also presented in Table 10.10.

Table 10.10 Total Costs and Benefits Discounted over a 25 Year Period for Reduced Package 1 (€10 Charge and Measures to Promote TDM)

Package	Present Value Costs (€ billion)	Present Value Economic Benefits (€ billion)	Benefit Cost Ratio
Reduced Package 1 €10 Congestion Charge + measures to promote TDM	1.52	2.29	1.51
<i>Sensitivity analysis</i>			
1. 30% less vehicle kilometres saved than forecast	1.52	2.09	1.38
2. 30% less vehicle hours saved than forecast	1.52	1.88	1.24
3. 30% more vehicle kilometres saved than forecast; ⁷⁷	1.52	2.49	1.64
4. 30% more vehicle hours saved than forecast;	1.52	2.70	1.78
5. 50% increase in capital and operational costs	2.18	2.29	1.05
6. Congestion Charge annual operating cost at 'lower' end estimate;	1.17	2.29	1.96
7. Congestion Charge annual operating costs at 'upper' end estimate	1.85	2.29	1.24

10.34. Although the benefits reduction as a result of the removal of the Work Place Parking Levy is significant, the results of the analysis indicate that the purely economic case for this package is also robust. Even if the capital and operating costs were 50% greater than forecast, the benefit/cost ratio would still be marginally greater than one, indicating an economically worthwhile project

Costs and Benefits Associated with Reduced Package 2

10.35. Analysis of Reduced Package 2 (€5 congestion charge and measures to promote TDM) also indicated a good economic case, as shown in Table 10.11, unless capital and operating costs were significantly greater than expected, which is unlikely given that the cost of the London scheme (upon which the costs are based) is expected to reduce significantly in coming years.

⁷⁷ One of the key findings to emerge from the London situation has been the underestimation of the quantum of transport operational impacts / benefits.

Table 10.11 Total Costs and Benefits Discounted over a 25 Year Period for Reduced Package 2 (€5 Charge and Measures to Promote TDM)

Package	Present Value Costs (€ billion)	Present Value Economic Benefits (€ billion)	Benefit Cost Ratio
Reduced Package 2 €5 Congestion Charge + measures to promote TDM	1.42 ⁷⁸	1.89	1.33
<i>Sensitivity analysis</i>			
1. 30% less vehicle kilometres saved than forecast	1.42	1.71	1.21
2. 30% less vehicle hours saved than forecast	1.42	1.54	1.09
3. 30% more vehicle kilometres saved than forecast; ⁷⁹	1.42	2.05	1.44
4. 30% more vehicle hours saved than forecast;	1.42	2.23	1.57
5. 50% increase in capital and operational costs	2.08	1.89	0.91
6. Congestion Charge annual operating cost at 'lower' end estimate;	1.07	1.89	1.76
7. Congestion Charge annual operating costs at 'upper' end estimate	1.76	1.89	1.08

Summary

10.36. In summary, the Preferred Package is an economically desirable project. If the workplace parking levy is not included, the resulting reduced package is still economically robust. If the workplace parking levy was not included and the congestion charge set at €5, the package would still represent a reasonable economic case – unless there were significant increases in capital and operational costs.

⁷⁸ Present value costs of the €5 scheme are slightly less than the present value costs of the €10 scheme (Table 10.10) as the public transport subvention required is slightly less.

⁷⁹ One of the key findings to emerge from the London situation has been the underestimation of the quantum of transport operational impacts / benefits.

Financial Appraisal

The Preferred Package

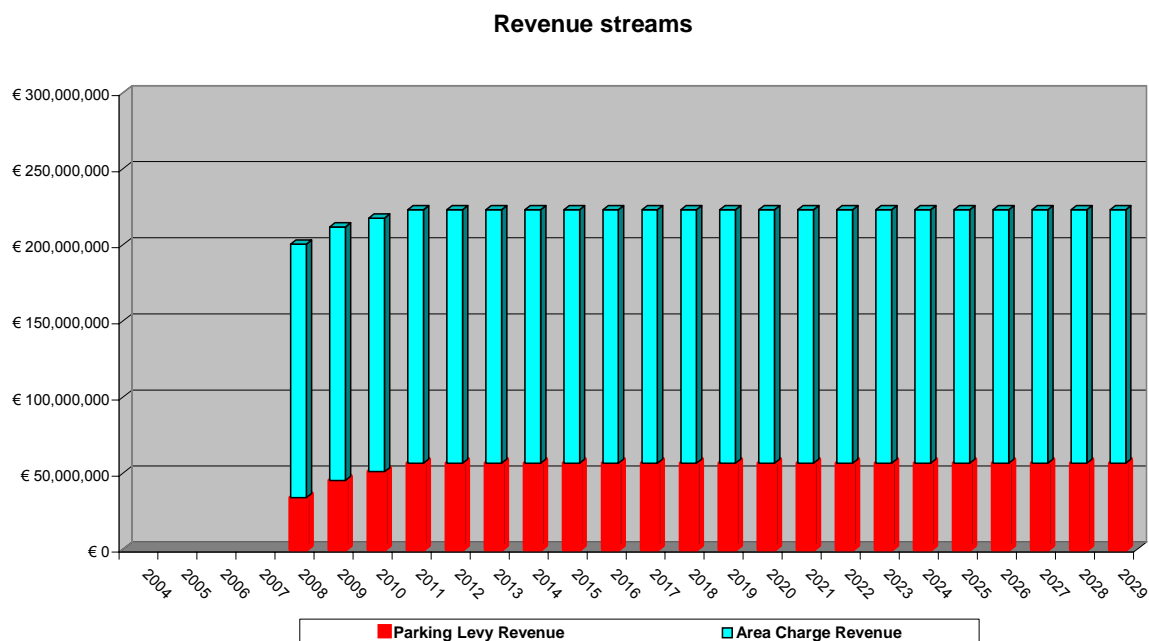
10.37. The introduction of the Preferred Package has the potential to generate very significant revenues of approximately €319 million annually (of which the congestion charge would account for almost two-thirds). The forecast annual costs are shown in Table 10.12. Figure 10.4 shows the forecast revenue stream over 25 years.

Table 10.12 Annual Revenues Associated with Preferred Package

Item	€ million
Revenues (annual) ⁸⁰	
Congestion Charge fees paid by those crossings the canals	144
Congestion Charge fees paid by residents within the canals	94
Work Place Parking levies paid for spaces within the GDA	81
Total	319

Revenues taken into account in the financial appraisal do not include revenues from increased bus patronage, as under current arrangements these would not accrue to the operator of the TDM charging schemes. Revenues resulting from increased revenues from on-street parking controls introduced to complement the workplace parking levy are not taken into account as, if any revenues occur (they are intended to be revenue neutral), these too would not accrue to the operator of the TDM schemes. Equally, any reduction in on-street parking revenues as a result of less people driving into the City Centre following the introduction of congestion charging has not been included.

⁸⁰ For appraisal purposes a 'ramp up' profile for revenues has been adopted to 'accommodate' some initial reluctance by car drivers (even those willing to pay the charge) and to help ensure that any optimism bias in the modelling is accounted for. The following profile has been adopted: 1st year 60%; 2nd Year 80%; 3rd Year 90% and Year 4 = 1st full year of modelled revenue streams.

Figure 10.4 Revenues Streams over a 25 Year Period with the Preferred Package

10.38. The results of the financial appraisal discounted cashflow analysis are presented in Table 10.13. In order to test the sensitivity of results to changes in key assumptions a number of sensitivity tests have been undertaken on the Preferred Package and these are also presented in Table 10.13.

Table 10.13 Total Costs and Revenues Associated with the Preferred Package Discounted over a 25 Year Period

Package	Present Value Costs (€ billion)	Present Value Revenues (€ billion)	Ratio of Revenues & Costs
Preferred Package €10 Congestion Charge, workplace parking levy + package of measures to promote TDM.	1.62	3.58	2.21
<i>Sensitivity analysis</i>			
A. 50% increase in capital and operational costs	2.30	3.58	1.56
B. Congestion Charge annual operating cost at 'lower' end estimate	1.27	3.58	2.82
C. Congestion Charge annual operating costs at 'upper' end estimate	1.95	3.58	1.84
D. 30% reduction in revenue streams ⁸¹	1.62	2.51	1.55
E. 30% reduction in revenue streams plus 30% increase in capital and operating costs	2.02	2.51	1.24
F. A doubling of revenue from the Congestion Charge (associated with 'all day' operation). ⁸²	1.62	6.28	3.89

⁸¹ Outturn *net* revenues in London in the first year of operations were €68 million compared to £130 million forecast. This was largely due to the introduction of residents' discounts and other discounts and exemptions. Other factors were a greater than expected impact in reducing car use and enforcement difficulties.

10.39. The results of the analysis indicate a robust financial case for the Preferred Package, even if the outturn revenue streams were 30% less than forecast. The results also indicate a robust financial case for the Preferred Package if the revenue streams were 30% less than forecast while the capital and operating costs were 30% greater than forecast. It is also noted that the scheme would have an even stronger financial case if it were to operate all day, or for more of the day, instead of in the morning only (7am-10am).

10.40. A transparent mechanism would need to be established to ensure that revenues generated by the fiscal measures (after operating costs have been covered) would be used to fund long term public transport strategy, in addition to the potential complementary measures outlined in Section 9.

10.41. As shown in Table 10.14, the introduction of Reduced Package 1 (€10 Congestion Charge only with measures to support TDM) has the potential to generate significant revenues of approximately €239 million annually, albeit some 25% less than those associated with the Preferred Package.

Table 10.14 Annual Revenues Associated with Reduced Package 1 (Annual)

Item	Million €s
Revenues – Reduced Package 1 (€10 Congestion Charge + measures to promote TDM)	
Congestion Charge fees paid by those crossing the canals	145
Congestion Charge fees paid by residents within the canals	94
Workplace parking levies paid for spaces within the GDA	0
Total	239

10.42. Table 10.15 shows the discounted cashflow analysis associated with Reduced Package 1. The results of the analysis indicate that the loss of the significant revenues associated with the workplace parking levy does not substantially diminish the financial case for Reduced Package 1. However, the commercial success of the scheme may be impacted by a significant reduction in revenues, over 30%, coupled with higher capital and operating costs at 30% above estimates. Under these circumstances, the financial case for Reduced Package 1 would be marginal.

⁸² It is understood that the London scheme generates between 40% and 50% of its revenue in the 7am-10am period on weekdays.

Table 10.15 Total Costs and Revenues Associated with Reduced Package 1 Discounted over a 25 Year Period

Package	Present Value Costs (€ billion)	Present Value Revenues (€ billion)	Ratio of Revenues & Costs
Reduced Package 1 (€10 Congestion Charge + measures to promote TDM)	1.52	2.72	1.79
<i>Sensitivity analysis</i>			
A. 50% increase in capital and operational costs	2.18	2.72	1.25
B. Congestion Charge annual operating cost at 'lower' end estimate	1.17	2.72	2.32
C. Congestion Charge annual operating costs at 'upper' end estimate	1.85	2.72	1.47
D. 30% reduction in revenue streams ⁸³	1.52	1.90	1.25
E. 30% reduction in revenue streams plus 30% increase in capital and operating costs	1.92	1.90	0.99
F. A doubling of revenue from the Congestion Charge (associated with 'all day' operation). ⁸⁴	1.52	5.43	3.58

10.43. The implementation of Reduced Package 2 (€5 Congestion Charge only combined with measures to promote TDM) the potential to generate significant annual revenues of approximately €131 million annually, but these are less than a half of those associated with the Preferred Package. These are shown in Table 10.16.

Table 10.16 Annual Revenues Associated with Reduced Package 2

Item	Million €s
Revenues – Reduced package – €5 Congestion Charge + TDM Support Measures	
Congestion Charge fees paid by those crossing the canals	79
Congestion Charge fees paid by residents within the canals	52
Work Place parking levies paid for spaces within the GDA	0
Total	131

10.44. The results of the financial appraisal discounted cashflow analysis for Reduced Package 2 (€5 congestion charge with measures to promote TDM) is shown in Table 10.17. The results of the analysis indicate that the loss of the significant revenues associated with the workplace parking levy and the halving of the congestion charge substantially weakens the financial case for this option. The

⁸³ Outturn revenues in London some 50% of forecasts. This was largely due to the introduction of residents' discounts and other discounts and exemptions. Other factors were a greater than expected impact in reducing car use and enforcement difficulties.

⁸⁴ It is understood that the London scheme generates between 40% and 50% of revenue in the 7am – 10am period on weekdays.

commercial success of this option is only likely to be achieved if the level of annual operating costs associated with the Congestion Charge are at the lower end of expectations and/or from a doubling of revenue from the congestion charge associated with all day operation.

**Table 10.17 Total Costs and Revenues Associated with
Reduced Package 2 Discounted over a 25 Year Period**

Package	Present Value Costs (€ billion)	Present Value Revenues (€ billion)	Ratio of Revenues & Costs
Reduced Package 2 €5 Congestion Charge + measures to promote TDM	1.42	1.49	1.05
<i>Sensitivity analysis</i>			
A. 50% increase in capital and operational costs	2.08	1.49	0.72
B. Congestion Charge annual operating cost at 'lower' end estimate	1.07	1.49	1.39
C. Congestion Charge annual operating costs at 'upper' end estimate	1.76	1.49	0.85
D. 30% reduction in revenue streams ⁸⁵	1.42	1.04	0.73
E. 30% reduction in revenue streams plus 30% increase in capital and operating costs	1.82	1.04	0.57
F. A doubling of revenue from the Congestion Charge (associated with 'all day' operation). ⁸⁶	1.42	2.98	2.10

Discounts and Exemptions

10.45. The Preferred Package does not allow for any discounts or exemptions associated with the congestion charge, although the charge has been assumed to operate in the morning only (7am to 10am). This section sets out the financial implications of discounts and exemptions where:

- residents within the canals are given a 90% discount on the Congestion Charge; and
- 15% of those crossing the cordon are exempt (e.g. taxis, emergency services, buses) or allowed a 100% discount (e.g. registered drivers with disabilities).

10.46. This situation would be equivalent to that in London where residents have a 90% discount and numerous categories of drivers or vehicles are exempted or allowed a 100% discount. The difference with the London scheme is that it operates all day.

10.47. To allow like-for-like comparison with the London situation, all day operation of the congestion charging scheme was also considered in the analysis which is

⁸⁵ Outturn revenues in London were some 50% of forecasts. This was largely due to the introduction of residents' discounts and other discounts and exemptions. Other factors were a greater than expected impact in reducing car use and enforcement difficulties.

⁸⁶ It is understood that the London scheme generates between 40% and 50% of revenue in the 7am-10am period on weekdays.

summarised in Table 10.18. This analysis assumes that the residents' discount would apply to all those drivers that have an origin within the charging area during the modelled period (8am-9am) and therefore overstates the number of "residents" slightly as some non-resident drivers may also be starting a trip at that time (e.g. trips starting from the workplace). The results of the analysis clearly indicate that introduction of exemptions would significantly reduce the performance of all the options that include a morning only congestion charge, so that only the Preferred Package would have a robust case. The case for Reduced Package 1 (€10 Congestion Charge (AM only) + TDM support measures) would be marginal and there would be no financial case for Reduced Package 2. If the congestion charge were to apply all day while allowing the discounts and exemptions, there would be a strong financial case for the Preferred Package, for Reduced Package 1 (€10 congestion charge with measures to promote TDM). Under the all day scenario, there would even be a financial case for Reduced Package 2, although it would be less robust than for the other packages.

Table 10.18 Total Costs and Revenues Discounted over a 25 Year Period

	Present Value Costs	Present Value Revenues	Ratio of Revenues & Costs
Preferred package with €10 Congestion Charge in AM			
90% discount to residents & 15% exemptions for crossings	1.62	2.37	1.47
Preferred package with €10 Congestion Charge all day			
90% discount to residents & 15% exemptions for crossings	1.62	3.87	2.40
Reduced Package 1: €10 Congestion Charge (AM only) + TDM support measures			
90% discount to residents & 15% exemptions for crossings	1.52	1.51	1.00
€10 Congestion Charge (All day) + TDM support measures			
90% discount to residents & 15% exemptions for crossings	1.52	3.01	1.98
Reduced Package 2: €5 Congestion Charge (AM only)+ TDM support measures			
90% discount to residents & 15% exemptions for crossings	1.42	0.82	0.58
€5 Congestion Charge + TDM (All day) support measures			
90% discount to residents & 15% exemptions for crossings	1.42	1.65	1.16

10.48. In summary, the financial case is sensitive to both residents' discounts and exemptions, and morning only operation. The Preferred Package could comfortably accommodate both these concessions. Reduced Package 1 presents a break-even case for the incorporation of residents' discounts and exemptions in a morning only scheme, but a reasonably robust case for residents discounts and exemptions exists with all day congestion charging. Reduced Package 2 could only accommodate residents' discounts and exemptions if the scheme were to operate all day (say 7am-7pm) and even then, it would not be a strongly robust proposition. It is noted that if the congestion charging scheme operated for the morning only, the case for

extensive residents' discounts and exemptions such as those in London is weak because residents and other candidates for discounts and exemptions could drive after 10am without paying the charge.

10.49. It is worth noting that the analysis in this study is based on the 2001 DTO Model, projected to 2008. The number of trips to work in the 2001 DTO Model are based on a sample employment survey and a best estimate of numbers of workplaces within the City. Census 2002 gives, for the first time, accurate data on the numbers of people working in the City Centre area, the trip origins of those travelling to work in the City Centre and their mode of travel. It suggests that the 2001 estimate of the number of city residents driving to work may need to be revised downwards. Hence the issue of the impact of residents' discounts will need to be further examined when the Census data has been incorporated into a newly updated model.

Summary of Appraisal

10.50. In summary, the Preferred Package is effective and presents an attractive business case. It would comprise a €10 road user area licence, a workplace parking levy and the measures to promote TDM. This would deliver overwhelming net benefits to the community as the economic benefits arising from the Preferred Package greatly outweigh the costs. It presents both a solid economic and financial proposition whilst meeting the broader transport objectives of this study.

The Preferred Package

- Land Use Planning Measures
- Measures to Promote Travel Demand Management
- A City Centre Congestion Charge of €10/day applicable within the canals
- A workplace parking levy in the rest of the Metropolitan Area and the Development Centres set at market rates for parking in the local area

10.51. The revenue streams associated with the Preferred Package are very significant, as are the non-revenue benefits streams associated with travel time savings, vehicle operating costs savings and environmental benefits. These could be used to fund long term public transport improvements as well as complementary measures.

10.52. The robust financial case for the Preferred Package indicates that, even if the outturn revenue streams were 30% less than forecast, the financial case would be strong. In London, outturn revenue was significantly less than forecast due to, amongst other factors, the introduction of residents' discounts and many categories of exemption. The incorporation of similar discounts and exemptions in the Preferred Package for the GDA would still allow a reasonably attractive financial proposition. The preference for morning only operation of the congestion charging scheme has significant financial implications for the Preferred Package. An all day scheme would be stronger financially and give more scope to offer discounts and

exemptions and to fund complementary measures. Conversely, if congestion charging were to operate in the morning only, the need for exemptions and discounts is questionable.

10.53. The effectiveness and viability of the Preferred Package would also be eroded if the package were not implemented in its entirety, at the levels of charge envisaged. However, opting for a reduced impact package that did not include a work place parking levy (Reduced Package 1) would still deliver substantial net benefits. Such a reduced package would suffer from loss of revenues associated with the workplace parking levy but would still have a robust financial case unless revenues were significantly less than forecast.

10.54. Opting for a reduced package that did not include a work place parking levy and lowered the price of road user area licence from €10 to €5 (Reduced Package 2) presents a marginal case. The commercial success of this option would be critically influenced by the level of annual operating costs associated with the congestion charge and the hours of operation of the scheme.

Winners and Losers

Principal Beneficiaries

10.55. The overall community of the GDA would be the principal beneficiary.

10.56. Central and local government would benefit from the monies raised from the congestion charge and the workplace parking levy. Public transport users would benefit if these funds were invested in improved public transport.

10.57. All those that continue to travel by car, whether they have to pay charges or not, would benefit from substantial time savings, and to a lesser extent, from reduced vehicle operating costs and accident savings. The value of these non-revenue benefits would exceed the total charges paid by drivers.

10.58. Non-car users would benefit from reduced traffic flows leading to more attractive conditions for walking and cycling, reduced road traffic accident rates and reduced noise and emissions. Although these benefits would accrue throughout the GDA, they would be greatest for people living and/or working in the central area.

10.59. Bus and Luas passengers would benefit from faster journey times, and improved reliability as a result of reduced congestion. However, unless additional capacity is provided, they may suffer from increased overcrowding.

10.60. Bus and Luas operators would benefit from faster operating speeds which would enable better fleet utilisation. They would also benefit from increased revenues due to increased patronage.

10.61. National Toll Roads, the operator of the Eastlink and Westlink bridges, would benefit from increased traffic flows, as would the State through taxes on the revenue generated.

Principal Losers

10.62. People who lose their workplace parking space as a result of the levy (i.e. their employer chooses not to register their space) would lose out.

10.63. The area to the east of the charging zone would suffer from increased traffic flows as a result of drivers diverting to Macken Street Bridge and East-link. Some areas around the M50 may suffer from increased traffic flows as a result of more people using the M50.

10.64. Overall subvention to public transport would increase as a result of increased passengers, even though subvention per passenger carried may fall.

10.65. The City Council and other parking providers in the city may lose parking revenue as a result of less people driving to the city. However, this may be off-set by increased revenues accruing from additional parking controls established to complement the work place parking levy.

10.66. The exchequer would have reduced income as a result of lower indirect tax from fuel duty and VAT arising from less car use.

11 Conclusions and Next Steps

A Viable TDM Package and Programme for the GDA

11.1. A viable TDM package and programme have been prepared for the GDA for implementation in the short term (by 2008). The package comprises three groupings of measures:

- Measures that can be implemented through the planning system;
- Measures to promote TDM; and
- Fiscal Measures.

11.2. The TDM package would be complemented by other strategies already underway which comprise bus priority measures, walking measures, cycling measures, traffic management measures and integration measures. In addition, specific complementary measures will be required in tandem with some of the proposed TDM measures.

11.3. The measures proposed for implementation through the planning system are diverse and wide ranging. They include:

- Consolidation of residential population in existing built up areas in the GDA region, where accessibility to work, leisure and other destinations by foot, cycle and public transport is generally better;
- Location of major trip-intensive land uses in areas well served by public transport;
- Grouping of key trip destinations (employment, retail, leisure and other services such as hospitals) in defined district or town centres;
- Relating the scale of district and town centres to their public transport accessibility;
- Providing a mix of local services within walking distance of their surrounding neighbourhood;
- Designing all new developments with walking, cycling and public transport in mind;
- Relating the density of new developments to public transport accessibility, and proximity to nearest centre; and
- Regional maximum parking standards, and the relating of maximum permitted parking provision for new developments to public transport accessibility, and proximity to the nearest centre.

11.4. Some of the above recommendations have been proposed for inclusion in the Regional Planning Guidelines. Guidance at a regional level is required so that all authorities act in a consistent manner, providing a “level playing field” in terms of TDM policy.

11.5. The measures to promote travel demand management have been described in terms of workplace travel plans (Mobility Management Plans), school travel plans, virtual mobility and individual marketing. The travel plans could draw on a wide range of possible individual TDM measures including car sharing, car pooling, shuttle buses, alternative hours or staggered hours, flexible hours and measures to assist walking and cycling. Guidance on implementing plans has already been prepared by the DTO⁸⁷. Large public and private sector employers are considered to be key to wider take up of plans. It is important that plans are put in place to manage the public sector workforce within the coming years.

11.6. Two fiscal measures are under consideration: a workplace parking levy and City Centre congestion charging. In the Preferred Package, congestion charging would apply in the City Centre (between the canals) in the morning only (7am-10am) and the cost would be €10. The workplace parking levy would apply in the rest of the GDA, except the rural hinterland, and it would be set at a rate equivalent to the market price for parking in the local area.

11.7. The impact of the Preferred Package would be to reduce the number of car trips in the GDA by 10% during the morning peak hour (8am-9am). This would have a significant effect on congestion as the total number of vehicle-hours in the GDA would fall by some 30,000, a reduction of 12%. The total number of vehicle-km would be reduced by over 330,000, a 5% reduction. Within the City Centre a 34% reduction in vehicle-hours is predicted, and a 14% reduction between the Canals and the M50.

11.8. As a result of the substantial transport impact, the economic case for the Preferred Package is strong. The financial case is also robust, even when taking a 90% discount to residents and a 15% exemption for crossings into account. Substantial revenues would be generated from this package which could be used to finance public transport improvements. Were the congestion charge to be implemented on an all day basis, the financial and economic case would be further strengthened for the Preferred Package.

11.9. If the workplace parking levy was not implemented and instead there was a reduced package comprising the congestion charge and measures to promote TDM (Reduced Package 1), the result would be somewhat weakened but still positive from both an economic and financial perspective. A sensitivity analysis shows that even with a 30% reduction in revenue streams, the financial case would still be robust. It is not until a 30% increase in capital and operating costs is combined with a 30% reduction in revenue streams that the financial case ceases to achieve positive returns.

11.10. The package presenting a €5 Congestion Charge and measures to promote TDM (Reduced Package 2) also presents a viable economic case. However, if the capital and operational costs rise to 50% above expectations then this package fails to present a viable economic case. Similarly, from a financial perspective, Reduced Package 2 can only present a positive case with operating costs at the lower end

⁸⁷ "The Route to Sustainable Commuting": An Employers Guide to Mobility Management Plans, DTO, 2001

estimate or with congestion charging operating on an all day basis. However, even the all day congestion charging presents a marginal case when a 90% discount to residents and 15% exemption for crossings are taken into account.

Complementary Measures

11.11. Specific complementary measures that may be required to ensure that the Preferred Package is workable and acceptable could include:

- Improved bus services, for example, additional buses, additional bus priority measures or additional bus routes;
- Pedestrian improvements, or other amenity gained from reallocating roadspace;
- Improved facilities for cyclists;
- Traffic management and local junction improvements;
- Parking controls around the edge of an area in which road users are charged, or in an area in which workplace parking levies apply; and
- Non-transport measures, for example, a marketing initiative to ensure the City Centre remains a vital and vibrant centre for shopping and cultural activities.

11.12. A budget for the cost of the above complementary measures, and an allowance for increased public transport subvention, has been allowed for in the cost estimate for the preferred package.

11.13. Complementary measures are not confined to specific measures to aid a particular TDM measure. Within the wider context, integration initiatives to improve public transport generally are also complementary, for example, integrated fares, ticketing and provision of information. The complementary effect of TDM and its role in long term transport strategy, for example, *A Platform for Change* and any future updates should also be emphasised, including the potential for any monies raised by TDM to fund future public transport proposals.

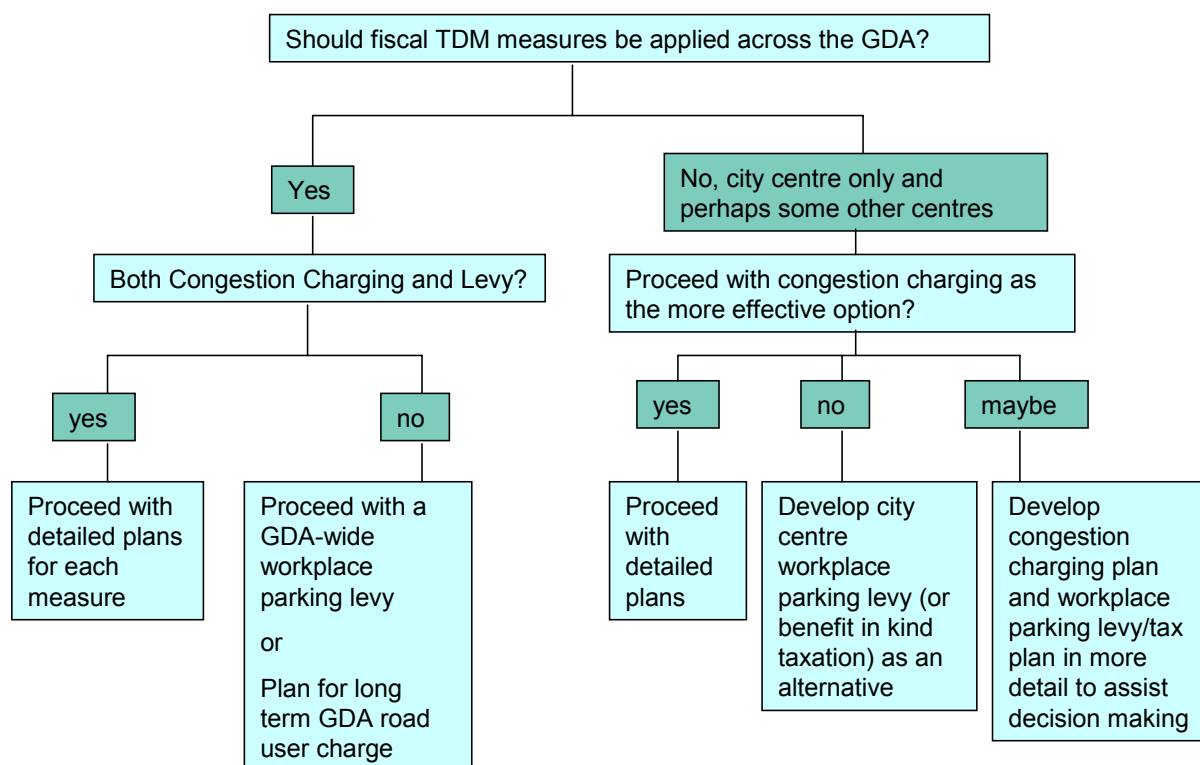
Decisions regarding Fiscal Measures

11.14. Following the success of the London scheme, there is confidence that a similar scheme could be implemented in Dublin. The one major concern is the estimated operating cost of the scheme.

11.15. By comparison, the workplace parking levy would be less costly to introduce and administer. However, a number of practical difficulties have been recognised. As a result there is less confidence that a workplace parking levy would be acceptable throughout the GDA, or even within designated centres in the GDA, or that it would be implemented in an effective manner. There is no example of a regional workplace parking levy elsewhere that can be used as a model.

11.16. Before moving ahead with either fiscal measure, a set of choices needs consideration, as illustrated in Figure 11.1. The first question is whether it is realistic, in the short term, to impose any fiscal measures outside the City Centre (and possibly some other centres that are well served by public transport).

Figure 11.1 Decisions Regarding Fiscal Measures



Next Steps

11.17. The proposed measures that can be implemented through the planning system should be taken on board by the Regional Planning Authorities and the City and County Councils, and incorporated into the Regional Planning Guidelines and subsequently the City and County Development Plans.

11.18. The measures to promote TDM, incorporated in the Workplace Travel Plans (Mobility Management Plans), School Travel Plans and individual marketing proposals, require additional resourcing so that the local authorities and possibly the DTO can implement and monitor travel plans on a sufficiently large scale. An important first step is the introduction of Plans within the public sector. It is recommended that a Travel Plan is first established in one local authority and one Government Department which would act as a blueprint for other authorities. Government funding for travel plans and for local authority travel plan coordinators would be required initially. Over time, the fiscal measures would generate an income to fund these activities.

11.19. The fiscal measures are more complex and require the following steps, some of which could help inform decisions on final approval:

- Legislation: primary legislation needs to be established for road user charging or workplace parking levies. This could be done through one or more current opportunities, for example the Finance Act 2005, Public Transport Regulatory Reform or the Review of Rating Law.
- Institutional arrangements: the Vehicle Registration Department of the Department of Environment, Heritage and Local Government need involvement from the early stages for any automatic number plate recognition scheme associated with congestion charging.

Further Market Research and Consultation on Proposed Measures

11.20. In considering the need for consultation, issues are clearer if fiscal and non-fiscal measures are separately considered. Non-fiscal measures comprise all measures in the Preferred Package except the workplace parking levy (or benefit in kind taxation) and the road user charge.

11.21. The proposals to manage demand through the planning system will be reflected in the Regional Planning Guidelines and the Development Plans which have their own statutory consultation process, and that will now embrace travel demand management. The priority will be for internal stakeholder liaison to inform and support the local authorities.

11.22. In terms of workplace travel plans (mobility management plans) and school travel plans, public consultation is neither necessary nor appropriate; however, the next big step in this direction is the establishment of MMP in the public sector which will require consultation within those organisations. Each site-specific plan will clearly need consultation with users and other stakeholders. A wider travel awareness campaign would support the mobility management initiative.

11.23. Some level of public debate regarding the fiscal measures would be desirable to fine tune the proposals. Also, structured market research will be required as part of the scheme design in order to confirm appropriate charging levels. Many of the traffic management measures (parking controls, etc.) associated with the implementation of the fiscal measures would need to go through a local consultation process.

Communications Strategy

11.24. In the lead-up to the introduction of either fiscal measure, if the decision was taken to implement, major information campaigns would be needed. In the case of the workplace parking levy, each employer would need to be contacted to ensure that they knew how to register their spaces and when to do it. Alternatively, if a benefit in kind tax were to be introduced, both employers and employees would need to be given notification. In the case of the congestion charge, the public will

need to know how much the charge is, what area it covers, when it operates and how they pay.

11.25. At present there are two fiscal measures in the Preferred Package. To successfully communicate both simultaneously might be very challenging.

11.26. In summary, communications would be an integral part of the implementation process. For the fiscal measures it would be a major task. Table 11.1 brings together the different strands of any potential communications strategy.

Table 11.1 Communications Strategy

	Public	Stakeholders	Media
Advocacy – explaining the benefits and marketing TDM	Travel Awareness Campaigns	Appreciation of the benefits will come from the general awareness campaigns and also from participation in TDM Stakeholder Groups.	Press releases Feature articles
Participation in decision-making	Statutory consultation on development plans will address TDM through the planning system Local consultation is desirable for local TDM and complementary measures Referendum type consultation on fiscal measures is unlikely to be productive.	TDM Stakeholder Group required going forward including the planning and local authorities; Departments of Environment, Transport and Finance; public transport operators and representatives of the business community.	Can provide a channel for public and stakeholder participation
Information	Clear and timely explanations when measures begin, how they will work and what is required of the public and employers will be needed.	Explanation of what local authorities and other agencies need to do for implementation.	Press releases Advertising

Appendix A: Study Terms of Reference

Demand Management – Consultants’ Terms of Reference

Introduction

The DTO has recently published the transport strategy for the Greater Dublin Area 2000 - 2016 *A Platform for Change*. This multi-modal strategy envisages the provision of significantly enhanced suburban rail, LRT, metro and bus services and roads in a phased implementation programme to the end of 2016.

Demand Management forms a key element of the strategy, and has the following objectives

- To reduce the growth in overall travel by motorised modes of travel in the Greater Dublin Area.
- To effect further modal transfer from private car to public transport modes over and above that achievable through the infrastructure and service enhancement measures described in *A Platform for Change*
- To achieve a good level of service on the road network for essential road users
- To encourage more sustainable trip distributions and modal split throughout the Greater Dublin Area (Dublin, Meath, Kildare and Wicklow).
- In the Metropolitan Area, as defined by the Strategic Planning Guidelines, to reduce morning peak hour (08:00-09:00) car journeys forecast for 2016 to approximately 1997 levels (approximately 127,000 car journeys in the morning peak hour in the Metropolitan Area).
- In the Hinterland Area, measures should be designed to achieve sustainable modal split and trip distributions, for travel within the “development centres” identified in the Strategic Planning Guidelines, within other Hinterland Area towns, and in the rest of the Hinterland Area, at an early date.

The purpose of the study is to devise a package of effective and feasible demand management measures to meet the above objectives, and produce a programme for its implementation, as part of the transport strategy for the Greater Dublin Area up to 2016.

The consultant should be aware that the National Spatial Strategy (NSS) could be published during the lifetime of the Study. The current Strategic Planning Guidelines and DTO Transport Strategy will be reviewed once the NSS is published.

Consultant Tasks

Specifically, consultants will be required to deliver the following tasks:

1. *Carry out initial consultations*

The consultant will consult appropriate government departments, strategic planning bodies, local authorities, transport operators, professional bodies, and business groups, as agreed by the Study steering committee in advance of the main part of the Study. The consultant will consider and report on the consultation responses, before proceeding to the main part of the Study.

2. *Research and development of potential demand management measures*

The consultant will examine, and develop potential demand management measures under each of the following categories and any other categories that may be relevant.

- Land Use Policies: including advice relating to the location, scale and mix of development; parking standards; development densities and other key development principles to facilitate sustainable travel
- Economic/Fiscal Instruments: including vehicle and fuel charges and taxes; public transport fares – structure and levels; road pricing / congestion charging; parking charges, including charging for workplace parking.
- Management and control of public parking: on-street and public off-street parking control and management, park and ride
- Other traffic management measures.
- Mobility Management Plans – including IT related measures, and re-organisation of work practices.

For each of the potential measures, research experience in Greater Dublin Area and other city-regions, where such demand management measures have been implemented, to help determine the likely effectiveness of the potential demand management measures or packages of measures in meeting the objectives listed above.

3. *Determine feasibility and timescales for potential measures*

Identify any required legislative changes, statutory procedures, additional administrative requirements, and any technological constraints, and in the light of this analysis determine the feasibility and cost of introducing each potential demand management measure within the required time scale.

For each measure deemed feasible, produce where appropriate a schedule indicating key milestones in any implementation programme for the measure.

4. Assess the potential contribution of feasible measures

Assess the potential contribution of each feasible measure to the demand management objectives set out above.

5. Public consultation for feasible measures

Assess attitudes to, and acceptance of, feasible demand management measures or package of measures by consulting and surveying transport users, local authorities and other stakeholders. In advance of any consultation/survey exercise, produce a draft consultation method statement including questionnaire(s) for discussion and agreement with the Study Steering Committee

6. Evaluation of candidate measures

Taking into account the transport infrastructure that will be available in the forecast years, and the outcome of the consultation and research exercises, produce candidate packages of demand management measures for further evaluation.

Assess the likely impact of the candidate packages of demand management measures on 2006 and 2016 forecast demand for travel by each mode, by modelling behavioural responses to the measures.

Assess the potential trip distribution effects, locational effects and distribution of impact across different socio-economic groups for each candidate package of measures

Demonstrate the performance of each candidate package of measures, against the objectives of demand management listed above. Rank the packages of measures, in order of effectiveness, for both of the forecast years.

7. Recommended measures

Based on the above, recommend a set of demand management measures for the Greater Dublin Area, which meet the objectives listed above, differentiating where appropriate between measures to be applied in the Metropolitan Area and those to be applied in the Hinterland Area.

Recommend priorities and produce a programme for the implementation of the package. Any associated administrative requirements should be identified. The programme should focus on those measures that should be put in place with immediate effect, and those which should be in place in each of the forecast years of 2006 and 2016. Indicative implementation dates only should be provided for any measures to be introduced after 2006.

It is anticipated that any strategic land use and transportation changes arising from the NSS may have a long term impact on the Greater Dublin Area, but will have less

impact in the shorter term. For this reason, in advance of the publication of the National Spatial Strategy, a detailed implementation programme should focus on measures for implementation in the short term (up to the end of 2006).

Identify the broad capital and ongoing operating cost of implementing each element of the package of measures. Identify the likely revenue to be generated by each of the recommended economic/fiscal instruments, and produce an indicative cost-benefit analysis for the recommended economic/fiscal instruments (should such measures be recommended).

Arising from the study recommendations, and implementation programme, produce recommendations for submission to relevant bodies charged with the production and review of relevant local and regional plans, policies and guidelines.

8. Reports and meetings

Produce a draft final report and, following comments from the Study Steering Group, a final report detailing all assumptions, analyses, conclusions and recommendations, including a proposal for the phased implementation of those recommendations.

Produce an executive summary of the proposed demand management strategy and the rationale for it.

Attend progress meetings at the DTO offices, roughly on a monthly basis, with a Study Steering Group drawn from the DTO agencies to oversee the study. Attend other meetings with DTO executive staff as required.

Provide short written progress reports for each progress meeting, and progress reports and technical notes to the Study Steering Group, the DTO Steering and Advisory Committees, Cabinet Sub-Committee for Infrastructure, and others, as required.

9. Study Period

It is anticipated that the study will commence in September 2002, and take 16 months to complete.

Appendix B: Demand Management Steering Group

Name	Organisation
Tom Ferris (Liam Daly initially)	Department of Transport (Public Transport Division)
John Devlin (Also Peter McEvoy initially)	Department of Environment, Heritage and Local Government (Roads)
Derek Brady	Dun Laoghaire and Rathdown County Council
Muiris O’Keeffe	South Dublin County Council
Michael McGrath	Department of Finance
Owen Keegan	Dublin City Council
Mary Darley	Regional Planning Authority
Sean O’Faircheallaigh	Fingal County Council
Mick MacAree	Dublin Transportation Office
Jeremy Ryan	Dublin Transportation Office

Appendix C: List of TDM References

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Appendix D: Person Trips to work by Mode to work destinations in the GDA

Mode	Local Authority Area							Total
	DCC	FCC	SDCC	DLRCC	Meath	Kildare	Wicklow	
Walk	43,924	5,194	6,670	5,381	2,801	4,728	4,352	73,050
Cycle	13,852	1,160	1,851	1,955	377	913	347	20,454
Bus/Coach	57,704	6,396	7,204	5,057	602	1,277	1,050	79,292
Train	26,264	840	267	2,796	49	275	460	30,950
M/Cyc	5,600	830	1,171	943	218	492	284	9,536
Car (Driver)	139,052	38,514	48,912	34,945	17,041	28,925	16,035	323,424
Car (Pass)	12,701	3,657	4,673	2,517	2,350	3,547	2,034	31,479
Lorry/Van	5,147	2,014	3,078	1,039	1,678	1,981	1,154	16,090
Total	304,243	58,605	73,825	54,632	25,116	42,138	25,715	584,274

Source: DTO modelling section, based on Census 2002

Appendix E: Transport Model Network and Service Assumptions

The DTO transport model for the year 2008 was used to assess the transport impacts of the proposed measures individually and as a package. The congestion charging measures were modelled directly in the transport model. The private vehicle trip reductions due to “soft” factors and the workplace parking levy were modelled in a separate policy model, and the effects of those reductions on the road network was assessed using the DTO model. The methodology is described in more detail in the assessment report.

The DTO transport model for the year 2008 includes committed improvements to the transport network that will be in place by then:

- Luas Line C and extension to Docklands;
- Luas Line B and extension to Cherrywood;
- DART upgrade and suburban rail enhancements;
- Port Tunnel; and
- South East motorway extension.

The service frequencies assumed on the rail and light rail systems are summarised below. Capacity improvements will come from longer trains as well as increased frequencies.

Assumed Service Frequencies for Rail and Light Rail in 2008

	Services/hour and direction	Outbound
Luas		
Cherrywood-Stephens Green	6 inbound	6 outbound
Sandyford-Stephens Green	14 inbound	14 outbound
Heuston – Point Depot	10 inbound	10 outbound
Tallaght – Connolly	10 inbound	10 outbound
DART and suburban		
DART	7 southbound	6 northbound
Maynooth – Wicklow lines	7 west to south	5 south to west
Heuston lines	6 inbound	4 outbound
Northern lines	5 inbound	4 outbound

Appendix F: Long List of TDM Measures

TABLE F LONG LIST OF TDM MEASURES		
Strategy	Measure	Description
Financial Measures	Public transport fares subsidy	Cost of travelling by public transport is subsidised.
	Cycle subsidy	Cost of bicycle purchase and/or maintenance is subsidised
	Ridesharing allowances	Direct assistance from employers for carpooling or vanpooling costs/fares
	Public transport fares schemes	Can include off-peak fares and fare free zones
	Cashing out parking	Employees given the right to receive cash equivalent of parking subsidy
	Indirect financial incentives	Non-cash rewards for participating in TDM programmes
	Travel behaviour based insurance	Insurance premiums based on actual time of travel, and total distance travelled rather than on trends and average costs
Taxation Measures	Car purchase and ownership taxes	Can be differentiated to favour smaller, fuel efficient vehicles
	Fuel taxes	Price of fuel affects relative cost of travel by car and public transport
	Treatment of car ownership and parking	Taxing employees (e.g. 'benefit-in-kind') for employer provided cars and / or parking spaces has an impact on this practice
	Tax deductible PT passes	Give employers tax deductibility for subsidising PT passes
Road Pricing	Congestion Pricing	Varying road-pricing charges according to traffic conditions, area and time of day (the higher the congestion the higher the charge).
	Cordon Pricing	Charges levied for crossing a cordon, usually around a City Centre. Charging can be one way or two way with differential charging by direction.
	Area Licence Scheme	Charged for entry into zone, and use of vehicle within zone. Generally fixed fee for all travel within one time period.
Alternative Hours	Staggered working hours	Employee starting and finishing times spread out over a 1-3 hour period
	Flexible Hours	Employees choose starting and finishing times within constraints
	Compressed Working Weeks	Working hours compressed into less than 5 day week or 10 day fortnight
Ridesharing	Carpooling	Two or more people travel together in a private passenger vehicle on a regular basis
	Vanpooling	Two or more people travel to work on a pre-arranged basis in a vehicle designed for 5 or more people.
	Shuttle Buses	Provide transport from the worksite to public transport or to shops, etc.

TABLE F LONG LIST OF TDM MEASURES		
Strategy	Measure	Description
Education/Marketing	Travel Awareness Campaigns	Education programmes to inform public of the benefits of non-Single Occupancy Vehicle modes
	Individualised Marketing	A marketing approach aimed at individuals which enters into a dialogue with 'interested' potential users on non-car travel modes
	Travel Blending	Assistance at household level to encourage people to reduce their car use – by blending travel modes, destinations, travel times.
Information and Communication Technologies (ICT)	Teleworking (e-work)	Arrangements to allow employees to work at home, or close to home – varying use of telecommunications technology (at least phone)
	Telework centres	Centres designed for teleworking close to an employees home
	Teleshopping (e-commerce)	Shopping via the television, and the internet
	Teleservices (e-services)	Promoting the use of online services e.g. government, local authority, online learning, telemedicine, etc
	'Wired-up communities'	Facilitate getting a community 'online' to be able to access e-commerce and e-services
Alternative Modes	Worksite cycle/pedestrian facilities	Provision by employers of cycle facilities, changing rooms and showers
	Cycle route network	A complete network of cycle routes throughout the city/region
	Improvements to pavements and crossings.	Upgrading and improvements to existing footpaths and pedestrian crossings to encourage walking as a mode choice.
	Signal priority in favour of Pedestrians and cyclists in inner city.	The establishment of a hierarchy of modes with pedestrians and cyclists at the top of the pecking order with signal priority.
	Provision of maps and awareness campaigns.	The provision of maps and information regarding the cycle network and linkages to promote cycle and walking use. (This could also involve promotion of the health benefits of the modes and raising awareness of the relative speed of these modes in relation to the car in inner city areas).
	Provision of secure cycle parking at public transport stations & in shopping centres	Secure (covered) cycle parking facilities at public transport stations, and in shopping centres
	Pedestrian zones and walkways	Pedestrian only areas and new pedestrian links. (e.g. new bridge over the river Liffey).
	Car Sharing	Individuals join a 'car club' and have access to hire cars on an as-required basis from several 'car stations'.
Parking Restraint	On-street: Parking charges	A range of parking pricing measures which increase the cost of SOV travel
	On-street: Reduce parking spaces	Reduce parking spaces to make room for other measures, e.g. cycle ways, pavement space, and bus stops.
	On-street: Controlled Parking Zones	Management of parking in area to balance demand and supply

TABLE F LONG LIST OF TDM MEASURES		
Strategy	Measure	Description
	Off-street: Long-stay vs. short-stay pricing	In public car parks – long-stay spaces at higher rate than short-stay spaces
	Off-street: Parking Levy	Levy of fixed amount per year on all business district car spaces (i.e. incl Private Non Residential spaces)
	Off-street: Commuted Payment Schemes	Developers pay Local Authority in-lieu of providing car parking spaces
	Off-street: Maximum Parking Standards tied to PT accessibility	Maximum no of car park spaces – lower maximum where higher PT level of service
	Off-street: Parking Ceiling	Maximum no of total spaces in City Centre set
	Off-street: Ban parking spaces in new buildings	Parking spaces banned in new buildings in certain parts of city
	Off-street: HOV car parking	In public car parks – spaces reserved for carpools
	Off-street: Park + Ride / Peripheral Parking	P+R facility on periphery of City Centre in conjunction with dedicated bus service, or with rail services
Travel Plans	Employer Travel Plans	A package of TDM measures aimed at providing alternative travel options to the car for employees at a worksite
	School Travel Plans	A package of TDM measures aimed at providing alternative travel options to the car for school children travelling to school.
Administrative	Transportation Management Associations (TMA's)	Voluntary administration and implementation bodies, usually involving private businesses or co-operatives, which manage TDM measures in a commercial/employment centre or in an area
	Trip reduction ordinances	Legal (planning) mechanisms requiring land users (owners, businesses, developers) to achieve trip reduction goals
Land Use	Employment/Services	Hierarchy of Employment centres focussed on the potential for growth.
	High Residential	Higher residential densities and lower parking provision at high accessibility locations.
	High Commercial	Higher density commercial development with lower parking provision at high accessibility locations.
	TDAs at Existing Nodes	Application of Transport Development Area (TDA)/ Urban design land approaches at existing and proposed areas.
	Integrated Residential Neighbourhoods	Application of integrated development and transport approaches to new residential neighbourhoods.
	Non / low Car Housing	No and Low car housing schemes.
	Developer Contributions to non-car modes.	Development contributions to non-car modes (including public transport).
Intelligent Transport Systems (ITS)	PT user real-time information	Providing real-time information to PT users about PT service timing e.g. time next bus will arrive
	Internet transport information	Providing access to traveller information (both timetable & real-time) on the internet

TABLE F LONG LIST OF TDM MEASURES

Strategy	Measure	Description
Traffic Management	Public Transport Priority	Measures which give public transport vehicles priority over other traffic: Bus Lanes, Traffic Signal Priority, other Traffic Control measures.
	HOV Lanes	Generally involve the provision of a section of roadway accessible only by buses or vehicles carrying a threshold number of passengers.
	Traffic Calming	Physical infrastructure measures aimed at either slowing down traffic on particular streets or in a particular area (speed control), or reducing the number of vehicles travelling on particular streets (volume control).

Appendix G: International Practice with TDM Measures

TABLE G INTERNATIONAL PRACTICE WITH TDM MEASURES				
TDM Strategy Area	UK	European	US	Other
Financial Measures	Public transport use subsidies included in some Employer Travel Plans Norwich Union Insurance trialling 'Pay as You Drive' insurance scheme which is based on how often, when and where you use your vehicle.	Similar to UK Policies to deter people from buying a car.	Extensive use of subsidies for non-car modes in employer trip reduction plans Trialling of travel behaviour based insurance premiums Cashing out parking.	Limited Singapore: policies to deter people from buying a car.
Taxation Measures	Commuting expenses not tax-deductible Car ownership tax. Motor fuel tax.	In several European countries commuting expenses are tax exempt (e.g. France, Germany). In the Netherlands only public transport users and cyclists commuting expenses now exempt. Company car usage levy.	Special measures to support employer travel plans: employer public transport benefits tax deductible to employer & tax free to employee. Specific tax on larger cars, 'gas guzzler' tax. Provision of tax deductible benefits to the employee by the employer is allowed.	Car purchase taxes. Car park spaces provided by employers taxed in Australia.
Road Pricing	Durham – toll charge on a City Centre street London congestion charging scheme commenced 17 February 2002. .	Toll rings in Norway: Bergen, Oslo & Trondheim Trial in Stuttgart	Tolling on high occupancy lanes on freeways	Singapore–full electronic road pricing scheme Hong Kong – ERP trialled
Alternative Hours	Flexible work hours common in public sector, less in private sector Staggered work hours and compressed workweek less common.	Similar to UK Specified time allowance (e.g. 15 minutes) work time rescheduling allowed.	Similar to UK	Similar to UK
Ridesharing	Carpool schemes being included in Employer Travel Plans.	Carpool schemes being included in Employer Travel Plans.	Area-wide carpooling schemes trialled in 1970s. Carpooling & vanpooling used at worksites in 1980s & 1990s Use of shuttle buses.	Formal ridesharing not common.
Information and Communications	Telework included in some Employer	European Commission is supporting research &	Federal government has promoted	Limited

TABLE G INTERNATIONAL PRACTICE WITH TDM MEASURES				
TDM Strategy Area	UK	European	US	Other
Technologies (ICT)	Travel Plans Telework actively promoted by government for travel reduction 2.2 million teleworkers in the UK - about 7.4% of the workforce	awareness on teleworking E-workers are 5% of European workforce Levels higher-Scandinavian countries	teleworking for many years. However, still only around 4% of workers telework regularly.	
Travel Plans	The UK Government is promoting Employer and School travel plans. Around 4% of employers have travel plans nationwide (less in London).	Most common in the Netherlands which has strongly promoted employer travel plans (8-15% of employers have plans).	Employer 'Trip Reduction Plans' introduced in 1990s to meet air quality targets.	Limited.
Alternative Modes	Walking and cycling facilities improved as part of travel plan process Cycling infrastructure measures being implemented e.g. Safer Routes to Schools Limited Carsharing—several trials.	Walking and cycling facilities improved as part of travel plan process Some cities have extensive cycling friendly facilities e.g. Amsterdam (cycle ways, Cycle Club) Car Sharing schemes are in place in several countries.	Walking and cycling facilities improved as part of travel plan process Limited Carsharing	Similar to US and UK Limited Carsharing
Parking Restraint	Maximum parking standards for development, controlled parking zones Provision for local authorities to introduce workplace charging.	Maximum parking standards for development, residents parking zones, area-wide parking zones.	Some cities have set parking ceilings (e.g. Portland, Boston). Parking taxes on public car parks in some cities (e.g. Baltimore, Chicago, New York) Parking maximums	Office parking levy in CBD and major business areas in Sydney, Australia. Parking levy on all central city parking in Perth, Australia.
Land Use	UK Government has established planning guidelines to foster land use development that supports public transport, walking and cycling, i.e. high density, mixed use, located on public transport corridors 'No and Low Car' housing schemes. Development contributions to non car modes and public transport. Construction of the Light railway and, later, the Jubilee Line Extension were integrated into the development of the London Docklands.	Many European cities also fostering sustainable land use development Netherlands ABC Location Policy.	Movement towards promoting sustainable land use development. However, very varied application of these principles. Transit Oriented Development.	Sustainable land use planning popular in Australasia. Land Use Clustering, Canada. Hong Kong is a leading example of transport led development where large scale commercial and residential developments were incorporated into the design of each station on the mass

TABLE G INTERNATIONAL PRACTICE WITH TDM MEASURES				
TDM Strategy Area	UK	European	US	Other
				transit system.
Intelligent Transport Systems (ITS)	Real time information systems for PT being installed in many places	Similar to UK	Similar to UK	Similar to UK
Administrative	Limited.	The Netherlands Government has supported establishment of Transport Management Associations (TMAs).	Regulatory approach to TDM (Trip Reduction Ordinances) mostly abandoned. TMAs widespread.	Limited.
Education/Marketing	Demonstration projects have been run with Travel Blending & Individualised Marketing.	Substantial trials of Individualised Marketing	Limited	Major Individualised Marketing and Travel Blending programmes in Australia.
Traffic Management	Public Transport priority relatively widely implemented Bus lanes Traffic calming widely practiced Traffic signal measures. High Occupancy Vehicle lanes.	Public Transport priority very common. Bus Lanes Traffic calming originated in the Netherlands. Traffic signal measures. High Occupancy Vehicle lanes.	HOV Vehicle facilities widely implemented; Traffic calming now being introduced. Bus Lanes Traffic signal measures. High Occupancy Vehicle lanes.	Being implemented in other parts of the world as well. Bus lanes Traffic signal measures. High Occupancy Vehicle lanes.

Appendix H: Application and Effectiveness of TDM Measures

TABLE H APPLICATION AND EFFECTIVENESS			
Strategy	Measure	Application	Effectiveness Factors
Financial Measures	Public transport fares subsidy	Main application is the journey to work trip.	Most effective when implemented in conjunction with disincentives such as parking restraint.
	Cycle subsidy		
	Ridesharing allowances	Most appropriate in areas with significant road congestion and/or parking problems, and adequate public transport provision.	In addition, should be implemented in tandem with improvements to alternative modes.
	Public transport fares schemes		
	Cashing out parking		
	Indirect financial incentives		
	Travel behaviour based insurance	At trial stage: could potentially apply to all motorists.	At trial stage.
Taxation Measures	Car purchase and ownership taxes	Applicable in any jurisdiction, but particularly where the level of car usage is high and its adverse effects are a significant problem. With respect to car ownership and parking, for example, this could be by way of 'benefit-in-kind' taxation on employees but may be problematic to implement and administer.	Commuter travel taxation measures need to provide definite tax advantages for alternative modes, and not treat all modes equally.
	Treatment of car ownership and parking		
	Tax deductible PT passes		
	Fuel Taxes		
Road Pricing	Congestion Pricing	Road pricing schemes have been introduced to either (i) address significant road traffic congestion problems; or, (ii) to finance new road building schemes. Road pricing could be applicable where it would have a significant effect on traffic congestion and the surrounding road network and/or the public transport network could cope with diverted traffic.	Road pricing should be implemented as part of a package of measures aimed at demand management. To achieve modal shift to public transport improvements to the public transport system are required in conjunction with the road-pricing scheme. Ensure alternative routes are available for traffic, which wishes to bypass the pricing zone.
	Cordon Pricing		
	Time Based Pricing		
Alternative Hours	Staggered working hours	Many different types of work can be organised on a staggered or compressed basis. The main issues arising are management and team process related.	The impact of alternative work hours schemes will depend on: the absolute amount of employee participation, the degree to which peaking is present in the present work schedule, - the degree to which the new work schedules are spread, and, the type of variable work hour programme initiated.
	Flexible Hours		
	Compressed Working Weeks		
Ridesharing	Carpooling	Cost incentives through provision	The employer has promoted and co-
	Vanpooling		

TABLE H APPLICATION AND EFFECTIVENESS			
Strategy	Measure	Application	Effectiveness Factors
	Shuttle Buses	<p>of direct payments, indirect payments (subsidised fares, provision of van), provision of free parking, exemption from tolls;</p> <p>Time and convenience incentives, i.e. providing preferential parking sites, heavy occupancy vehicle lanes, guaranteed ride home scheme;</p> <p>One way distances involved are relatively long;</p> <p>Work schedules are largely fixed and regular;</p> <p>The number of employees involved is relatively large, i.e. to provide enough participants from residential areas to fill a car or van;</p> <p>Public transport is inadequate;</p> <p>Some parking or congestion problems exist.</p>	<p>ordinated the ridesharing programme. Employer run programmes have been much more successful than those organised by local authorities or other public organisations;</p> <p>Within employer schemes, the extent to which management promotes and supports the scheme has a significant impact on the participation rate;</p> <p>Transportation allowance as fringe benefit remuneration designed to balance parking costs.</p>
Information and Communications Technologies (ICT)	Teleworking (e-work)	<p>Applies to most organisations – administrative and other knowledge-based functions. Greatest opportunity amongst larger organisations, in particular government bodies</p> <p>Some opportunities for SMEs but likely to be less impact</p>	<p>Effectiveness of awareness-raising campaign</p> <p>Willingness of employers to change ways of working</p> <p>Adequacy of ICT infrastructure, especially affordable broadband</p> <p>Adequacy of housing</p> <p>Penetration (people who can or will telework) and levels of uptake (how regularly) are key factors</p>
	Telework centres	<p>Solution for larger organisations who can afford investment</p> <p>Particular opportunities for govt bodies, for facilities exchange, more intensive use of local properties</p>	<p>As for teleworking</p> <p>Availability of funding to support more rapid deployment of local telecentres</p>
	Teleshopping (e-commerce)	<p>Opportunities to develop high-tech approach to market for most vendors of products and services</p>	<p>Affordable broadband will increase effectiveness and rate of uptake</p>
	Teleservices (e-services)	<p>Applies primarily but not exclusively to public sector</p>	<p>Affordable broadband will increase effectiveness and rate of uptake</p>

TABLE H APPLICATION AND EFFECTIVENESS			
Strategy	Measure	Application	Effectiveness Factors
	'Wired-up communities'	Applies to developers, social housing providers, planning authorities and telecoms companies, in looking at new settlement and regeneration opportunities	High level of integration/coordination needed between public and private sector interests
Alternative Modes	Worksite cycle/pedestrian facilities	Employment sites	<p>Worksite needs to be within reasonable distance of the workforce/employees home</p> <p>Access to the workplace is suitable for cycling</p> <p>Facilities must be clean and adequate to meet demand</p>
	Cycle route network	Area wide	<p>Proper design and tailoring to local conditions and needs.</p> <p>Comprehensive and continuous across the network</p> <p>Needs to be direct and of good quality</p> <p>Regular maintenance is required</p> <p>Must be off road if adjacent traffic exceeds 40 km/h</p>
	Improvements to pavements and crossings	Area wide	<p>Crossings must adequately cater for the number of pedestrians</p> <p>Improvements must be tailored to suit local conditions.</p>
	Signal priority in favour of Pedestrians and cyclists in inner city	Area wide	
	Provision of maps and awareness campaigns	Area wide or concentrated on specific areas identified by surveys	<p>The information must be clear and concise</p> <p>Awareness campaigns could target schools</p>
	Provision of secure cycle parking at public transport stations & in shopping centres	Public transport station and interchanges, City Centre and shopping areas.	<p>Facilities must have adequate lighting and if possible security cameras or supervision</p> <p>The parking facilities must be sheltered and secure</p> <p>The facilities must be located at a direct access point to the station/shops</p>

TABLE H APPLICATION AND EFFECTIVENESS			
Strategy	Measure	Application	Effectiveness Factors
	Pedestrian zones and walkways	Inner city/shopping areas/town centres	Shelter should be provided if possible Street furniture and obstacles must be kept to a minimum. The zones must be car free and be enhanced to encourage pedestrian use.
Alternative Modes	Car Sharing	It appears that carsharing would have the most potential in a limited number of inner city neighbourhoods with low car ownership. Swiss experience indicates that up to 8% of population potential members of car clubs.	
Parking Restraint	On-street: Parking charges On-street: Controlled Parking Zones Off-street: Long-stay vs short-stay pricing Off-street: Parking Levy Off-street: Commuted Payment Schemes Off-street: Maximum Parking Standards tied to PT accessibility Off-street: Parking Ceiling Off-street: Ban parking spaces in new buildings Off-street: HOV car parking Off-street: Park + Ride / Peripheral Parking	Generally applied in areas where a degree of traffic congestion is occurring, e.g. City Centres. Centre needs to be of a certain size and 'critical mass' to avoid any displacement of activities. Key features of centre are: amenity, character and ambience; and, depth and spread of business activities.	Control of parking stock – generally, the greater the proportion of parking spaces under public control the greater the effectiveness of parking measures. Employer Parking Subsidies – extent of employer subsidisation of employee parking costs affects the impact of parking pricing measures. Public transport provision – quality and level of PT will affect degree of modal switching achieved. Through-route traffic – parking measures only affect destination traffic, not through-route traffic. Compliance and Enforcement – adequate enforcement required to ensure compliance with parking regulations. Constrained parking in adjoining areas is also necessary; otherwise drivers merely park in the adjoining areas.
Education/Marketing	Travel Awareness Campaigns		Alternative viable transport options are available. An impetus exists for people to change travel behaviour, e.g. lack of car parking, bad congestion. They are linked to other initiatives such as health and exercise.

TABLE H APPLICATION AND EFFECTIVENESS			
Strategy	Measure	Application	Effectiveness Factors
	Individualised Marketing	Areas where PT service better than general perception of it; or, where PT service improvements being made.	Areas with a relatively high quality public transport service, and which are readily amenable for walking and/or cycling for many trips
	Travel Blending	Most areas, but may be best suited to better-educated areas.	Areas where adequate resources are available to service programme.
Travel Plans	Employer Travel Plans	Mainly implemented where businesses have a travel related problem, e.g. parking shortage, planning requirement, travel options for staff.	<p>The most effective ETPs usually address parking as well as providing positive incentives for modal change, i.e. a mix of carrots and sticks.</p> <p>Small scale, single mode initiatives can be effective. This can occur by organisations playing to their strengths (e.g. a nearby public transport station).</p> <p>Travel plans need an overall strategy for encouraging progressive change based on reducing the attractiveness of car use and increasing the attractiveness of alternative modes.</p> <p>Successful travel plans alter the financial balance of different commuting options (e.g. by introducing parking charges or introducing cheaper public transport fares)</p>
	School Travel Plans	More suited to urban areas than rural areas (pupils travel longer distances to school in the latter, and opportunities for walking and cycling are lower).	Depends on the attitude of parents to allowing their children to walk and/or cycle to school, and the degree of support from the local authority in terms of implementing measures to improve the safety of the walk/cycle to school
Intelligent Transport Systems (ITS)	PT user real-time information	All public transport routes, although not generally required on very high frequency routes.	Most popular on lower frequency routes.
	Internet transport information	Particularly useful where users have high access to the internet.	Internet information is likely to become an important source of information regarding transport options as access to the internet grows.
Administrative	Transportation Management Associations (TMAs)	Particularly applicable where group of businesses with common interest or geographical dimension (e.g. Business Park).	Private sector participation is vital to long-term success.

TABLE H APPLICATION AND EFFECTIVENESS			
Strategy	Measure	Application	Effectiveness Factors
Land Use	Employment/ Services (Improved balance between local population and local employment – mixed use).	Intended to transfer employment/ service development to centres closer to residential areas, particularly growth centres in hinterland. Aim is to balance residents, jobs and other activities.	Centres will be selected for actual or potential public transport accessibility. Requires coherent spatial planning strategy to implement.
	High Residential	Objective is to encourage higher density residential development accessible to public transport, i.e., around existing or proposed PT nodes.	Will be based around actual or potential public transport nodes or corridors, or in future as transport-led development.
	High Commercial	Objective is to maximise numbers of jobs close to public transport routes/nodes.	Will be based around actual public transport nodes or potential as transport led development. Requires control and management of on-street and off-street public parking.
	TDAs at Existing Nodes	Principles as for first three measures.	Requires existing high accessibility node with substantial redevelopment opportunities.
	Integrated Residential Neighbourhoods	Objective is to create new housing areas, which maximise the potential for public transport and other non-car modes. Applicable to large Greenfield and estate renewal sites.	Probably requires minimum site area of 20ha but principles can apply to smaller schemes.
	Non + low Car Housing	Could, at present, only be around 5 to 10% of all new housing.	Only applicable in City Centres and other centres with high public transport accessibility and excellent local services and jobs.
	Developer Contributions to non-car modes.	Contribution scales to vary by geographic area, extent of on-site provision being made and the need for off-site provision.	Appropriate Development Contributions Schemes under the Act need to be made.
	Planning conditions to ensure delivery of MMP's and other TDM measures.	Larger developments particularly business parks, etc.	Ongoing monitoring and enforcement.
Traffic Management	Public Transport Priority	Areas with traffic congestion and with inadequate bus flow.	Extent to which the priority measure allows PT and HOVs to bypass congested road sections. Degree of enforcement has significant impact on effectiveness.
	HOV Lanes	Similar to bus lanes. Generally: major urban areas with large employment centres, heavy congestion and supportive TDM policies.	
	Traffic Calming	Areas with cut-through traffic and high traffic speeds with certain minimum traffic volumes.	The geometrics and spacing of traffic calming measures, the availability of alternative routes, and treatment of other streets in area wide applications.

TABLE H APPLICATION AND EFFECTIVENESS

Strategy	Measure	Application	Effectiveness Factors
	Pedestrian Only Streets	Specific streets or areas with high pedestrian demand.	Total priority given to pedestrians and minimal access granted to traffic. Enforcement.
	Reallocation of road space	Areas where traffic reduction is desirable. Areas where the increased use of alternative modes is sought/required.	Comprehensive design and implementation. Enforcement. Monitoring and post implementation revisions.

Appendix I: TDM Stakeholders Consulted

Organisation	Name	Title
Dublin Chamber of Commerce	Maurice Pratt	
Dublin Chamber of Commerce	Declan Martin	Director Policy, Campaigning & Lobbying
Dublin Docklands Development Authority	Peter Coyne	Chief Executive
Dublin City Centre Business Association	Tom Coffey	Chief Executive
IBEC	John Dunne	
IBEC	Reg McCabe	
Automobile Association	Conor Faughnan	
Road Hauliers Association	Sheila Mc Cabe	
Dublin Port	Enda Connellan	
Rail Procurement Agency	Frank Allen	Chief Executive
CIÉ	Michael Reidy	
Dublin Bus	Alan Westwell	Managing Director
Iarnród Éireann	Joe Meagher	Managing Director
Iarnród Éireann	Michael Murphy	Suburban Rail Manager.
Bus Éireann	Bill Lilley	Managing Director
Bus Éireann	Tim Hayes	
Private bus operators PAMBO	Mike Goodliffe	
FOTO	Frank King	
National Taxi Drivers Union	Tommy Gorman	
Dublin Cycling Campaign	Eammon Ryan	
Taxi Company Owners Association	Derek Dalrymple	
Garda Traffic Bureau.	Tony Hickey	Assistant Commissioner
National Disability Authority	Donie O'Shea	
National Roads Authority	Eugene O'Connor	Head of Project Management
National Roads Authority	Michael Tobin	
Wicklow County Council	Michael Looby	Director of Transport Services
Department of Finance	Adrian Finneran	
Department of the Environment and Local Government	Mary Moylan	
Department of the Environment and Local Government	John Martin	

Organisation	Name	Title
Department of the Environment and Local Government	Kevin Ring	
Department of the Environment and Local Government	Martin Condon	
Department of Transport	Tom Ferris	Head of Public Transport Planning Division
Strategic Planning Guidelines	Mary Darley	Technical Director
Dublin City Council	John Fitzgerald	City Manager
Dublin City Council	Owen Keegan	Director of Traffic
Dublin City Council	Michael Phillips	City Engineer
Dublin City Council	Pat Mc Donnell	City Planner
Dun Laoghaire Rathdown County Council	Derek Brady	County Manager
Dun Laoghaire Rathdown County Council	Michael Gough	Director of Planning services
Dun Laoghaire Rathdown County Council	Eamon O'Hare	Director of Transport services
Fingal County Council	Willie Soffe	County Manager
Fingal County Council	Mark Walsh	Director of Planning Services
Fingal County Council	Michael Lorigan	Director of Transport Services
South Dublin County Council	Joe Horan	County Managers
South Dublin County Council	Ciaran Kennedy	Director of Planning Services
South Dublin County Council	Frank Coffey	Director of Transport Services
Kildare County Council	Niall Bradley	County Manager
Kildare County Council	Tommy Skehan	Director of Planning Services
Kildare County Council	Jimmy Lynch	Director of Services, Transportation and Environment
Meath County Council	Tom Dowling	County Manager
Meath County Council	Joe Crockett	Director of Planning Services
Meath County Council	Oliver Perkin	Director of Transport Services
Wicklow County Council	Eddie Sheehy	County Manager
Wicklow County Council	Brian Doyle	Director of Planning and Economic Development
Irish Homebuilders Association	Ciaran Ryan	
The Irish Parking Association	Paul Flynn	Chairman
Fire Brigade	Mike Walsh	Chief Fire Officer
IDA Ireland	Conor Agnew	Manager East Region

Appendix J: Register of Submissions

	Organisation or Name of Individual
1	Public Transport Operators and Business Seminar
2	Directors of Transportation and Planning Seminar
3	Dublin City Centre Business Association
4	Garda Traffic Bureau
5	Meath County Council Transportation and Planning SPCs
6	Kildare County Council Transportation SPC
7	Fingal County Council Planning SPC
8	South Dublin County Council Infrastructure Mgt Team
9	Dublin City Council Transportation SPC
10	Dun Laoghaire Rathdown Transportation and Planning SPCs
11	Wicklow County Council Transportation and Planning SPCs
12	Rail Procurement Agency
13	Dublin Chamber of Commerce
14	South Dublin Chamber of Commerce
15	Greater Blanchardstown Chamber of Commerce
16	Dublin Cycling Campaign
17	Wicklow County Development Board
18	Finnstown Input Group
19	National Council on Ageing and Older People
20	Irish Senior Citizens Parliament
21	Chartered Institute of Logistics and Transport
22	Killiney Ballybrack Renewal Group
23	Barbara O'Leary
24	Cabra Community School
25	Michael Keefe
26	Robert O'Brien
27	Steven Paul
28	Alan Cowap
29	St Johns Drive Residents Association
30	Sheelagh Collins
31	Gary Kearns
32	Combined Ashbourne Residents' Associations
33	Distance Education International Ltd, Desmond Keegan
34	Gabrielle Farrelly
35	Michael Boyle
36	Angela O'Brien
37	James M.G. Hogan
38	John Mc Gill
39	Paul Daly
40	Shane O'Mearain
41	Paul Cullen
42	Ann Fogarty
43	R O'Connor

	Organisation or Name of Individual
44	Deirdre Purcell
45	DTA Marketing
46	Jason Duggan
47	David Mooney
48	Patrick Devine
49	Pieter van Velzen
50	Richard Bowden
51	Johnny Gordon
52	Kathleen Forde
53	Declan McGuire
54	Richard Barrett
55	Eileen Gavin
56	Sean Giblin
57	Redbullsuzuki
58	Blackrock Resident
59	David Trevitt
60	Joseph Neville P.C.
61	David Mc Namara
62	Jean Acheson
63	Stephen Dolan

Appendix K: Planning Data and Future Scenarios

Population Growth Projected to 2016 in Public Transport Corridors								
	"Base" Scenario				Scenario to Redress Decline			
	Rail	Luas	Metro	Other	Rail	Luas	Metro	Other
Dublin City	30,030	12,694	-606	-1,422	41,882	15,730	1,087	-1,040
Fingal	56,500	0	22,713	13,190	56,503	0	16,063	10,209
South Dublin	29,666	-2,171	-7,272	8,335	31,325	-627	-2,733	6,356
Dun Laoghaire								
Rathdown	-7,760	-1,328	24,580	9,293	-3,401	-815	17,606	6,831
Meath	22,836	0	0	18,724	22,836	0	0	13,367
Kildare	19,198	0	0	682	18,442	0	0	-167
Wicklow	26,095	0	0	6,375	26,257	0	0	4,643
Total	176,564	9,195	39,415	55,178	193,844	14,288	32,022	40,198

Population Growth Projected to 2016 in Public Transport Corridors								
	"Base" Scenario				Scenario to Intensify Development in			
	Rail	Luas	Metro	Other	Rail	Luas	Metro	Other
Dublin City	30,030	12,694	-606	-1,422	52,166	12,694	-606	-1,422
Fingal	56,500	0	22,713	13,190	59,750	0	22,713	6,362
South Dublin	29,666	-2,171	-7,272	8,335	39,273	-2,171	-7,272	2,213
Dun Laoghaire								
Rathdown	-7,760	-1,328	24,580	9,293	-6,451	-1,328	24,580	1,004
Meath	22,836	0	0	18,724	25,974	0	0	8,043
Kildare	19,198	0	0	682	19,897	0	0	27
Wicklow	26,095	0	0	6,375	23,763	0	0	1,143
Total	176,564	9,195	39,415	55,178	214,372	9,195	39,415	17,370

Employment Growth Projected to 2016 in Public Transport Corridors								
	"Base" Scenario				Scenario to Intensify Development in			
	Rail	Luas	Metro	Other	Rail	Luas	Metro	Other
Dublin City	22,708	4,174	694	155	27,698	4,174	694	155
Fingal	7,064	0	31,343	9,594	6,871	-	31,343	6,829
South Dublin	11,751	0	9,492	452	12,983	-	9,492	194
Dun Laoghaire								
Rathdown	2,101	81	7,335	513	2,489	81	7,335	354
Meath	6,037	0	0	3,054	7,104	-	-	1,420
Kildare	477	0	0	5,930	3,722	-	-	2,082
Wicklow	9,141	0	0	1,478	7,913	-	-	643
Total	59,280	4,256	48,864	21,177	68,780	4,256	48,864	11,676

Appendix L: Other Behavioural Responses

Three potential behavioural responses to the congestion charge which are not addressed by the forecasting model are discussed below:

- Trip retiming and trip suppression
- Change of trip origin or destination
- Transfer to modes other than public transport

Trip retiming and trip suppression

It is not envisaged that workplace parking levies would be related to time of day, and therefore trip retiming would not be a possible response to this measure. Trip suppression may be a possible occasional response if the levy is applied on a daily basis and the employee is able to work from home or work flexibly (i.e. 4 day week or 9 day fortnight).

Trip retiming and/or suppression are implicitly included as responses in the assessment of the measures to promote TDM, as is transfer to walk, cycle, car share and public transport.

With regard to road user charging, a review of international research indicated that there is no conclusive evidence that this measure would lead to trip retiming. Some drivers might change time to avoid the charge. Some might be willing pay the charge in order to have a shorter trip – market research undertaken for this study showed that 25% of those that drove to work regularly would be very or fairly happy to pay a charge in order to avoid congestion.

The hours of operation of the congestion charging scheme could be set to avoid trip retiming being a problem. During the morning peak hour, most trips are to work (80%) or school (15%), and most people do not have a great deal of flexibility in timing these trips. For example, with the envisaged all-day charge (say 7am to 7pm), it seems unlikely that people would arrive at work before 7am and stay until after 7pm, effectively working an extra 4 hours, just to avoid paying 5 or 10 euro. If a morning peak only charge was proposed (7am to 10am), some people may drive to work before 7am or after 10am as they could travel home when they liked in the evening without paying the charge. The proportion of City Centre workers with this level of flexibility in work start times on a regular basis is probably small, but if it were an issue such that congestion was likely to arise after 10am, the hours of operation could be set at 7am to 11am.

Market research undertaken for this study indicated that, of the full time workers interviewed, only 16% were very likely to change their travel plans in order to avoid a peak hour only charge. Similarly, research for the ROCOL studies in London

showed that only a small proportion of those travelling to work, school or on business would be able to travel less often or to change the day of the trip⁸⁸. Observations from London⁸⁹ show that up to 10% of the reduction in car movements to the charging area represents the effect of car journeys to the charging zone being diverted to other destinations, made less frequently or not made at all.

The effect of congestion charging on discretionary, off-peak trips such as shopping and social or leisure trips has not been modelled. The market research undertaken for this study indicated that if there were a toll to enter Dublin City Centre, the response for shoppers would be as follows:

- Pay the charge: 31%
- Use bus or trains: 27%
- Reduce number of trips to central Dublin: 14%
- Stop shopping in central Dublin: 12%
- Walk/cycle/car share/other: 5%

The research did not specify the days or hours of operation of the charge and people may have assumed it would apply on a Saturday which would be highly unlikely.

Change of trip origin or destination

Change of origin or destination would not be a significant short-term response for work, school and employers business trips in the AM peak, and is not modelled. The effect on discretionary, off-peak trips would be greater - the research quoted above indicated that 12% of shoppers might stop shopping in central Dublin if there was a charge to enter the city.

Transfer to modes other than public transport

In common with most transport models, the DTO model does not include car sharing, walking or cycling as alternative modes. Consequently the impact of TDM in transferring drivers to these modes not included, and this represents a potential under-estimation of the effect of TDM in reducing car use. Data collected by Transport for London⁹⁰ since the introduction of the London congestion charging scheme can inform the possible extent of this under-estimation, as shown in the table below.

⁸⁸ Proportions of drivers that said they could reduce the frequency of their trips: travel to work: 15%; travel to education: 11%; and travel on employer's business: 11% as against 55% of shopping, 55% of visiting friends and family; 46% of leisure and 42% of personal business trips. Proportion of drivers that said they could have changed the day they made the trip: 12% travel to work, 7% of travel to education as against 81% of shopping, 70% of visiting friends and family, 48% of personal business, 43% of leisure and 22% of employer's business trips.

⁸⁹ Congestion Charging: Six Months On, Transport for London, October 2003

⁹⁰ Congestion Charging: Six Months On, Transport for London, October 2003

In London, the reduction in car trips to or through the charging zone is around 60,000 per charging day. Of these:

20-30%	Previously drove through the charging zone but now divert around it or travel less often
50-60%	Transferred to public transport
15-25%	Switched to other forms of transport (motorcycle, cycle, car sharing)
	Switched to walking
	Are making fewer car journey to the zone, or being diverted to other destinations (up to 10%)

Observations in London⁹¹ show 10 -15% of former car drivers transferred to walk, cycle or motorcycle, and there is a general sense that walking and cycling is now more attractive with less traffic, although exceptionally good weather in 2003 was also a factor. Car occupancy has increased by 10% in London since congestion charging was introduced, suggesting a small proportion of former drivers are now passengers/car sharers.

It could be assumed, based on the London experience, that the forecast reduction in traffic entering the canals as a result of the congestion charge may be underestimated by some 15-25%.

⁹¹ Congestion Charging: Six Months On, Transport for London, October 2003

Appendix M: Approach to Economic and Financial Appraisal

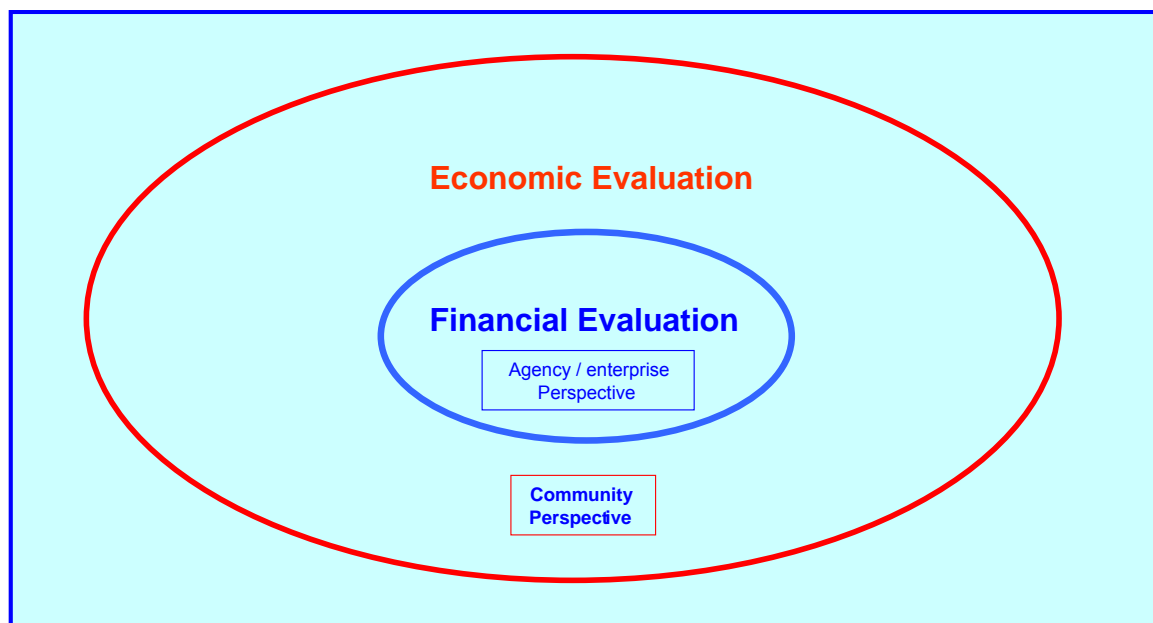
The appraisal of the preferred TDM package has been conducted within a cost benefit analysis framework consistent with standard guidance documents such as *Guidelines for the Appraisal and Management of Public Capital Projects* (Department of Finance, 1994), *CBA Parameter Values and Application Rules for Transport Infrastructure Projects* (DKM, 1994) and *Proposed Working Rules for Cost-Benefit Analysis* (CSF Evaluation Unit, June 1999). Furthermore, guidance was also taken from the UK and the EU such as:

- Guide to cost benefit analysis of investment projects, European Commission DG Regional Policy 2002;
- Transport Economics Note, UK Department for Transport;
- Highways Economics Notes No. 1, 2002, UK Department for Transport;
- The Green Book, Appraisal and Evaluation in Central Government, HM Treasury, 2003; and
- The Northern Ireland Practical Guide to The Green Book, NI Department for Regional Development, 2003

In order to avoid confusion, the differentiation between financial and economic evaluation that has been adopted for this project, namely that of varying perspectives, is set out in the Table below:

Differentiation between Financial and Economic Evaluation		
	ECONOMIC	FINANCIAL
Perspective	Economy	Sponsoring agency (typically a Govt. Dept. or Semi-State enterprise)
Objective	Using the community's resources efficiently	Using the sponsoring agency's resources efficiently
Pricing	Opportunity costs / market prices	Market prices
Income distributional effects	Excluded	Excluded
Externalities	Included	Excluded

The economic and financial evaluations are separate but related exercises – in essence the financial evaluation is a sub-set of the broader economic evaluation.



The steps in the analyses are the same but content and perspective differ. Both methods utilise a cost benefit analysis framework.

The steps undertaken for this appraisal are summarised below. An illustration of the process is also provided.

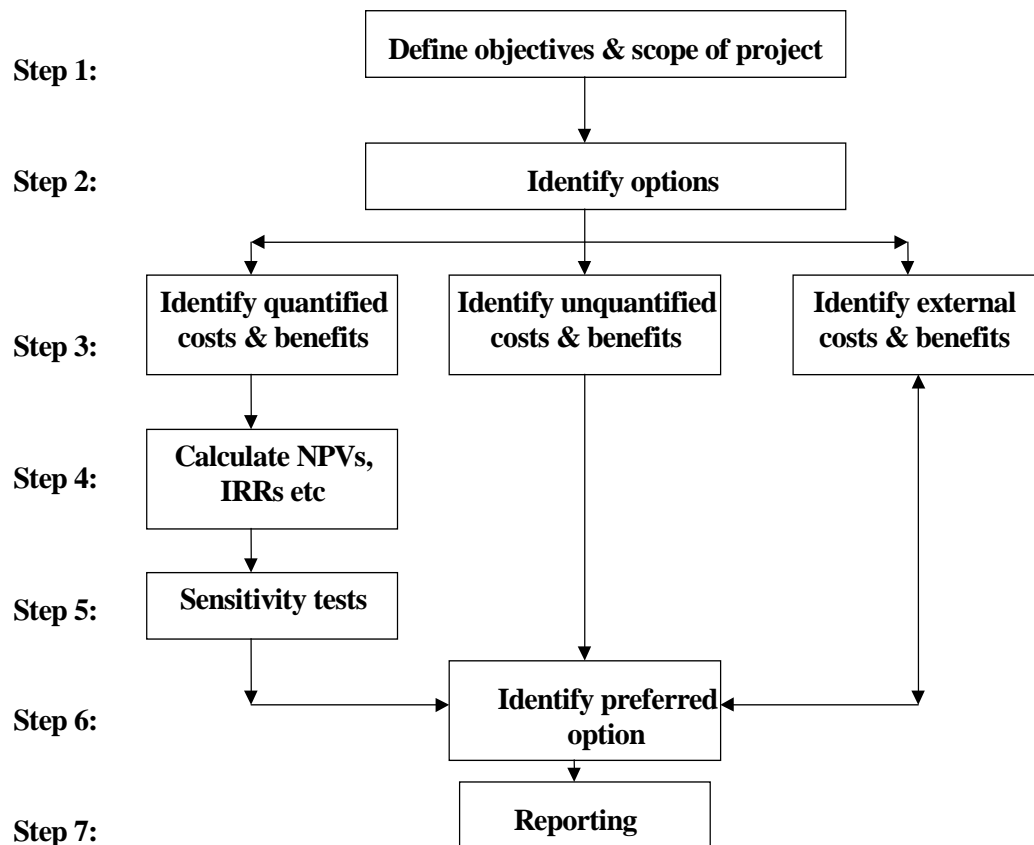
The major data sources for the analyses have been:

- Transportation model outputs 'with' and 'without' the TDM package implemented by 2008 such as:
 - changes in peak period vehicle kilometres;
 - changes in peak period vehicle hours;
 - changes in peak period private car journeys and
 - changes in peak period public transport journeys;
- Parameter values for elements such as vehicle operating costs (VoCs), vehicle accident costs (VACs) and value of travel time savings (VoTs) sourced from the published guides and / or derived using data from the, *inter alia*, Central Statistics Office (CSO), An Garda Síochána, National Roads Authority, Environmental Protection Agency and AA Ireland;
- Other data sourced from UK sources including the UK's Strategic Rail Authority; and
- Capital and operating costs estimates from recent / current Irish experience and from other locations / jurisdictions (including

information sourced from Transport for London in relation to the London Congestion Charging scheme).

Booz Allen Hamilton

The Cost Benefit Analysis Process



Appendix N: Further Details of Cost Assumptions

Table N Costs Associated with Preferred Package

Item	€million	Basis for cost
Capital Costs		
<i>Congestion Charge</i> System set-up – over 3 years	50	2/3 of London Congestion Charge capital cost estimate of £50 million. (ROCOL estimated £33-50 million, outturn £58.2 Capital Expenditure on Tolling Facilities, TfL Annual Report 2002/03)
Complementary measures – over 2 years	44	In London significant funds were allocated by TfL initially (£13.3m in 2002/03) and subsequently £30.6 m in 2003/04 TfL for traffic management schemes etc. Measures for the GDA would be identified during the scheme design stage (see Section 8 of the report). For illustrative purposes, Table A includes a possible “menu” of measures which could be implemented for the proposed budget.
Education / awareness programme – one-off	5	Indicative budget based on costs of similar programmes e.g. recent government allowances: e-voting awareness and education campaign, €5 million; suicide awareness €4.5 million; speed limits €2 million). National campaign likely to be required. Note that TfL’s communications and marketing strategy for the congestion charge scheme was £12 million (LTT, 12 th June 2003).
<i>Work Place Parking Levy</i> Inventory & database development – one-off	1	Requirements would be established through detailed design, assuming inventory is required (self-declaration may be considered to be sufficient). Budget allows for team of around 15 staff working for year, plus allowance for hardware and software. Cost of €65k per FTE pa assumed.
Complementary traffic management measures – over 3 years	25	Measures required would be identified as part of the scheme design. They would be predominantly parking control schemes, but also schemes to assist walking, cycling and bus use. See Table B for a possible menu of measures achievable for the proposed budget.
Education / awareness programme – one-off	1	Based on Government National Pensions awareness/PRSA campaign which allowed €1.5 pa spread over 3 years (€500,000 pa) and was similarly targeted at employers, but this would include GDA only.
<i>TDM Support Measures</i> Establishment costs – one-off	2	Allowance for each local authority to establish in-house travel plans
Complementary traffic management measures – over 3 years	25	Measures would be identified on a bottom-up basis as work place travel plans, school travel plans and other initiatives develop. Table C provides possible menu of measures for the proposed budget.
Launch costs - one-off	1.5	Allowance for a general GDA travel awareness campaign or individual campaigns in each local authority.
Total Capital Costs (over 3 years)	154.5	
Recurrent Costs		
Congestion Charge Scheme administration – recurrent	5 pa	Based on scheme approx. 2/3 size of London's - which was estimated at £5m p.a. for 2003/04 source: Congestion Charging 6 months on, Major of London /

GREATER DUBLIN TRAVEL DEMAND MANAGEMENT STUDY

Scheme operations – recurrent	60-120 pa	TfL, 23 Oct 2003 See note above for Admin - same 'rules' applied except that Scheme Ops cost derived from TfL 2003/04 Budget. This initial assumption was refined to provide a broader range of costs – see memo from Derval Cummins to Jeremy Ryan dated 5 th April 2004.
<i>Work Place Parking Levy</i> Scheme administration – recurrent	1.3 pa	WPPL recurrent costs based on a team of 20 FTE across the 7 local authorities to undertake admin., inspections, enforcement, monitoring etc. FTE cost of €65k pa allowed
<i>TDM Support Measures</i> Scheme administration – recurrent	1.0 pa	TDM support measures based on a team of 16 staff - 2 in each local authority and 2 more in DCC for oversight / admin / management. Cost of FTE based on LTT Feb 2004 adverts for workplace & school travel co-ordinators etc £26-32k salary
Total recurrent costs	67-127 pa	

Table A: Complementary Measures for Congestion Charging

Junction treatments (signal modifications, crossings, signing, pedestrian and cycle facilities)		
Cost per junction (source: typical costs for GDA local authorities where work contracted)		€ 250,000
No. junctions on Outer Ring Road	39	
No. junctions on Inner Ring Road	42	
No. junctions elsewhere (allow)	4	
Total junction work		€21,250,000
Parking Controls around ORR		
No. FTE per year for design and negotiation	6	
Cost per FTE		€ 65,000
number of years to implement	2	
Cost of parking control design		€ 780,000
Signing and lining (allow)		€ 500,000
total parking work		€1,280,000
Traffic calming in residential areas near ORR		
Traffic calming work near ORR (allow)		€5,000,000
QBN treatment		
Average rate per km with no widening (QBN office)		€ 375,000
Average rate per km with widening (QBN office)		€ 850,000
km with no widening required (allow)	20	
km with widening	-	
Cost of QBN treatment		€7,500,000
Workplace-based individual marketing		€2,400,000
Other measures negotiated by City groups (allow)		€1,000,000
Total		€ 38,430,000
contingency	15%	€ 5,764,500
Total		€44,194,500
London Congestion charging related traffic management		
2002/03		19,950,000
2003/04		45,450,000
Total		65,400,000
Assume 67% of this is appropriate for Dublin		43,818,000

Table B Complementary Measures associated with Workplace Parking Levy

No. FTEs to design/negotiate parking control schemes in Dublin Counties	8	
No Dublin counties	3	
No FTEs to design/negotiate schemes in City	2	
No FTEs to design/negotiate schemes in hinterland counties	3	
No. hinterland counties	3	
Total FTE required	35	
Number of years to implement	3	
Cost of FTEs	6,825,000	
Other costs (e.g. mapping, leaflets, advertising, procurement of parking contractors)	2,000,000	
Cost of signing and lining		
Allow per county for Dublin Counties	1,000,000	
Allow per county for hinterland	500,000	
Allow for City	200,000	
Total signing and lining	4,700,000	
Total	13,525,000	
Allow for measures to encourage cycling, walking, bus use e.g. crossings		
Dublin Counties	2,000,000	
City and Hinterland counties	500,000	
Total	8,000,000	
total parking and other measures	21,525,000	
contingency	15%	3,228,750
Total cost of workplace parking levy complementary measures		24,753,750

Table C: Cost of TDM Support Measures Complementary Measures

Number of junction improvements in each Dublin County		11
Number of junction improvements in each Hinterland County		7
Number of junction improvements in City		6
Total junction improvements		60
Cost of junction improvements		15,000,000
Total km of corridor improvements (assume QBN cost, no widening)		20
Cost of corridor improvements		7,500,000
Total traffic management improvements		22,500,000
contingency	15%	3,375,000
Total cost of TDM Support Measures complementary measures		25,875,000