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Report Series No. 7

Barriers to Sustainable Transport in Ireland

SSTI
Strategy for Science, Technology and Innovation

Comhshaol, Pobal agus Rialtas Áitiúil
Environment, Community and Local Government

Environmental Protection Agency

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EPA Climate Change Research Programme 2007–2013

Barriers to Sustainable Transport in Ireland

Assessing the Barriers to Sustainable Transport in Ireland

CCRP Report

End of Project Report available for download on http://erc.epa.ie/safer/reports

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DISCLAIMER

The EPA Climate Change Research Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

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Executive Summary

This synthesis report provides an overview of the findings from the *Assessing the Barriers to Sustainable Transport in Ireland* project and distils the conclusions outlined in the End of Project Report. The purpose of this project was to identify and evaluate existing and potential barriers to the delivery of sustainable travel and transport in Ireland and to qualitatively evaluate the costs and impacts of potential policies and measures that could help overcome these barriers. Finally, the project aimed to identify potential research priorities that could help form an agenda for sustainable transport research in Ireland.

Barrier priorities were identified as those that:

- Can be dealt with through direct policy intervention by national or local policy makers in the short to medium term;
- Are relevant in terms of an Irish policy context; and
- Are highly significant.

The most significant barriers are:

- The legacy of urban sprawl and low-density residential development and the long-term difficulties in retrofitting residential neighbourhoods;
- Public acceptability of new fiscal measures and political resistance to introducing potentially contentious fiscal measures;
- Lack of reliable and efficient public transport and cycling facilities, particularly in low-density rural areas and residential neighbourhoods;
- Perceptions of safety and distance in relation to cycling and walking;
- The limited range of alternative fuels and vehicles (AFVs) currently available on the market; and
- Existing social norms and lack of awareness of the economic, health and environmental benefits of sustainable transport.

Another significant barrier is public acceptability, for example in relation to, inter alia:

- Perceptions of public transport reliability and efficiency;
- Perceptions of safety and distance in relation to cycling and walking;
- Resistance to new fiscal measures, which are perceived to create a disproportionate burden for rural dwellers and commercial operators; and
- Consumer inertia towards AFVs.

It was found from the local authority survey, which was carried out as part of this desk-top study, that the most significant barriers in terms of delivering sustainable transport at a local level include, in order of response:

1. A lack of alternatives and, specifically, accessible and reliable public transport and adequate cycling and walking facilities;
2. Resource constraints on agencies and local authorities; and
3. Physical barriers, e.g. topography, distance, etc.

In addition, it was found that 100% of respondents to the survey of local authorities felt that local public transport services were inadequate in their local areas. The primary barrier to public transport provision in local authority areas was perceived to be low urban density or insufficient economies of scale, followed by a lack of incentives for potential market entrants. The issue of density is important, particularly in rural areas where services may not be feasible or cost-effective. Responses from local authorities on barriers to public transport use indicate that perceptions of unreliability were perceived to be the primary barrier, followed by unavailable or inaccessible services.

Eighty-six per cent of respondents considered that local cycling and walking facilities were inadequate. Local authority perceptions of barriers to cycling and walking indicate that a lack of suitable road space, followed by the perception that cycling and walking are unsafe, and the cost of developing a cycle network are the primary barriers. In addition, it was found that 91% of respondents felt that there was potential for significant modal shift in their local areas.

Potential policy recommendations were evaluated on the basis of:

- Cost to the network user and the Exchequer;
- Potential reduction in greenhouse gas (GHG) emissions; and
- Impact on modal shift, lower socio-economic groups and rural communities.

Policy priorities were identified as measures that could deliver medium to high GHG emission reductions over the period to 2020 and/or high modal shift at low costs to the Exchequer and/or the network user and with low impacts on lower socio-economic groups and rural communities.

Policy priorities identified from the desk-top study include:

- The integration of spatial planning, land-use policy and transport investment through measures, including (a) incentives for densification and consolidation in urban centres, (b) restrictions on one-off housing, out-of-town retail centres and ribbon development, (c) retrofitting of residential neighbourhoods, and (d) the creation of critical mass in key urban areas;
- Improvements in existing public transport services through, for example, network management, reallocation and rationalisation of existing services, improved service quality, integrated ticketing and real-time passenger information; and
- Promotion of the economic, social, health and environmental benefits of smarter travel through awareness campaigns, market segmentation and customised advertising.

Other priorities ranged from increased accessibility to frequent, efficient public transport services to promotion of eco-driving.

The main policy priorities identified from the local authority survey include, in order of response:

1. Education and awareness;
2. Investment in cycling and walking infrastructure;
3. Improved public transport services; and
4. Balanced regional development and spatial planning.

1 Introduction

1.1 Project Background

Transport is the backbone of any economy as it allows the matching of goods, employment opportunities, amenities and services with potential customers. A competitive economy requires a reliable and efficient transport system that is reasonably affordable to all potential network users and that succeeds in decoupling transport activity from impacts on ecosystem services. In addition, a healthy and inclusive society requires high levels of accessibility for communities and, in particular, peripheral or marginalised groups that are transport-disadvantaged. The challenge, therefore, is to ensure that the transport system in Ireland:

- Facilitates long-term economic welfare;
- Maintains competitiveness;
- Improves quality of life;
- Ensures the efficient transportation of people and goods;
- Helps deliver a more low-carbon economy; and
- Meets the needs of all citizens, regardless of location.

The transport sector in Ireland faces a number of significant challenges, not least of which is the commitment to reduce greenhouse gas (GHG) emissions in Ireland by 20% below 2005 levels by 2020 in sectors not included under the European Union Emissions Trading Scheme (EU-ETS), as set out in Article 3 of Decision No. 406/2009/EC[1]. Other challenges include delivering on targets for renewable energy and electric vehicle (EV) market penetration, for example as set out in Directive 2009/28/EC, which sets a target of a 10% share of renewable energy in the transport sector by 2020[2]. In addition, the European Council has agreed that developed countries should, as part of an international agreement, reduce GHG emissions by 60–80% by 2050. This policy is underpinned by the vision for 2050 as set out in the Environmental Protection Agency (EPA) Climate Change Research Programme (CCRP).

The 2009 *Smarter Travel – A Sustainable Transport Future* Action Plan[3], which was published following the 2008 public consultation process, proposed 49 specific actions under four overarching measures (DoT, 2009a):

1. Actions to reduce the distance travelled by private car;
2. Actions aimed at ensuring that alternatives to the car are more widely available;
3. Actions aimed at improving the fuel efficiency of transport; and
4. Actions aimed at strengthening the institutional arrangements required to deliver the targets.

In addition, the 2009 *National Cycle Policy Framework*[4] (NCPF) recommended a number of interventions to improve the modal share of cycling in Ireland by 2020 (DoT, 2009b). This synthesis report is based on the *Assessing the Barriers to Sustainable Transport in Ireland* desk-top study report, which aimed to assess if there are significant barriers in Ireland to sustainable transport. Further details and in-depth analysis on the topics presented in this document may be found in the End of Project Report.

1.2 Trends

The imperative for this project lies in the adverse trends in the transport sector in Ireland, primarily in relation to GHG emissions, as identified in the *2020 Vision – Sustainable Travel and Transport: Public*

1. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009D0406:EN:NOT
2. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:01:EN:HTML
3. http://www.smartertravel.ie/download/1/NS1264_Smarter_Travel_english_PN_WEB.pdf
4. http://www.smartertravel.ie/download/1/0902%2002%20EnglishNS1274%20Dept.%20of%20Transport_National_Cycle_Policy_v4.pdf

Consultation Document[5] (DoT, 2008). Total GHG emissions from the transport sector in Ireland, not including international aviation, increased from 5.17 Mt CO_2 equivalents in 1990 to 14.38 Mt CO_2 equivalents in 2007. This compares with total economy-wide emissions, which increased by 25% over the same period[6]. Its sectoral share increased from 9.3% to 20.8% over the same period.

However, it should be noted that GHG emissions in the transport sector did fall by 0.8% from 2007 levels to 14.255 Mt CO_2 equivalents in 2008, primarily as a result of the economic downturn and the associated decline in freight transport activity[7]. In 2010, the EPA revised its GHG emissions projections for 2020, based on updated economic and population growth projections[8]. Under the 'With Measures' scenario, GHG emissions in the transport sector are projected to increase by 25% to 17.8 Mt CO_2 equivalents by 2020. Under the 'With Additional Measures' scenario, transport GHG emissions are projected to increase by 12% to 16 Mt CO_2 equivalents[9].

Dependency on private car travel and road freight has a number of other environmental impacts, including:

- Point-source and localised air pollution;
- Ambient noise;
- Waste production;
- Water pollution; and
- Impacts on biodiversity.

Socio-economic impacts include the opportunity cost of travel times, network congestion, social exclusion and health impacts, such as obesity arising from sedentary lifestyles and chronic respiratory illness (Greene and Wegener, 1997; O'Mahony et al., 2002; Delucchi, 2003). Emissions from road traffic are the main source of injurious air pollutants, which are harmful to human health. In Dublin and Cork, concentrations of nitrogen dioxide (NO_2) are close to the limit value at a number of monitoring stations (EPA, 2010).

In terms of vulnerability to peak oil, Ireland is ranked fifth most vulnerable out of 18 benchmarked countries, based on oil price sensitivity and fossil fuel import dependency (Forfás, 2006). Import dependency in Ireland in 2007 was 88.3%, which was the second highest in the EU-27 and considerably higher than the average of 53.1% (EEA, 2009). Car ownership is also a significant factor, for example four out of every five households had at least one car in 2006. In the 2006 Census, it was found that car ownership was higher in rural areas (88.6%) than in urban areas (75.2%) (CSO, 2007). It has been estimated that 380,000 people living in rural areas in 2005 did not have access to the transport services they required (McDonagh, 2006).

1.3 Aims and Objectives

The aims and objectives of this synthesis report are to:

- Identify, evaluate and prioritise the most significant barriers to sustainable transport in Ireland;
- Identify potential policy recommendations that could help overcome these barriers;
- Present the findings of the local authority survey on barrier and policy priorities; and
- Identify potential research priorities that could help form an agenda for sustainable transport research in Ireland.

The structure of the rest of the report is as follows. Chapter 2 describes the methodology applied in this study. Chapter 3 assesses barriers to passenger road transport, passenger modal shift and more efficient freight transport and evaluates potential policies and measures to address these. Chapter 4 provides an overview of the findings from the local authority survey. Finally, Chapter 5 offers some discussion on the findings from the End of Project Report as well as final conclusions.

5. http://www.transport.ie/upload/general/10378-0.pdf
6. http://www.epa.ie/downloads/pubs/air/airemissions/GHG_UN_2007_Final_150409.pdf
7. http://www.epa.ie/downloads/pubs/air/airemissions/name,27533,en.html
8. http://www.epa.ie/downloads/pubs/air/airemissions/EPA_GHG_Emission_Projections_2010.pdf
9. http://www.epa.ie/downloads/pubs/air/airemissions/GHG_Emission_Proj_08_12_30032009.pdf

2 Methodology

This section of the report details the methodology that was used in both the End of Project Report and this synthesis report to identify and prioritise barriers to sustainable transport and evaluate policy measures to overcome them. The methodological framework is set out in Fig. 2.1.

This research initially involved a comparative analysis of trends in order to evaluate the performance of the transport sector in Ireland across a range of indicators and parameters. Barriers to sustainable transport and potential policy options were identified and evaluated using a desk-top study and literature review, with specific focus on barriers and policies in the Irish context. Potential barriers were categorised under seven main categories:

1. Financial barriers;
2. Availability of alternatives and/or technical barriers;
3. Institutional and administrative barriers;
4. Public acceptability;
5. Legal or regulatory barriers;
6. Policy failures and unintended outcomes; and
7. Physical barriers.

The system boundary that was adopted includes the transport modes that are included in the EPA national GHG emissions inventory reporting requirements, i.e. passenger car, road freight transport, rail transport, inland waterways and domestic aviation. This system boundary reflects geographical responsibility and, therefore, includes fuel tourism or fuel sales that are consumed outside the State. Actions associated with maritime transport and inbound and outbound tourism are not considered. This report takes 2020 as its time frame as this is the time frame adopted by current EU policies on renewable energy and climate change as well as being the time frame adopted by the *Smarter Travel – A Sustainable Transport Future* Action Plan (DoT, 2009a).

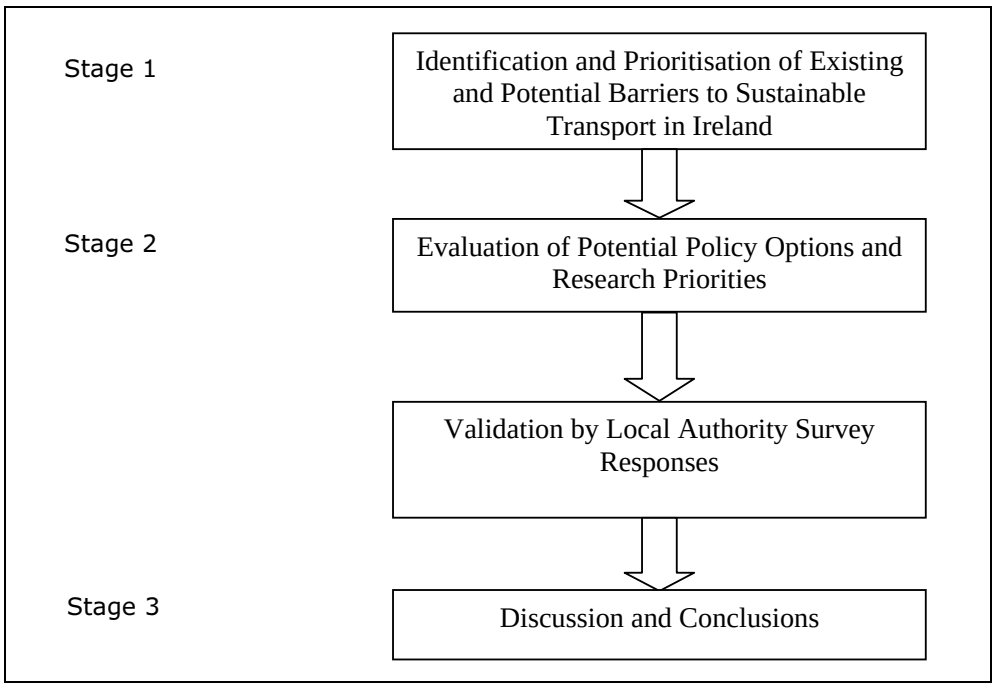

Figure 2.1. Schematic framework of methodology.

Barrier priorities were identified as those that:

- Can be dealt with by national or local policy makers over the short to medium term;
- Are relevant in terms of an Irish policy context; and
- Are highly significant.

The results of this analysis for all barriers were compiled in table format in the End of Project Report. Sustainability appraisal was used to qualitatively analyse individual policies or actions. Thus, policy priorities were identified as those which:

- Can deliver high or medium modal shift and reduction in GHG emissions;
- Are low cost or result in a reduction in cost to the consumer;
- Are low or medium cost to the Exchequer or have no additional cost;
- Have a positive or neutral impact on lower socio-economic groups and rural communities; and
- Can be delivered over the short to medium term. This relates to the potential time frame within which the particular policy action could be taken.

The barrier and policy evaluation stages were corroborated and validated by consultation with local authorities in order to evaluate perceptions of barriers to sustainable transport at a local authority level as well as perceptions of policy priorities. This was done by means of an online questionnaire, which was sent to all 34 local authorities in Ireland, including the 29 county councils and 5 city councils. Twenty-two responses were received, which represents a response rate of almost 65%. Finally, research priorities were identified on the basis of gaps in current knowledge and potential contribution to the empirical evidence base.

3 Achieving Sustainable Transport

This chapter presents the most significant barriers and policy priorities, as identified in the End of Project Report, under three main headings:

1. Passenger road transport;
2. Passenger modal shift; and
3. Freight transport.

Each subsection is evaluated by examining:

(i) Context;

(ii) Goals;

(iii) Barriers;

(iv) Areas of high potential;

(v) Policy recommendations; and

(vi) Research recommendations.

Areas of high potential were identified as policy-relevant strategies that could deliver significant and cost-effective GHG emissions reductions.

3.1 Passenger Road Transport

Passenger transport is driven by a number of factors, including:

- Economic growth;
- Demographics and household composition;
- Active participation in the labour force;
- Urban and household density; and
- Settlement and commuting patterns.

In order to reduce GHG emissions from passenger road transport, it is imperative that policies address:

- Distance travelled;
- Type of vehicle or fuel source;
- Nature of driving patterns; and
- Low occupancy levels.

Modal shift and accessibility of public transport services are addressed in Section 3.2.

3.1.1 Context

Road private car carbon dioxide emissions increased by 135% between 1990 and 2007 and accounted for 37.5% of total transport carbon dioxide emissions (including international aviation) in 2007 (Howley et al., 2009). DG-TREN (2009) estimates that car passenger-km in Ireland increased by 100% from 21 billion in 1990 to 42 billion in 2007. The total increase in the EU-15 in the same period was 32%. In addition, the level of private car ownership per 1,000 population in Ireland increased by 92% between 1990 and 2008 (Howley et al., 2009). In terms of commuting to work, school or college, the private car continues to dominate as the main means of transport in Ireland with 62.6% of commuters using the private car in 2006, as either driver or passenger, compared with 46.9% in 1991 (CSO, 2007). Over the same period, the active labour force increased by approximately 66%, while the numbers working from home approximately halved due to, inter alia, a decline in the numbers working in agriculture and greater participation in the labour market.

3.1.2 Goals

The *Smarter Travel – A Sustainable Transport Future* Action Plan states that:

- "*Transport will make a meaningful contribution to Ireland's commitment under the proposed EU effort-sharing arrangement in relation to climate change and real reductions on current levels of emissions will be achieved*";
- "*...future population and employment growth will have to predominantly take place in sustainable compact urban areas or rural areas, which discourage dispersed development and long commuting*"; and

- "*The total kilometres travelled by the car fleet in 2020 will not increase significantly from current total car kilometres*" (DoT, 2009a).

The barriers to achievement of these goals in Ireland are now explored.

3.1.3 Barriers

Population and economic trends over the last decade or so have changed the economic geography in Ireland, resulting in a number of adverse trends, including urban sprawl, the proliferation of one-off housing in rural areas, longer commuting distances and a car-dominated transport system. This is exacerbated by the transition to more serviced-oriented employment, which tends to be located in urban areas and on the fringes of the larger metropolitan areas, as well as the failure of national and regional planning to provide for balanced regional development and critical mass outside the Greater Dublin Area (GDA). As a result, there is increasing dislocation between where people live and work, which is caused by, inter alia, insufficient affordable or suitable housing in urban areas, particularly for multi-person households, and value preferences for more detached housing in rural and suburban areas. This is related to a perception that apartment housing is unsuitable for families with children as well as issues such as poor apartment design, lack of amenities and green space, anti-social behaviour, air pollution, congestion and noise in urban areas (Williams and Shiels, 2000, 2002; Winston, 2009).

Given the long life of residential assets and infrastructure, this is a barrier that will be difficult to address in the short and even medium term. Local authority perceptions of barriers to sustainable residential development indicate that difficulties in retrofitting sustainable transport solutions, particularly in low-density urban and rural areas, were perceived to be the most important barrier, followed by the legacy of one-off housing and urban sprawl and the limited availability of suitable high-density housing. The results of the local authority survey indicate that resource and time constraints on local authorities and a lack of political commitment were perceived to be the most significant barriers. This has resulted in a failure at national, regional and local levels to ensure that transport, land-use, housing and employment policies are systematically and formally integrated. In addition, policy implementation is sometimes fragmented between a number of agencies or stakeholders, which may prevent the delivery of integrated planning.

Another key barrier is the structure of vehicle and fuel taxation. Once purchased, the capital and maintenance costs of vehicle ownership are sunk or fixed costs and have little influence on daily decisions to drive, which are influenced mainly by low marginal variable costs (fuel and time) and marginal benefits (convenience, comfort and time). In addition, consumers tend to be committed to vehicle use once the vehicle is purchased, i.e. the vehicle is used more liberally if readily available or accessible. This leads to uncertainty over the effectiveness of fiscal measures, particularly where travel patterns are locked in to long-term commuting trips or where there is a lack of readily available alternatives. As a result, network user response may be relatively inelastic in the short to medium term. In addition, there tends to be a general resistance to new taxation measures due to commercial concerns, for example where measures such as parking pricing are introduced on a local basis, concerns over the potential impact on competitiveness and concerns over the equitable impact on lower-income groups and rural communities. This tends to be coupled with a perception of revenue raising or unfairness. There is also a lack of fiscal incentives for incentivising the uptake of more fuel-efficient vehicles in the second-hand vehicle market.

Newer cars entering the Irish fleet have shown increasingly higher efficiency levels. However, the efficiency benefits gained as a result of technological improvements have been eroded by a purchasing trend towards larger engine sizes (Howley et al., 2009; O'Gallachóir et al., 2009). This counteracting trend is driven by attitudinal barriers such as, inter alia:

- A perception that larger vehicles, such as sports utility vehicles (SUVs), are inherently more reliable and safer;

- Greater priority given to factors such as the initial cost price rather than life-cycle fuel costs; and

- A general desire for more powerful vehicles, which are perceived to confer status, prestige, cultural symbolism and image benefits.

It has been argued that those with access to a car may actually gain more psychosocial benefits or ontological security such as mastery, self-esteem, security and feelings of autonomy, protection, status and prestige (Richardson et al., 2007). Furthermore, the automobile is beneficial for multi-purpose trips, for personal security, transport of young children and for storing purchases.

Measures to restrict or influence car use can rarely count on broad public support and can generate strong emotions as well as a wide range of paradoxical behaviour or inconsistency between declared attitudes and actual behaviour ('cognitive dissonance') (Hiscock et al., 2002; Diekstra and Kroon, 2003; Ellaway et al., 2003). Furthermore, there is a general lack of awareness of the social, economic or environmental effects of travel and transport among the general public and, in particular, in relation to domestic and short-haul air travel. Encouraging modal shift from private road transport is addressed in Section 3.2.

There are a variety of alternative fuels and vehicles (AFVs) currently available on the market or close to commercial feasibility, including liquid biofuels, biogas, battery electric vehicles (BEVs), hybrid electric vehicles (HEVs) and hydrogen fuel cell vehicles (AEA, 2007; Nylund et al., 2008; Ball and Wietschel, 2009). Liquid biofuels may involve a higher cost, depending on the source, feedstock, scale of production, transportation costs and use of by-products or waste materials. The experience in Germany and the UK shows that most consumers only purchase biofuels if they are price competitive with mineral petrol and diesel and the environmental reasons for purchasing biofuels are overshadowed by price and availability (Bomb et al., 2007).

For EVs and hybrids, the higher vehicle cost or premium and the limited availability of quality and reliable designs of AFVs to choose from may act as a barrier to early adoption for the normal consumer, in the absence of fiscal incentives. Currently, HEVs and BEVs have higher cost due to the extra battery costs. Even in the long run and with larger production tranches, the price of HEVs is likely to be significantly higher than that of conventional vehicles (Lipman and Delucchi, 2006; AEA, 2007; Richardson et al., 2007; Nylund et al., 2008; Ball and Wietschel, 2009). Caulfield et al. (2010) examined individual motivations for vehicle purchases in Ireland and found that respondents did not rate GHG emissions or Vehicle Registration Tax (VRT) as crucial attributes when purchasing a new vehicle, compared with reliability, automobile safety, fuel costs and the cost price. In addition, consumers tend not to prioritise fuel economy compared with other vehicle attributes when purchasing a car (Caulfield et al., 2010).

Other barriers to AFVs include (Flynn, 2002; Van Mierlo et al., 2006; Agnolucci, 2007; Nylund et al., 2008; Steenberghen and Lopez, 2008; Ball and Wietschel, 2009):

- Low level of visibility or market penetration;
- Market uncertainty surrounding biofuel feedstock and battery raw material availability;
- Lack of charging or fuelling infrastructure;
- Inertia or lack of awareness in the marketplace;
- Perceptions over reliability and 'range anxiety', in the case of EVs;
- Infrastructural challenges or 'lock-in', i.e. the 'chicken and egg' scenario associated with developing infrastructure for AFVs where demand does not yet exist; and
- The issue of home charging, which may not be practical in apartment blocks or terraced houses with limited off-street parking.

Thus, it was concluded that the most significant policy-relevant barriers to travel demand management are:

- Difficulties in retrofitting residential neighbourhoods and tackling the legacy of urban sprawl;
- Public acceptability of new fiscal measures or stringent planning measures, which may impact on certain sectors of society; and

- Existing social norms and lack of awareness of the economic, health and environmental benefits of smarter travel and transport.

3.1.4 Areas of high potential

Areas of high potential that were identified in order of potential impact include:

1. Awareness campaigns and provision of information on fuel economy and eco-driving;
2. Spatial planning and land-use measures, including incentives for densification and consolidation in urban centres as well as the provision of social and affordable housing;
3. Equitable and effective fiscal measures for travel demand management and influencing vehicle purchases; and
4. Mobility management measures such as telecommuting and lift sharing.

3.1.5 Policy recommendations

A number of policies that could address the barriers to sustainable transport outlined above were identified and prioritised. A full list of the policies considered is available in the End of Project Report. Spatial planning and land-use measures, including incentives for densification and consolidation in urban centres, were found to have a high potential for GHG emission reductions in the long term. In particular, restrictions on one-off housing, out-of-town retail centres and ribbon development would ensure that urban sprawl is mitigated and transport demand is reduced. Related spatial planning measures include:

- Mandatory travel plans for new developments;
- Stronger application of existing guidelines; and
- Strengthening planning legislation, for example as anticipated under the Planning and Development (Amendment) Act 2010[10].

These are neutral-cost measures, which may reduce commuting costs and result in a reduction in GHG emissions.

To address travel demand from existing settlement patterns and residential infrastructure, the retrofitting of residential neighbourhoods and the creation of local employment opportunities are vital in terms of managing travel demand and delivering significant GHG emissions reductions in the long term. Local and regional authorities could be offered incentives by creating a long-term 'smarter travel' fund available for local projects, which would be financed by the proceeds of the hypothecation of revenues from fiscal measures.

Policy strategies need to be underpinned by strong regional and local institutional arrangements to complement the institutional structures, as envisaged for the GDA under the Dublin Transport Authority Act 2008 and Public Transport Regulation Act 2009. In addition, transport, land-use, housing and employment policies should be integrated at all vertical and hierarchical policy levels, for example through local transport plans (LTPs) and regional transport strategies. This is a low- to medium-cost technical measure, which is capable of achieving medium modal shift and medium reduction in GHG emissions.

Equitable and effective fiscal measures can help manage travel demand and influence vehicle purchases. In the long term, the vehicle and fuel taxation system should be restructured or calibrated so that all fixed costs and environmental, economic and social externalities are internalised in a 'pay-by-use' system, such as nationwide road pricing, where charges are levied according to network use on the basis of congestion levels, emissions class, type of road, geographical location and time of day. Alternatively, consideration could be given to developing a carbon trading system, such as personal carbon trading (PCT) or Cap and Share or including road transport in the EU-ETS.

This could be supported by the promotion of 'pay as you drive' insurance with discounts for fuel-efficient vehicles and/or reductions in vehicle use. Fiscal measures can help re-balance the fixed and marginal costs of vehicle use by placing greater emphasis on variable user charges. This should be supported by a modification of the re-balanced vehicle taxation system to include the second-hand vehicle market and should

10. http://www.oireachtas.ie/viewdoc.asp?DocID=11970

further consider the potential for removing perverse incentives, which might favour older diesel vehicles or result in increased vehicle use ('the rebound effect').

Mobility management measures, such as lift sharing, travel blending and telecommuting, are neutral/low-cost measures, which might possibly result in reduction in cost to the consumer and may deliver medium GHG emissions reduction, depending on take-up. A national travel information portal could support these measures. National awareness campaigns should be prioritised as they can deliver high modal shift and reductions in GHG emissions at medium cost. Education, particularly of schoolchildren, should be undertaken to influence longer-term behaviour change. Eco-driving lessons and grants for fuel economy meters could deliver medium reduction in GHG emissions at medium cost.

Roll-out of EV charging and AFV refuelling infrastructure at optimal locations, including on-street charging near high-density residential neighbourhoods and workplaces and along motorways and national roads, will facilitate the long-term transition to AFVs. This could achieve a high impact on GHG emissions, albeit at potentially medium to high cost over the long term, particularly if subsidies and fiscal incentives are maintained. Mandatory intelligent speed adaptation (ISA) and retrofitting of speed limiters, fuel economy meters and smart applications in vehicles could deliver medium reduction in GHG emissions but will increase direct cost to the consumer. This could be offset by fuel economy savings.

3.1.6 Research recommendations

Research priorities that were identified include:

- Estimation of disaggregated income and price elasticities in Ireland, using bottom–up analysis;
- Data collection on non-commuting travel as well as more qualitative information on commuting patterns;
- Comparative analysis of all potential fiscal measures in order to determine their macroeconomic and environmental impact. Particular focus should be placed on evaluating the feasibility of a nationwide road pricing scheme and the potential inclusion of road transport in the EU-ETS; and
- Review of the National Spatial Strategy (NSS) based on revised demographic and land-use projections, including research on factors influencing housing preferences and settlement patterns.

3.2 Passenger Modal Shift

3.2.1 Context

The share of public transport by bus fell from 7.7% in 1991 to 6.1% in 2006, although the number of persons commuting to work by rail increased from 1.7% in 1991 to 2.9% in 2006. Walking modal share fell from 11.1% in 1991 to 10.9% in 2006 and cycling modal share fell from 4.4% to 1.9% (CSO, 2007). DG-TREN (2009) estimates that, in terms of motorised traffic, the national average modal share for bus and coach use in Ireland in 2007 was 14.2%, which is higher than the EU-27 average of 9.4%. Railway modal share was 3.9%, compared with the EU-27 average of 6.9%. Tram and metro modal share was 0.3%, compared with the EU-27 average of 1.5%.

3.2.2 Goals

The *Smarter Travel – A Sustainable Transport Future* Action Plan states that "*work-related commuting by car will be reduced from a current modal share of 65% to 45%, which will mean that between 500,000 and 600,000 commuters will be encouraged to take means of transport other than car driver (of these 200,000 would be existing car drivers)*". In addition, it is stated that "*alternatives such as walking, cycling and public transport will be supported and provided to the extent that these will rise to 55% of total commuter journey to work*" (DoT, 2009a). The NCPF also aims to "*create a strong cycling culture in Ireland [to the] extent that 10% of all trips will be by bike by 2020*" (DoT, 2009b).

The DTO (2006) has set an overall objective to increase the proportion of short trips (up to 6 km) made by bicycle in the Dublin area to 30% by 2016, with trips to places of education and commuting trips of up to 10 km in length particularly targeted as suitable for cycling. To achieve these aims, it will be necessary to address the apparent preference of a large part of the population to travel by car instead of other modes of

transport. In our survey of local authorities, 91% of respondents felt that there was potential for significant modal shift in their local areas.

3.2.3 Barriers

The most significant barrier to passenger modal shift that was identified is the fact that public transport or cycling facilities may not be available or there may be limited network coverage, particularly for residents in rural communities and low-density urban areas, for example it is estimated that 45% of rural district electoral divisions (DEDs) in Ireland have a minimal level of scheduled public transport service while frequency and timing of services can vary widely (Fitzpatrick Associates, 2002; MVA, 2006; Steer Davies Gleave and Fitzpatrick Associates, 2006; Tyrinopoulos and Antoniou, 2008). This may result in consumer inelasticity to fuel price increases, particularly where travel patterns are locked in to long-term commuting or where local recreational and retail services or employment opportunities are not available. In the local authority survey, it was found that 100% of respondents indicated that local public transport services were inadequate.

Lack of availability also includes a lack of appropriate services due to inflexible routing that does not respond to consumer demand, for example radial bus routes serving the urban centre may not be suitable for passengers wishing to travel from suburb to suburb or to 'edge cities' or employment clusters, which are increasingly located in suburban or peri-urban locations or on the periphery of metropolitan city-regions. Furthermore, some existing public transport services may be perceived to be inefficient and/or unreliable due to, for example, inflexible work practices, lack of integrated ticketing, and absence of bus priority measures such as signalling priority and dedicated lanes. In addition, network users lack system-wide accessible or real-time passenger information on bus arrival times, which may exacerbate perceptions of unreliability.

Improved public transport availability could address this but low-density settlement patterns can act as a barrier to the provision of a comprehensive network. Urban sprawl may result in long commuting or travel distances, which can also impact on cycling and walking, particularly for inexperienced pedestrians and cyclists. Distance to work or to access recreational or shopping facilities may be prohibitive for certain population cohorts, for example children, the elderly, the disabled or the infirm. People are most likely to cycle for short journeys and only a small proportion are willing to cycle over a distance of 10 km due to the physical effort required and, as a result, cycling and walking may be easier to encourage in higher density urban settlements and residential areas. The distance that people are prepared to walk or cycle is also dependent on the aesthetic quality of the physical environment (Kingham et al., 2001; Keegan and O'Mahony, 2003; Bauman et al., 2008).

Public transport may be viewed as something that is only used by certain sections of the population, for example schoolchildren, students, the elderly, low-income groups, etc. Some studies have indicated that people perceive public transport to be inferior to private transport in terms of protection, autonomy and prestige (Ellaway et al., 2003; Fitzpatrick et al., 2004; MVA, 2006; Beale and Bonsall, 2007; Stradling et al., 2007; Currie and Stanley, 2008; Tyrinopoulos and Antoniou, 2008). This is sometimes related to poor early cognitive experiences, which may be dominated by a 'recollection bias' of negative events, for example long waiting times in poor weather or observing queues of people waiting in the rain. Kennedy (2002) argues that the automobile outperforms public transport with respect to many aspects of service, for example the automobile provides for higher average travel speeds in urban regions and access to low-density areas where public transportation is limited.

The results of the local authority survey showed that the primary barrier to public transport provision in local authority areas was perceived to be low urban density or insufficient economies of scale, followed by a lack of incentives for potential market entrants. Deloitte et al. (2009) have concluded that, despite the recent significant capital investment in fleet replacement and expansion for Dublin Bus and Bus Éireann, current funding is relatively low when compared with comparable operations in other European countries and increases in fuel prices, combined with falling passenger numbers, have put significant financial pressures on both companies. The Dublin Bus public

service obligation (PSO) payment in 2007 equated to about 29% of total revenue whereas levels of operational subvention are generally higher in other European cities. The Bus Éireann PSO payment in 2007 equated to about 12% of total revenue although Bus Éireann does use its own resources, generated from its commercial services, to cross-subsidise PSO services. Deloitte et al. (2009) have found that, when compared with the PSO received by national operators in the Netherlands (49% of revenue), Belgium (51% of revenue) and Switzerland (78% of revenue), the subsidy received by Bus Éireann is low.

Issues of safety can be another important barrier to increasing the modal share of cycling and walking (Bauman et al., 2008; Pucher and Buehler, 2008; Gatersleben and Haddad, 2010; Heinen et al., 2010). There is a perception that cycling and walking are unsafe and potentially hazardous as a result of high speed limits, absence of traffic calming measures, conflict at junctions, aggressive driving behaviour and increasing traffic volumes, although the perception of safety varies depending on traffic volumes, vehicle speed, attitudes of motorists, gender, age and experience. In the survey undertaken for this study, local authority perceptions of barriers to cycling and walking indicate that a lack of suitable road space, followed by the perception that cycling and walking are unsafe, are the primary barriers.

Unlike other European countries, Ireland has no national cycle network. Some cycle paths and footpaths are badly designed or may not be contiguous or integrated, for example discontinuous cycle lanes may end abruptly on to a busy road or adjoin parked vehicles. A lack of segregated and off-road cycle paths, which protect inexperienced cyclists from traffic, can contribute to both objective and subjective safety concerns (Tolley et al., 2001; Martens, 2004; Rodríguez and Joo, 2004; Krizek and Roland, 2005; Gatersleben and Appleton, 2007; Bauman et al., 2008; Ryley, 2008). In the survey reported here, it was found that 86.4% of local authority respondents indicated that local cycling and walking facilities were inadequate. The cost of facilities can act as a barrier to the provision of a national cycling network. For example, the 2009 *Smarter Travel – A Sustainable Transport Future* Action Plan estimated that a comprehensive national network would cost in excess of €2 billion (DoT, 2009a).

Average travel time, by bus in particular, may be higher than a similar car journey, particularly where there are too many stops on a route or where bus routes are congested. Average bus speeds in Irish cities are well below the European average of 23 km/h, i.e. average speeds are 13.5 km/h in Dublin, 11.9 km/h in Cork, and 13.7 km/h in Galway (Fitzpatrick et al., 2004; MVA, 2006). In the local authority survey, 100% of respondents indicated that local public transport services were inadequate. The primary barrier to public transport provision in local authority areas was perceived to be low urban density or insufficient economies of scale, followed by a lack of incentives for potential market entrants. The issue of density is important, particularly in rural areas where services may not be feasible or cost-effective.

Responses from local authorities on barriers to public transport use indicate that perceptions of unreliability were perceived to be the primary barrier, followed by unavailable or inaccessible services. It was found also that 86.4% of respondents indicated that local cycling and walking facilities were inadequate. Local authority perceptions of barriers to cycling and walking indicate that a lack of suitable road space, followed by the perception that cycling and walking are unsafe, and the cost of developing a cycle network are the primary barriers. In addition, 91% of respondents felt that there was potential for significant modal shift in their local areas.

Thus, it was concluded that the most significant policy-relevant barriers to modal shift are:

- Availability of public transport services and difficulties in providing services in low-density areas;
- Quality of existing public transport services and perceptions of safety for potential cyclists; and
- Cost of providing comprehensive accessible, frequent and reliable public transport services as well as an integrated national cycle and walking network.

3.2.4 Areas of high potential

Areas of high potential that were identified, in order of potential impact, include:

1. Provision of increased accessibility to frequent, efficient and reliable public transport services;
2. Improvements in cycling and walking infrastructure, supported by traffic calming measures;
3. Improvements in existing public transport services, for example through network management, improved service quality, integrated ticketing and provision of real-time passenger information;
4. Promotion of the economic, social, health and environmental benefits of public transport, walking and cycling through awareness campaigns, market segmentation and customised advertising, fiscal incentives and mobility management; and
5. Development of a national cycling and walking network.

3.2.5 Policy recommendations

A number of policies were identified and prioritised, which could address the barriers to modal shift outlined above. One key priority could be an extension in rural public transport services and improved accessibility to services, which might deliver a high modal shift and a significant reduction in GHG emissions, albeit at high cost. This may require greater market participation from private operators, for example through increased market competition, franchising or competitive tendering. Improvements in efficiency, service quality and reliability, for example through network management, improved service quality, integrated ticketing and real-time information, have the potential to deliver high modal shift and a medium reduction in GHG emissions, although total cost could be high. This may involve an increase in subsidy or PSO payments through comparative benchmarking.

Improvements in the existing cycling and walking infrastructure, development of dedicated segregated cycle paths along rural roads and shared cycling infrastructure in urban areas are estimated to have high modal shift and medium reduction in GHG emissions at medium cost to the Exchequer. This could be supported by traffic calming schemes and lower speed limits, which have the potential to deliver medium modal shift and reduction in GHG emissions but at medium cost. It is recommended that a reasonably cost-effective strategy could be the promotion of the economic, social, health and environmental benefits of smarter travel through awareness campaigns, market segmentation and customised advertising, fiscal incentives and mobility management.

Over the longer term, it is suggested that resources be committed to the completion of the National Cycle and Walking Network, incorporating commuting, leisure and tourism routes. This could deliver high modal shift and a medium reduction in GHG emissions although it will have a significant cost. It is anticipated, however, that much of the proposed national cycle network could utilise the existing network of country roads.

3.2.6 Research recommendations

Potential research recommendations include:

- Baseline attitudinal surveys of consumer attitudes to public transport, cycling and walking in order to evaluate propensity for behavioural change;
- Complete national network analysis review of all public transport services, including urban and inter-urban services, in order to identify priorities for network improvements; and
- Research into best practice for retrofitting public transport services and achieving more permeable residential neighbourhoods and urban centres.

3.3 Freight Transport

Demand for freight transport is also a 'derived demand' but it is driven both by domestic demand and exogenous factors. Increased efficiencies in the freight transport sector can be achieved primarily through improved logistics and fuel efficiency, although there may be potential for a modal shift to rail and/or inland waterways on a localised basis. Historically, freight transport and economic growth have been closely correlated and growth in freight transport is primarily a

consequence of growth in economic activity. However, decoupling of road freight traffic growth from economic growth has been observed in Denmark, Finland, Sweden and the UK and may be a consequence of structural economic change in more 'mature economies', i.e. a shift towards tertiary industries such as services with a concomitant reduction in the role of heavy industry and manufacturing (Stead, 2001; Tapio, 2005; Kveiborg and Fosgerau, 2007; McKinnon, 2007).

3.3.1 Context

Road freight accounted for 23% of total carbon dioxide emissions from transport in 2007 and emissions from the road freight sector increased by 284% between 1990 and 2007 (Howley et al., 2009). Total vehicle-km travelled by goods vehicles in Ireland increased by 90% from 4.075 billion in 2000 to 7.745 billion in 2008, while national haulage by vehicles registered in Ireland increased by 41% from 12.263 billion tonne-km in 2000 to 17.289 billion tonne-km in 2008 (CSO, 2009). However, more recent estimates show a marked decline in road freight activity due to the economic downturn, i.e. tonne-km by Irish goods vehicles fell by 30% from 2008 levels to 12.069 billion tonne-km in 2009 (CSO, 2010).

Rail freight fell by 40% from 0.5 billion tonne-km in 2000 to 0.3 billion tonne-km in 2005 (DG-TREN, 2006). Indeed, the modal split of freight transport in Ireland was estimated to be 99.3% road and 0.7% rail in 2007, with a negligible share for inland waterways. This compares with the EU-27 average of 76.5% road, 17.9% rail and 5.6% inland waterways in 2007. Ireland was estimated to have the lowest modal split for rail in the EU-27 in 2007 (EEA, 2009).

3.3.2 Goals

No specific targets have been set for the freight sector, although the 2009 *Smarter Travel – A Sustainable Transport Future* Action Plan does state that "*the road freight sector will become more energy efficient, with a subsequent reduction in emissions [and] further research will be necessary to establish a target*" (DoT, 2009a).

3.3.3 Barriers

Barriers to efficient road freight are shaped by exogenous factors, which are determined by complex logistical chains and the structural mix of the economy, in addition to domestic transport policy decisions and production and consumption patterns. Contemporary production and distribution is no longer a single-firm activity but is increasingly fragmented in complex and time-sensitive networks of suppliers and subcontractors. Logistics chains tend to be quite complex as a result of spatial economic expansion and fragmentation, global economic integration and production, intricate networks of flows and hubs and the development of transnational companies (TNCs). The market preference for just-in-time (JIT) delivery can lead to smaller consignment sizes, reduced load consolidation opportunities and an increase in the frequency of delivery. This acts as a barrier to reducing tonne-kilometres and increasing load factors (McKinnon, 2003; Hesse and Rodrigue, 2004; Léonardi and Baumgartner, 2004; Blauwens et al., 2006; McKinnon, 2007; DfT, 2008).

The freight industry competes intensively on price. Intense competition can lead to reluctance to invest in new vehicles, which are regarded as long-lived assets. This leads to low replacement rates and an unwillingness to invest in vehicles with higher emission standards (List et al., 2003; Léonardi and Baumgartner, 2004; Anderson et al., 2005; Woodburn, 2007). Increases in the costs of road haulage would be expected to reduce the demand for road freight movement. However, the price elasticity of demand may be low and, thus, increases may not have a material impact (McKinnon, 2007; Bowen, 2008). Higher taxes could create distortions in the market and damage the competitiveness of domestic hauliers. Therefore, there may be fears over a loss of national competitiveness by unilaterally introducing fiscal measures.

The Irish overland freight market is one of the smallest in Europe in terms of the volumes available and the lengths of haul involved and this has constrained rail's share of the market (Goodbody and Carl Bro, 2006). The freight network in Ireland is physically constrained due to the lack of surface links with neighbouring countries, relatively short haulage distances,

geographical peripherality and inflexibility of rail freight. Companies generally dictate location policy, i.e. company investment decisions may be dominated by factors such as access to airports and ports, surface road links and a high-quality labour market. However, it is possible that certain industries, for example extraction or beverages, may be in a position to avail of the existing rail network, even over short distances, provided sufficient institutional, financial and political commitment is granted.

3.3.4 Areas of high potential

Areas of high potential that were identified, in order of potential impact, include:

1. Increased logistics efficiency and use of information and communication technology (ICT);
2. Promotion of eco-driving through incentives for fuel economy meters;
3. Provision of grants to encourage modal shift and promote containerisation; and
4. Investment in rail rolling stock.

3.3.5 Policy recommendations

One of the key policy mechanisms could be to encourage more fuel-efficient and higher emission standard heavy goods vehicles (HGVs) through pricing mechanisms such as feebates or exemptions from tolls, regulatory mechanisms such as restricted access or low emission zones (LEZs) and eco-driving training. In addition, greater emphasis should be placed on promoting logistics efficiency, for example by increasing the load factor, promoting intelligent transport systems (ITS), use of telematics and real-time information on congestion bottlenecks, increasing the legal maximum weight of trucks, optimising the entire transportation chain and tackling underutilisation and empty running. This was identified as offering high reduction in GHG emissions, neutral impact on modal shift and reduction in cost to the network users.

Policy makers should also consider the provision of grants or subsidies to encourage modal shift from road freight to rail or inland waterways and promote containerisation. Modal shift grant funding could be provided in a targeted manner so that schemes that benefit a particular part of the network are prioritised and could be supported by stakeholder input. This was identified as offering medium reduction in GHG emissions and modal shift, medium cost to the Exchequer and reduction in cost to the network user. This should be supported by the development of best practice guidelines and a national freight strategy, which sets out a policy framework for freight transport, including road, rail and inland waterways, over the period to 2020. In addition, it is recommended that an advisory HGV network or 'freight forum' be established to advise on best practice for sustainable freight transport.

3.3.6 Research recommendations

- Review of freight networks and an examination of the potential demand and incentives for road freight efficiency and freight modal shift, based on industry and stakeholder input; and
- Assessment of the feasibility of regional distribution centres, internal rail depots ('dry ports') and use of the light rail system for moving goods at off-peak times.

4 Local Authority Survey Responses

This section of the report presents some of the results from the local authority survey conducted for this project. Further detailed analysis of the results of this survey can be found in the End of Project Report. Figure 4.1 collates local authority responses in relation to their overall impression of barriers to sustainable travel and transport in their local areas, in order of perceived significance. It can be seen that a lack of alternatives, for example public transport, cycling and walking facilities, was perceived to be the most significant barrier, followed by resource constraints on agencies and local authorities.

Figure 4.2 collates local authority perceptions of policy priorities, in order of perceived significance. The main policy priorities that were identified include:

- Education and awareness;
- Improved public transport services;
- Investment in cycling and walking infrastructure; and
- Balanced regional development and spatial planning.

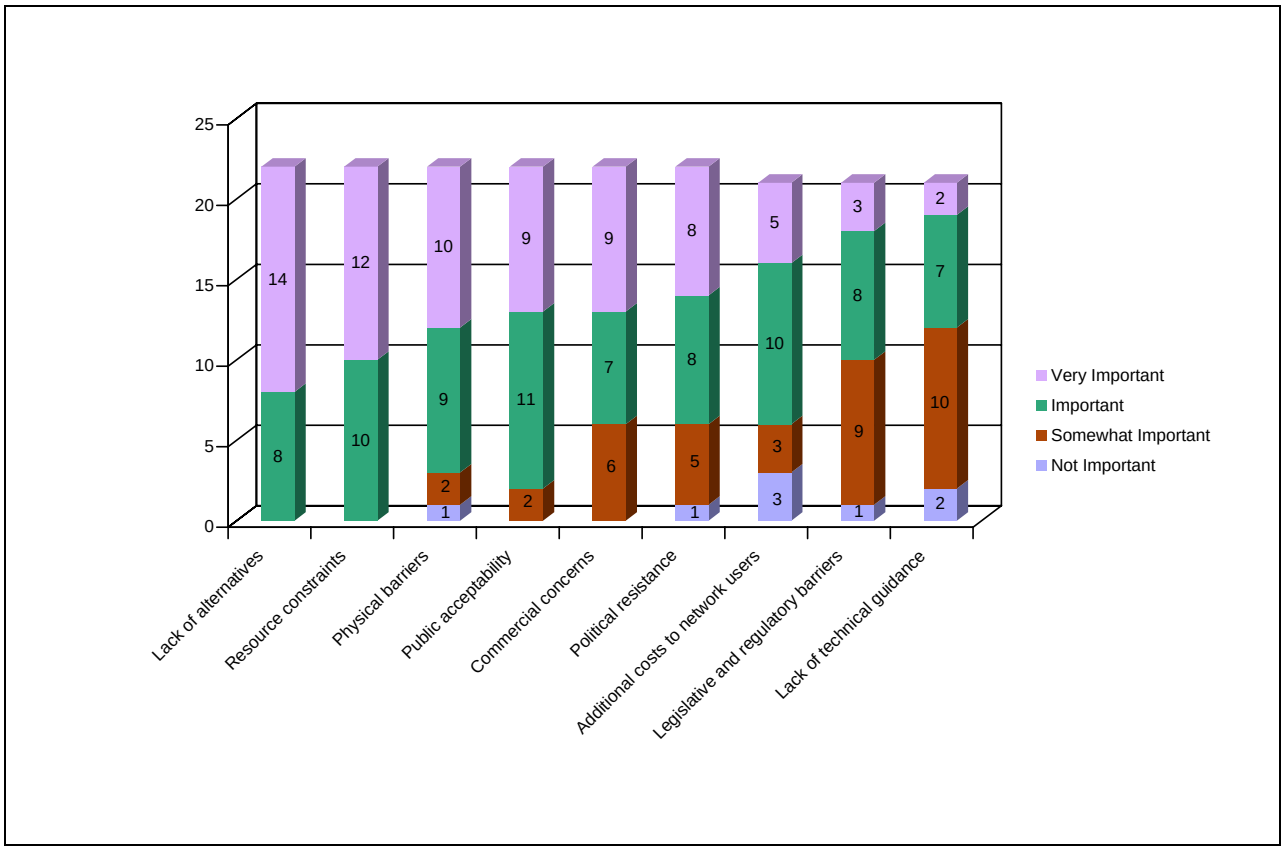

Figure 4.1. Local authority perceptions of barriers to sustainable travel and transport.

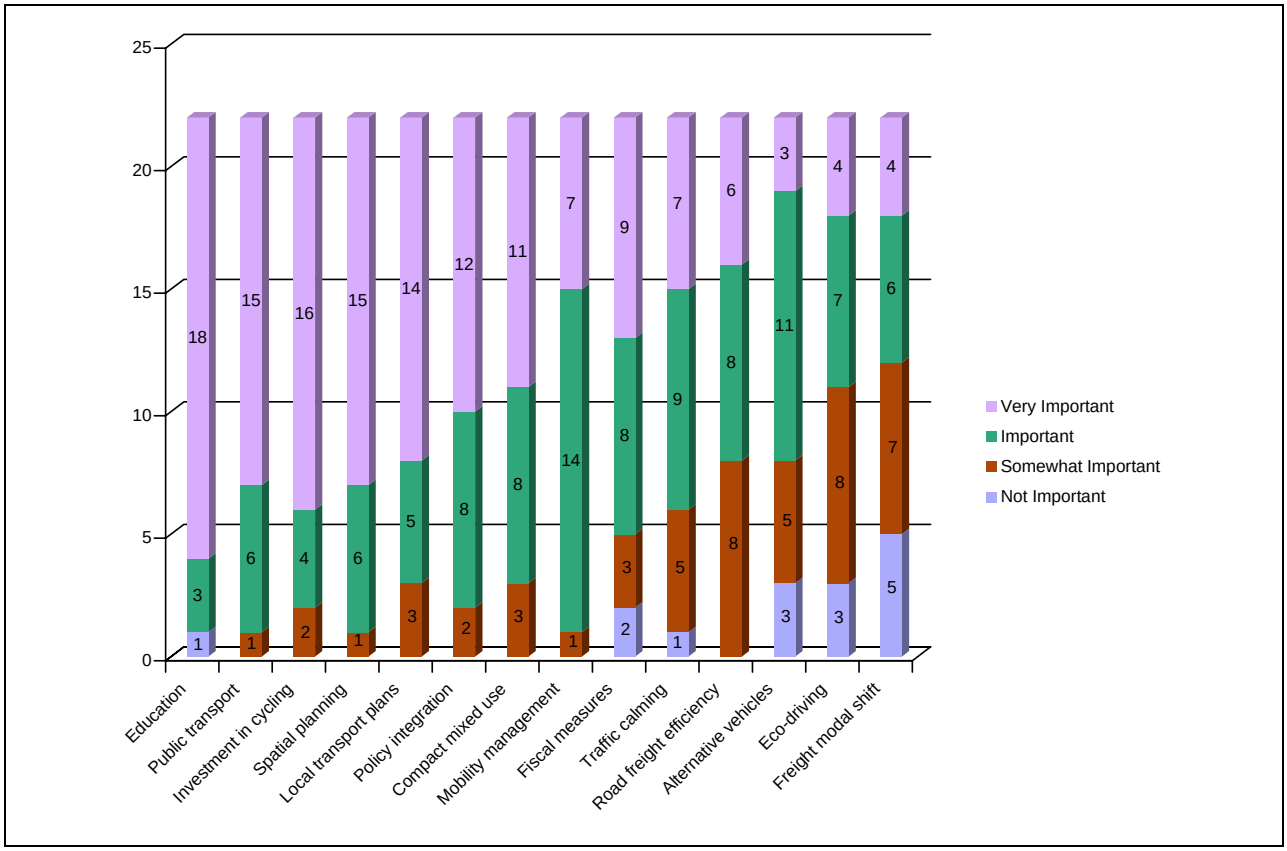

Figure 4.2. Local authority perceptions of policy measure priorities.

5 Discussion and Conclusions

This synthesis report provides an overview of the main barriers and policy recommendations that were identified and evaluated as part of this project. For further details, one should consult the End of Project Report available from the EPA and disseminated as part of the CCRP.

In the area of passenger road transport, the most significant policy-relevant barriers to travel demand management that were identified include:

- The legacy of urban sprawl and low-density residential development;
- Long-term difficulties in retrofitting residential neighbourhoods;
- Public acceptability of new fiscal measures and political resistance to introducing potentially contentious measures; and
- Existing social norms and lack of awareness of the economic, health and environmental benefits of sustainable transport.

Structural travel demand is inherently linked to spatial settlement patterns and may be difficult to influence in the short term. Therefore, spatial planning, balanced regional development and urban regeneration are vital in terms of developing critical mass in cities and towns outside the GDA and creating strong local economies. In addition, the urban form and function of existing urban centres need to be strengthened and urban-generated rural housing should be curtailed. The spatial planning policy package must be comprehensive, integrated across all modes and consider related policies in the areas of job creation, health and planning. Institutional arrangements are important in terms of integrating housing, land-use and transport policies and it is imperative that regional structures established for the GDA under the National Transport Authority (NTA) are considered for the other major city-regions. In the long term, it is vital that existing urban areas and residential neighbourhoods be retrofitted to allow for the consolidation of existing low-density areas.

In terms of fiscal measures, the main barrier that was identified was that, once the 'entry cost' of owning a car has been met in terms of purchase, maintenance, insurance and VRT, the marginal variable cost is relatively low or not immediately transparent to the user and vehicle owners have less of an incentive to drive less. Therefore, in the short term, it is recommended that greater awareness should be directed towards the structure of vehicle and fuel taxation. A number of measures have been introduced recently, including the re-balanced vehicle taxation system for new vehicle purchases, which takes into account carbon dioxide emissions rather than engine size, and the carbon levy, while workplace parking levies have been proposed for the major urban centres. It is imperative that the range of fiscal measures is transparent, effective and equitable and incentivises both purchasing choices and efficient vehicle use.

In the short to medium term, a number of measures could be introduced, for example:

- The vehicle taxation system should be modified to incorporate the second-hand vehicle market;
- Fuel economy labelling should be amended to include average annual fuel costs for consumers; and
- The carbon levy ideally should be included as an additional transactional step in fuel purchases.

In particular, the vehicle taxation system should be 'technology-agnostic', i.e. the taxation system should incentivise fuel-efficient or low-emission vehicles, regardless of technology or fuel source. In the long term, the vehicle taxation system should be reconfigured from vehicle ownership to vehicle use in order to ensure that fixed costs of vehicle use as well as environmental externalities are internalised as marginal variable costs and are made more

transparent to the network user. In addition, revenue from fiscal measures should be hypothecated or ring-fenced for compensatory mechanisms such as the provision of sustainable transport alternatives and/or reductions in personal income tax.

It may be that no one single fiscal measure is the optimal solution and that a plurality of policy options is needed, depending on:

- The objective, for example revenue-raising, internalisation of external costs, appropriate market signals, etc.; and
- Geographical focus, for example urban parking charges and workplace parking levies (local/ urban) or nationwide road pricing (national).

Tax and price increases should be gradual and predictable to allow individuals and firms the opportunity to adjust behaviour when making long-term decisions. The key objective is to ensure optimal timing and the complete suite of fiscal measures should be structured in such a way that they are equitable and effective and do not impose a disproportionate burden on certain groups, for example those in rural communities or lower socio-economic groups. Although nationwide road pricing or personal carbon trading may be the optimal policies in the long term, policy makers should consider localised measures in the short term such as workplace parking levies and on-street parking pricing in urban areas. In addition, the pricing disparity between urban centres and out-of-town retail outlets should be addressed.

Promoting the health and economic benefits of 'active travel' through general awareness campaigns can also encourage sustainable travel at relatively low cost and with minimal impact. It was found in the local authority survey that the main policy priority that was identified was improved education and awareness. Other simple cost-effective and potentially efficacious measures that should be encouraged and that deserve more attention in policy discourse include lift sharing, travel blending, flexible working and telecommuting. These measures have a wide geographical reach and offer potential economic benefits for network users, in terms of reduced variable costs. Targeted 'soft support' measures such as school travel plans, workplace travel plans and personalised travel planning can offer significant benefits at an organisational or community level.

Fuel efficiency, for example through more efficient driving or lower speeds, can deliver significant GHG abatement benefits for all vehicle users at relatively low cost to the Exchequer, although it is imperative that the 'rebound effect' associated with fuel efficiency be minimised. Efficient driving can also offer cost savings for individual drivers and consideration could be given to mandating fuel economy meters for new vehicles or offering grants for the retrofitting of fuel economy meters for the existing vehicle stock. Reduced speed limits also offer ancillary benefits in terms of safety and a more benign environment for pedestrians and cyclists in urban areas.

In the medium to long term, AFVs such as hybrids and EVs have the potential to reduce GHG emissions, ambient air pollution and noise, particularly in urban areas. However, as Ireland does not have an indigenous vehicle manufacturing industry, policy makers should focus on creating the right fiscal incentives, supported by infrastructural roll-out, demonstration and awareness programmes and marketing, to ensure optimal take-up. Incentives should also be put in place to support research and development (R&D), particularly in areas such as second-generation biofuels, EV battery technologies and smart technology applications.

In terms of modal shift, the clear conclusion from the local authority surveys is that 91% of respondents indicated that there is potential for a shift to public transport, walking and cycling. This should be complemented by attitudinal surveys among the general public in order to determine barriers at local level. However, there are currently significant gaps in the public transport and cycling network and existing services are not always of sufficiently high quality to attract motorists from the private car. Low urban densities and a lack of available alternatives, both in terms of accessible, reliable and efficient public transport services and local employment opportunities or amenities, also mean that fuel price elasticities may be low in the absence of high-quality substitutes.

Thus, in order to increase the responsiveness of demand to price, the provision of attractive supply-side alternatives to private motoring is critical. However, it may be difficult to supply complete public transport network coverage at suitable frequency and reliability, particularly in low-density areas, and network providers should prioritise public transport services on the basis of demand, critical mass, projected demographics and economies of scale. On a more immediate and localised basis, walking and cycling are relatively cost-effective options, particularly in urban areas, and confer additional health, environmental and economic benefits.

There is a policy gap in the area of freight and policy makers should develop a separate national freight strategy with input from stakeholders and industry representatives in order to evaluate the potential for more efficient road freight and freight modal shift from road to rail and/or inland waterways. Potential measures for the road freight sector could include:

- Fuel efficiency programmes such as eco-driving and logistics efficiency, supported by ICT and demonstration programmes; and

- Promoting alternative fuels such as pure plant oil (PPO) or higher biodiesel blends available at regional locations.

Support for freight modal shift may involve significant financial, institutional and political commitment although priority should be given to supporting freight modal shift in the short to medium term, where such services are viable and feasible. Further work needs to be carried out on consumer attitudes as well as on the potential costs and environmental and social impacts of all policies and measures.

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Acronyms and Annotations

AFV	Alternative fuels and vehicles
BEV	Battery electric vehicle
CCRP	Climate Change Research Programme
CO_2	Carbon dioxide
DED	District electoral division
EPA	Environmental Protection Agency
EU-ETS	European Union Emissions Trading Scheme
EV	Electric vehicle
GDA	Greater Dublin Area
GHG	Greenhouse gas
HEV	Hybrid electric vehicle
HGV	Heavy goods vehicle
ICT	Information and communication technology
ISA	Intelligent speed adaptation
ITS	Intelligent transport systems
JIT	Just-in-time
LEZ	Low emission zones
LTP	Local transport plan
NCPF	National Cycle Policy Framework
NO_2	Nitrogen dioxide
NSS	National Spatial Strategy
NTA	National Transport Authority
PCT	Personal carbon trading
PPO	Pure plant oil
PSO	Public Service Obligation
R&D	Research and development
SUV	Sports utility vehicle
TNC	Transnational company
VRT	Vehicle Registration Tax

An Ghníomhaireacht um Chaomhnú Comhshaoil

Is í an Gníomhaireacht um Chaomhnú Comhshaoil (EPA) comhlachta reachtúil a chosnaíonn an comhshaol do mhuintir na tíre go léir. Rialaímid agus déanaimid maoirsiú ar ghníomhaíochtaí a d'fhéadfadh truailliú a chruthú murach sin. Cinntímid go bhfuil eolas cruinn ann ar threochtaí comhshaoil ionas go nglactar aon chéim is gá. Is iad na príomh-nithe a bhfuilimid gníomhach leo ná comhshaol na hÉireann a chosaint agus cinntiú go bhfuil forbairt inbhuanaithe.

Is comhlacht poiblí neamhspleách í an Ghníomhaireacht um Chaomhnú Comhshaoil (EPA) a bunaíodh i mí Iúil 1993 faoin Acht fán nGníomhaireacht um Chaomhnú Comhshaoil 1992. Ó thaobh an Rialtais, is í an Roinn Comhshaoil, Pobal agus Rialtais Áitiúil.

ÁR bhFREAGRACHTAÍ

CEADÚNÚ

Bíonn ceadúnais á n-eisiúint againn i gcomhair na nithe seo a leanas chun a chinntiú nach mbíonn astuithe uathu ag cur sláinte an phobail ná an comhshaol i mbaol:

- áiseanna dramhaíola (m.sh., líonadh talún, loisceoirí, stáisiúin aistrithe dramhaíola);
- gníomhaíochtaí tionsclaíocha ar scála mór (m.sh., déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta);
- diantalmhaíocht;
- úsáid faoi shrian agus scaoileadh smachtaithe Orgánach Géinathraithe (GMO);
- mór-áiseanna stórais peitreail;
- scardadh dramhuisce.

FEIDHMIÚ COMHSHAOIL NÁISIÚNTA

- Stiúradh os cionn 2,000 iniúchadh agus cigireacht de áiseanna a fuair ceadúnas ón nGníomhaireacht gach bliain.
- Maoirsiú freagrachtaí cosanta comhshaoil údarás áitiúla thar sé earnáil - aer, fuaim, dramhaíl, dramhuisce agus caighdeán uisce.
- Obair le húdaráis áitiúla agus leis na Gardaí chun stop a chur le gníomhaíocht mhídhleathach dramhaíola trí comhordú a dhéanamh ar líonra forfheidhmithe náisiúnta, díriú isteach ar chiontóirí, stiúradh fiosrúcháin agus maoirsiú leigheas na bhfadhbanna.
- An dlí a chur orthu siúd a bhriseann dlí comhshaoil agus a dhéanann dochar don chomhshaol mar thoradh ar a ngníomhaíochtaí.

MONATÓIREACHT, ANAILÍS AGUS TUAIRISCIÚ AR AN GCOMHSHAOL

- Monatóireacht ar chaighdeán aeir agus caighdeáin aibhneacha, locha, uiscí taoide agus uiscí talaimh; leibhéil agus sruth aibhneacha a thomhas.
- Tuairisciú neamhspleách chun cabhrú le rialtais náisiúnta agus áitiúla cinntí a dhéanamh.

RIALÚ ASTUITHE GÁIS CEAPTHA TEASA NA HÉIREANN

- Cainníochtú astuithe gáis ceaptha teasa na hÉireann i gcomhthéacs ár dtiomantas Kyoto.
- Cur i bhfeidhm na Treorach um Thrádáil Astuithe, a bhfuil baint aige le hos cionn 100 cuideachta atá ina mór-ghineadóirí dé-ocsaíd charbóin in Éirinn.

TAIGHDE AGUS FORBAIRT COMHSHAOIL

- Taighde ar shaincheisteanna comhshaoil a chomhordú (cosúil le caighdéan aeir agus uisce, athrú aeráide, bithéagsúlacht, teicneolaíochtaí comhshaoil).

MEASÚNÚ STRAITÉISEACH COMHSHAOIL

- Ag déanamh measúnú ar thionchar phleananna agus chláracha ar chomhshaol na hÉireann (cosúil le pleananna bainistíochta dramhaíola agus forbartha).

PLEANÁIL, OIDEACHAS AGUS TREOIR CHOMHSHAOIL

- Treoir a thabhairt don phobal agus do thionscal ar cheisteanna comhshaoil éagsúla (m.sh., iarratais ar cheadúnais, seachaint dramhaíola agus rialacháin chomhshaoil).
- Eolas níos fearr ar an gcomhshaol a scaipeadh (trí cláracha teilifíse comhshaoil agus pacáistí acmhainne do bhunscoileanna agus do mheánscoileanna).

BAINISTÍOCHT DRAMHAÍOLA FHORGHNÍOMHACH

- Cur chun cinn seachaint agus laghdú dramhaíola trí chomhordú An Chláir Náisiúnta um Chosc Dramhaíola, lena n-áirítear cur i bhfeidhm na dTionscnamh Freagrachta Táirgeoirí.
- Cur i bhfeidhm Rialachán ar nós na treoracha maidir le Trealamh Leictreach agus Leictreonach Caite agus le Srianadh Substaintí Guaiseacha agus substaintí a dhéanann ídiú ar an gcrios ózóin.
- Plean Náisiúnta Bainistíochta um Dramhaíl Ghuaiseach a fhorbairt chun dramhaíl ghuaiseach a sheachaint agus a bhainistiú.

STRUCHTÚR NA GNÍOMHAIREACHTA

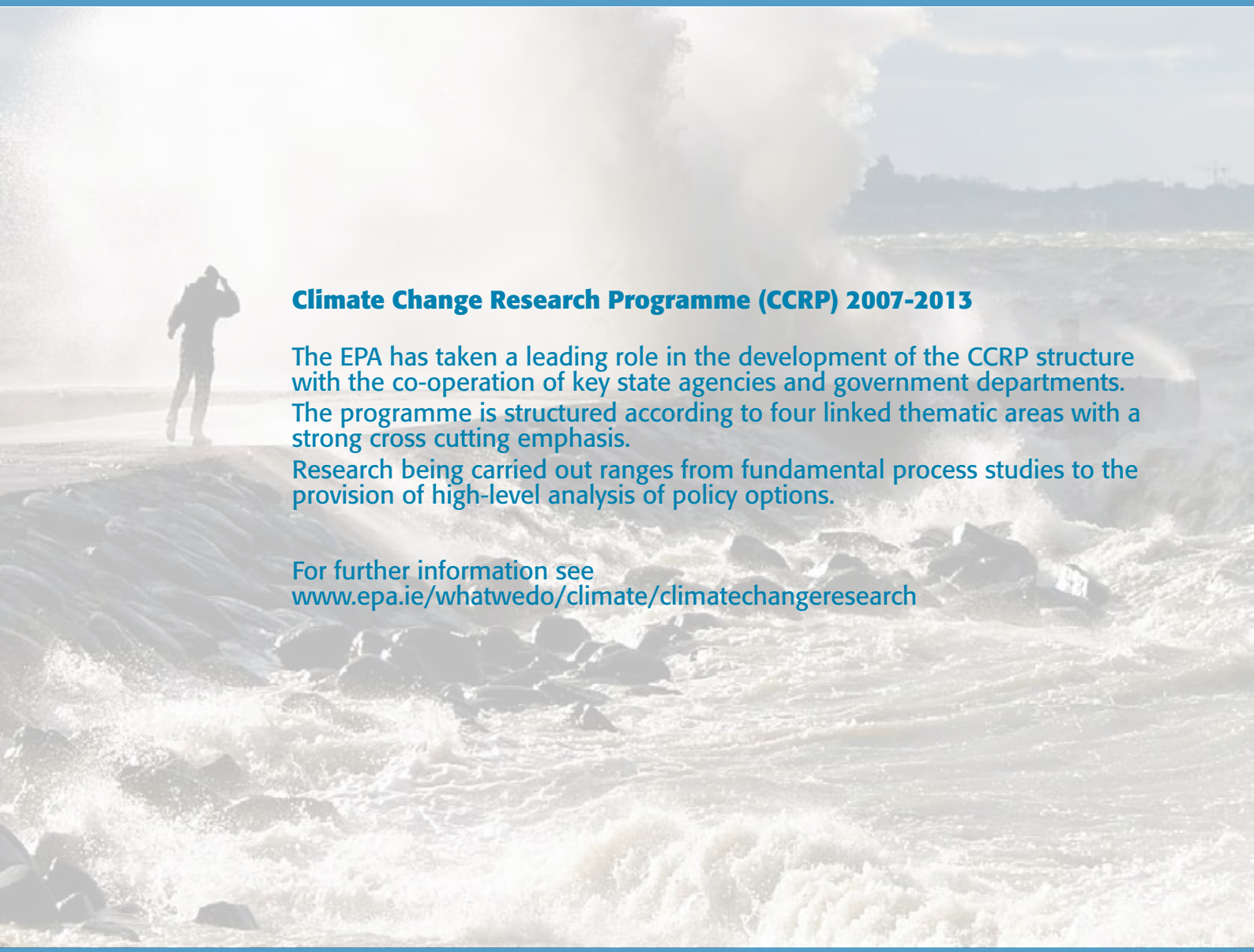
Bunaíodh an Ghníomhaireacht i 1993 chun comhshaol na hÉireann a chosaint. Tá an eagraíocht á bhainistiú ag Bord lánaimseartha, ar a bhfuil Príomhstiúrthóir agus ceithre Stiúrthóir.

Tá obair na Gníomhaireachta ar siúl trí ceithre Oifig:

- An Oifig Aeráide, Ceadúnaithe agus Úsáide Acmhainní
- An Oifig um Fhorfheidhmiúchán Comhshaoil
- An Oifig um Measúnacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáide

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag ball air agus tagann siad le chéile cúpla uair in aghaidh na bliana le plé a dhéanamh ar cheisteanna ar ábhar imní iad agus le comhairle a thabhairt don Bhord.

NDP
National Development Plan 2007 - 2013



Climate Change Research Programme (CCRP) 2007-2013

The EPA has taken a leading role in the development of the CCRP structure with the co-operation of key state agencies and government departments.

The programme is structured according to four linked thematic areas with a strong cross cutting emphasis.

Research being carried out ranges from fundamental process studies to the provision of high-level analysis of policy options.

For further information see
www.epa.ie/whatwedo/climate/climatechangeresearch

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