Belfast City

Air Quality Action Plan

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Chapter 1 - Introduction

It is encouraging to report that present levels of air pollution across most of Belfast are generally low. However, this was not always the case and fifty years ago, levels in the city were so bad that smog was visible almost every day throughout the winter period and streetlights had to remain on for most of the time. In the winter of 1963, pollution levels increased to such an extent that flights from Aldergrove Airport had to be cancelled due to poor visibility. This type of pollution was mainly caused by smoke from domestic chimneys, which has now been largely eliminated thanks to the completion of Belfast City Council's Smoke Control Programme, the availability of environmentally cleaner fuels such as natural gas and the closure of Belfast West Power Station in 2002.

Recently, the government recognised the health benefits of better air quality throughout the United Kingdom and subsequently introduced the National Air Quality Strategy, which established a series of health based objectives for eight key air pollutants including particulate material, nitrogen dioxide, sulphur dioxide, carbon monoxide, benzene, 1,3-butadiene, lead and ozone. The National Air Quality Strategy also fulfils the United Kingdom's responsibility under the European Union Air Quality Framework and Daughter Directives. More information about these pollutants, their sources and a complete list of the relevant National Air Quality Strategy objectives and European Union Limit Values can be found in Appendix 1.

In 2002, the Environment Order was introduced within Northern Ireland. This places a responsibility upon district councils to regularly assess air pollution levels within their districts against the abovementioned health-based objectives. In situations where a district council finds that air pollution levels are likely to exceed the relevant objectives, it must designate an Air Quality Management Area (AQMA) or areas and subsequently develop an Air Quality Action Plan in order to reduce the air pollution to acceptable levels.

Chapter 1 - Introduction (Continued)

Belfast City Council completed its initial assessment of air quality across the city during 2003 and concluded that measures would be required in four specific areas of the city in order to mitigate the effects of nitrogen dioxide and particulate material pollution. As these areas border major arterial roads, the pollution is principally attributable to road transport. However, it should be noted that publications such as the Design Manual for Roads and Bridges (DMRB), a United Kingdom standard used by all road authorities, indicate that transport related pollution levels decrease rapidly with distance from the kerbside. The relevant National Air Quality Strategy objectives for nitrogen dioxide and particulate material are summarised in the following table:-

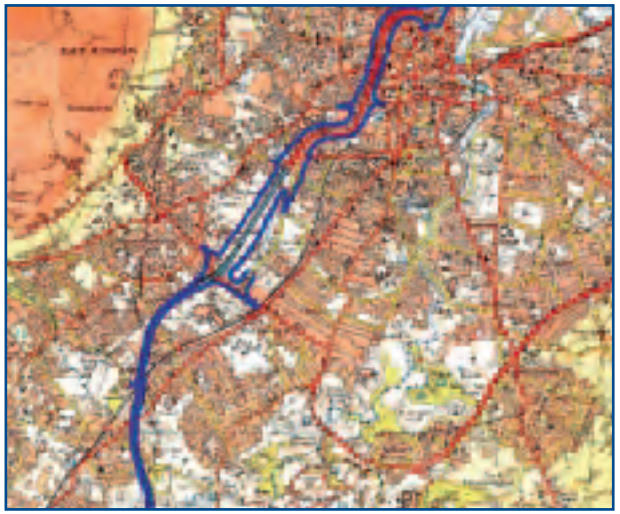
Pollutant	Concentration	Assessed As	Date to be Achieved
Nitrogen Dioxide (NO_2)	200 μgm^{-3} Not to be exceeded more than 18 times per annum.	1 hour mean	31st December 2005
	40 μgm^{-3}	Annual mean	31st December 2005
Particulate Material (PM_{10})	50 μgm^{-3} Not to be exceeded more than 35 times per annum.	24 hour mean	31st December 2004
	40 μgm^{-3}	Annual mean	31st December 2004

Chapter 1 - Introduction (Continued)

In August 2004, Belfast City Council declared four Air Quality Management Areas comprising the M1 Motorway and Westlink corridor, Cromac Street to the junction of Short Strand, Woodstock Link and the Albertbridge Road, the Upper Newtownards Road and the Ormeau Road. However, it is important to note that exceedences of the air quality strategy objectives are not predicted throughout the entirety of each air quality management area but at specific 'hotspots'. Nonetheless, after consultation with stakeholders, it was decided that the air quality management areas should encompass the relevant arterial commuter routes and were therefore declared using a ribbon type approach, which enables appropriate remedial measures to be implemented.

Additional information describing the four air quality management areas is outlined in the following figures. In all cases, the blue lines indicate the boundaries of the air quality management areas, which have been established in locations that compensate for any potential modelling inaccuracies during the initial review and assessment process. For the M1 / Westlink corridor, the air quality management area encompasses both predicted exceedences of the nitrogen dioxide and particulate matter objectives.

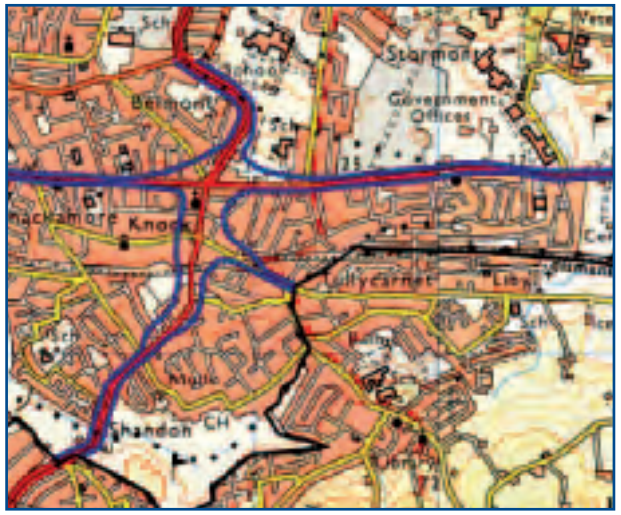
1. The M1 / Westlink corridor from the Belfast City boundary at Sir Thomas and Lady Dixon Park to the end of the Westlink at the junction with Great George's Street and York Street including Stockman's Lane and Kennedy Way. This area was declared for predicted exceedences of both the nitrogen dioxide and particulate material annual mean air quality strategy objectives as well as exceedences of the particulate matter 24 hour mean objective and the nitrogen dioxide 1 hour mean objective.

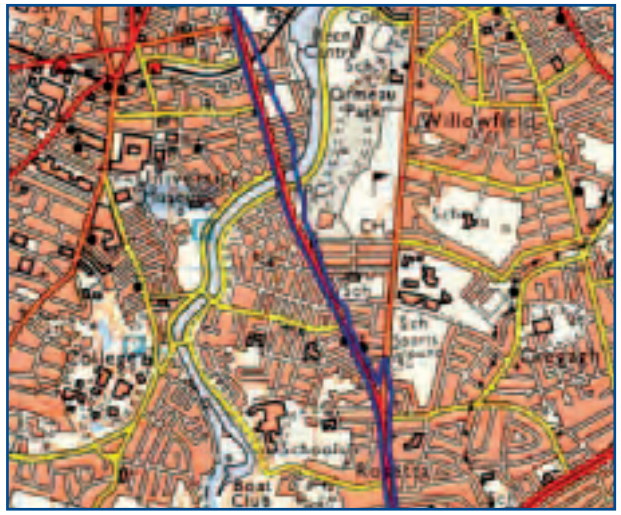


2. Cromac Street to the junction with East Bridge Street and then from East Bridge Street to the junction with the Ravenhill and Albertbridge Roads and Short Strand. This area was declared for predicted exceedences of the nitrogen dioxide annual mean air quality strategy objective.

3. The Upper Newtownards Road from the North Road junction to the Belfast City boundary at the Ulster Hospital incorporating the Knock Road to the City boundary at Laburnum Playing Fields and Hawthornden Way. This area was declared for predicted exceedences of the nitrogen dioxide annual mean air quality strategy objective.

4. The Ormeau Road from the junction with Donegall Pass to the City boundary at Galwally. This area was declared for predicted exceedences of the nitrogen dioxide annual mean air quality strategy objective.





Required Reductions in Ambient Nitrogen Dioxide and Particulate Material Concentrations in Order to Achieve National Air Quality Strategy Objectives.

The local authority air quality review and assessment process is completed in a series of distinct stages.

Stage 1 is an initial screening of industrial, transport and other sources, which are expected to have a significant impact within the local authority area and an identification of ambient pollutants, which are likely to be of concern.

Stage 2 is a more detailed assessment of those pollutants identified during the first stage and involves the use of screening models.

Stage 3 is an accurate detailed review of pollutants, using computer modelling and monitoring techniques to predict the likelihood of exceeding the NAQS objectives within forthcoming objective years. In the case of particulate matter, the objective compliance date was 31st December 2004 whereas for nitrogen dioxide it was the 31st December 2005.

In Great Britain, local authorities also completed a fourth stage as part of their review and assessment process. The fourth stage is designed to provide a local authority with the opportunity to supplement the information it has already gathered from its earlier review and assessment work and it also provides technical justification for those measures that the authority wishes to include within its air quality action plan.

Additionally, the fourth stage allows the local authority to confirm its original assessment of air quality against the prescribed objectives and therefore to confirm that it was correct to designate the Air Quality Management Area (AQMA) in the first place. It provides an opportunity to more accurately calculate how much of an improvement in air quality is needed in order to deliver the air quality objectives within the AQMA and allows the local authority to refine its knowledge of significant pollution sources so that the air quality action plan can be properly targeted.

In Northern Ireland, The Environment and Heritage Service decided that district councils would not be required to complete the fourth stage of the review and assessment process and consequently,

decisions to declare air quality management areas within Belfast have been based upon the third stage of the assessment process.

Therefore, in order to calculate the required reductions in ambient pollutant concentrations, Belfast City Council identified those relevant locations within each air quality management area where the pollutant concentrations are predicted to be at their maximum. The required reductions in ambient nitrogen oxides levels to achieve the annual mean nitrogen dioxide objective were then calculated using appropriate National Environmental Technology Centre (NETCEN) background concentrations and the local air quality management technical guidance equations relating roadside nitrogen dioxide to nitrogen oxides. The required reductions in nitrogen oxides for the four air quality management areas are summarised as follows:-

Air Quality Management Area	Percentage Reduction in Traffic Based Nitrogen Oxides Required to Achieve the Annual Mean Objective
M1 Motorway / Westlink	30
Ormeau Road	10
Cromac Street towards Albertbridge and Short Strand	10
Upper Newtownards Road	18

With regard to the required nitrogen oxides emission reductions along the M1 Motorway / Westlink corridor to achieve the nitrogen dioxide 1 hour mean air quality strategy objective, it should be noted that it is not currently possible to accurately predict the numbers of 1 hour exceedences in forthcoming years. However, the government's local air quality management technical guidance document states that a local authority may confidently assume that that the 1 hour mean objective will be achieved at locations where the annual mean nitrogen dioxide objective is met.

Therefore, this air quality action plan will primarily seek to introduce actions to achieve the nitrogen dioxide annual mean objective and in doing so, will correspondingly lead to achievement of the hourly mean objective.

Similarly, with regard to the required reductions in particulate emissions along the M1 Motorway / Westlink, it should also be noted that that it is not possible to directly predict the numbers of 24-hour exceedences in forthcoming years. Instead, the Government's local air quality management technical guidance document LAQM.TG(03) indicates that the number of 24-hour exceedences should be estimated in terms of the measured annual mean concentration and provides a mathematical equation for doing so. Ambient monitoring along the Westlink corridor indicates that the annual mean is already at a level, which the equation predicts, should result in compliance with the relevant air quality objective. Nonetheless, this action plan will propose a series of measures that will deliver further reductions in the annual mean particulate concentrations, enabling the 24-hour mean air quality strategy objective to be achieved.

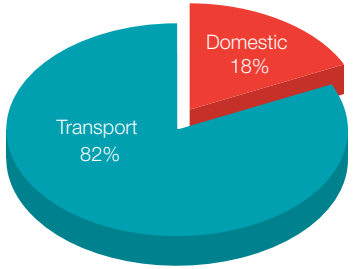
Photograph Courtesy Roads Service

Chapter 2 - Sources of Air Pollution within the Air Quality Management Areas

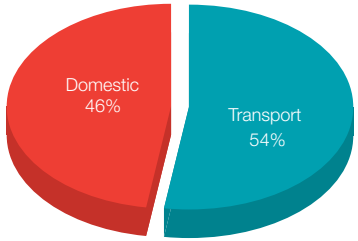
Although the air quality review process has identified road transport as a prominent pollution source contributing to the National Air Quality Strategy objective exceedences, there are other sources of nitrogen dioxide and particulate matter within Belfast, which might also need to be considered, including residential properties and industrial sources where present. Therefore, this air quality action plan needs to consider to what extent various sources are responsible for the exceedences of the nitrogen dioxide and particulate material objectives. Furthermore, within the road transport sector, the action plan ideally also needs to consider to what extent different classes of vehicle are responsible for the overall transport emissions.

The following pie charts illustrate the estimated contribution of each source to overall nitrogen oxides and particulate material emission levels – this is known as source apportionment. As the relative contributions of individual sources to overall pollution levels vary across the city, it is considered appropriate to present an apportionment for each AQMA.

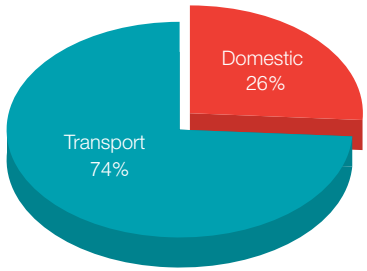
Nitrogen Oxides Source Apportionment for the M1 / Westlink corridor.



Particulate Matter (PM_{10}) Source Apportionment for the M1 / Westlink corridor.

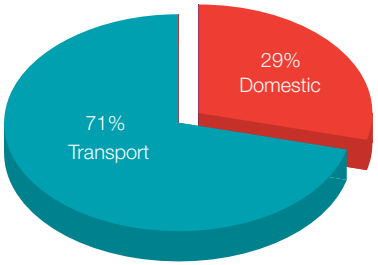


Nitrogen Oxides Source Apportionment for Cromac Street to the junction of Short Strand, Woodstock Link and the Albertbridge.

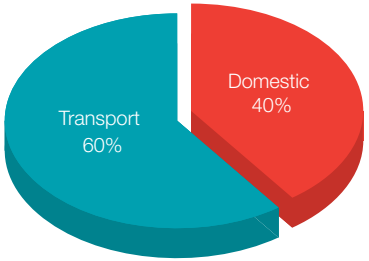


Chapter 2 - Sources of Air Pollution within the Air Quality Management Areas (Continued)

Nitrogen Oxides Source Apportionment for the Upper Newtownards Road.



Nitrogen Oxides Source Apportionment for the Ormeau Road.



These source apportionments have been completed, using fuel use data derived from a 2002 Belfast City Council survey and road transport emission factors obtained from the National Atmospheric Emissions Inventory (NAEI).

Within the air quality management areas, nitrogen oxide emissions attributable to road transport range from 60% along the Ormeau Road to 82% on the Westlink. These values represent typical traffic contributions in cities across the United Kingdom. The remainder of the NOx emissions arise from either industrial or domestic fuel burning. In order to address those emissions caused by domestic fuel burning, additional measures could be incorporated into the action plan that would target the domestic sector. However, to be effective such measures would have to be introduced at a national level and consequently their development is beyond the scope of this air quality action plan. Therefore, it is appropriate that the actions outlined within this plan, designed to reduce ambient nitrogen dioxide levels, by the amounts shown in the table on page 8, are predominantly targeted towards road transport sources.

With regard to the source apportionment for particulate material, the analysis indicates that the transport contribution to the overall emissions is the largest at 54%, with the domestic sector accounting for 46% of emissions. It should be noted that the M1

Motorway / Westlink air quality management area was declared for predicted exceedences of both the annual and 24-hour mean particulate material objectives although ambient monitoring has revealed that the annual mean objective is currently being achieved and therefore continued exceedences of the 24-hour daily mean objective are the principal concern.

Belfast City Council has already completed a smoke control programme for the entire city targeting domestic smoke emissions, and the recent heavy penetration of natural gas into both the domestic and commercial sectors has also had a beneficial effect upon ambient particulate concentrations. Indeed, in 2002, the General Consumer Council[1] reported that an overall majority of new domestic gas customers was coming from the solid fuel sector - 64% and that even 21% of new customers were householders who had switched from oil to gas. Furthermore, the Northern Ireland Housing Executive, which manages nearly 25,000 of the 130,000 homes within Belfast, has also introduced a heating policy of preferentially replacing both solid fuel and Economy 7 heating systems in its premises with natural gas where available.

Therefore, it can be seen that a series of measures have already been implemented to address particulate emissions from the domestic sector and consequently this action plan concentrates upon reducing emissions from the transport sector. It should be noted that those actions, designed to reduce ambient nitrogen dioxide concentrations, will inevitably deliver accompanying reductions in ambient particulate concentrations thus enabling the 24-hour daily mean air quality strategy objective to be achieved.

Vehicle Fleet Composition and Emissions.

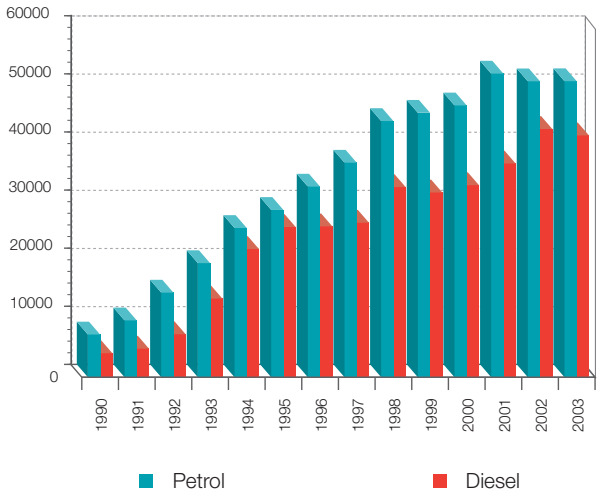
Given that the majority of vehicles using Belfast roads are either diesel or petrol fuelled, it is helpful to characterise the vehicle fleet by fuel type, since diesel and petrol cars emit different amounts of nitrogen oxides and particulate pollution. Studies have indicated that diesel cars generally emit more nitrogen oxides, nitrogen dioxide and particulate material than their petrol counterparts. Across Great Britain, studies have also indicated that approximately 24%

1 General Consumer Council for Northern Ireland (2002) - Gas Watch. Consumers' Experiences of Natural Gas in Northern Ireland.

Chapter 2 - Sources of Air Pollution within the Air Quality Management Areas (Continued)

of the overall vehicle fleet is diesel fuelled in urban areas whereas within Northern Ireland approximately 43% of the overall fleet is diesel fuelled. Therefore, it would be expected that nitrogen oxides emissions within Northern Ireland would be greater than from similar numbers and classes of vehicles in Great Britain. However, the age of a vehicle also significantly affects the amount of pollution that it emits. Older vehicles generally emit more pollution than newer vehicles and consequently, it is also important to consider the average age of the vehicle fleet within Northern Ireland against the rest of the United Kingdom. A recently published Department for Regional Development document entitled "Northern Ireland Transport Statistics 2003-2004" revealed that there were 852,742 vehicles registered within Northern Ireland by the end of 2003, of which 84% were cars (private light goods vehicles). The average age of cars within Northern Ireland is 4.3 years compared with an average Great Britain age of 6 years. Therefore, although there are a higher proportion of diesel cars on Northern Ireland roads than in Great Britain, Northern Ireland cars tend to be younger and therefore are likely to emit lower amounts of air pollution due to improved engine technology.

Vehicle statistics also indicate that car ownership has risen sharply over recent years within Northern Ireland. The following graph illustrates the increase in vehicles first registered by fuel type since 1990, when there were approximately 10,000 new vehicles registered per year, to the current levels approaching 100,000 vehicles per year.



Chapter 2 - Sources of Air Pollution within the Air Quality Management Areas (Continued)

As previously stated, it is also helpful to consider emissions associated with the differing vehicle classes using each road in order to identify whether the action plan should preferentially target certain highly polluting vehicles. However, the manner in which the Department for Regional Development Roads Service currently classifies road vehicles differs from that of the Department of the Environment's Driver and Vehicle Licensing branch and consequently it is not possible to accurately apportion vehicle age to Department for Regional Development Roads Service traffic counts at this time. Currently, the DRD is reviewing the methodology for calculation of the Vehicle Kilometres of Travel (VKT) survey.

Chapter 3 - What is being done to Improve Air Quality within Belfast?

As illustrated by the source apportionment analysis, a significant proportion of the nitrogen oxides pollutants emitted within the four air quality management areas is attributable to road transport. However, it should be noted that within Northern Ireland, the responsibility for managing the road network does not lie with district councils, but with the Department for Regional Development Roads Service.

Similarly, the provision of public transport is undertaken by Translink, which manages the integrated services of Ulsterbus, Metro and Northern Ireland Railways. Both the Department for Regional Development Roads Service and Translink have worked closely with Belfast City Council in compiling this action plan. Since these organisations already have a wide range of initiatives in place for encouraging increased public transport patronage, the plan will principally seek to build upon existing proposals rather than devising a variety of new ideas. It is felt that by supporting and building upon existing proposals, tangible improvements in air quality can be achieved more quickly.

A further consideration in reducing public exposure to air pollution within Belfast is the integration of air quality considerations within the planning process. Such an approach seeks to ensure that no new development is permitted to cause a significant deterioration in air quality, and that residential developments are not permitted to be built in locations where air quality might already be poor. Within Northern Ireland, the Department of the Environment Planning Service has responsibility for implementing government planning policies and development plans. The agency carries out a range of activities, which promote the government's key themes of sustainable development and creating a better environment by managing development in a way that balances environmental, economic and social considerations. Belfast City Council is conducting discussions with Planning Service on how air quality considerations might be more fully integrated within the planning system.

The development of an Air Quality Action Plan will act as a blueprint for making air quality in Belfast better. To assist with the development of such a plan, an Air Quality Forum was established in 2004 to help consider and co-ordinate the views of a diverse range of private and public sector

organisations, including transport planners, freight haulage associations, housing providers and numerous health and air quality specialists. Since the membership of the Air Quality Forum was extensive, it was felt that a steering group might make better progress towards the development of an air quality action plan and consequently, an Action Planning Steering Group was formed in late 2004 with the objective of...

"Agreeing upon a consultative approach to developing an air quality action plan for Belfast".

A range of principles were also devised to guide the Steering Group in formulating the Action Plan having regard to the local air quality management policy guidance LAQM.PGNI (03). These are summarised as follows:-

- To ensure that all participants in the Air Quality Action Planning process are clear concerning the rationale for development of the action plan.
- To identify and agree the elements of collaborative working having regard to legislative timetables.
- To share knowledge and information about those issues that can affect air quality from different group member perspectives.
- To identify the viewpoints and expectations of all participants in the action planning process.
- To identify key stakeholder groups.
- To reflect upon different options for stakeholder engagement.
- To have shared ideas about potential outcomes.
- To revise or adapt the action planning process in light of all the above conditions.

Background to Actions Proposed by the Department for Regional Development (Northern Ireland) Roads Service.

The Regional Transportation Strategy (RTS) for Northern Ireland 2002 – 2012, endorsed by the Northern Ireland Assembly in July 2002, identified a range of strategic transportation investment priorities and considered potential funding sources and affordability of planned initiatives up to 2012. The RTS presents a framework for action in support of the longer-term transportation vision for the region, i.e.

"To have a modern, sustainable, safe transportation system which benefits society, the economy and the

environment and which actively contributes to social inclusion and everyone's quality of life"

The Department for Regional Development (Northern Ireland) Roads Service contributions to the Belfast Air Quality Action Plan are based upon the Belfast Metropolitan Transport Plan (BMTP) 2015. The BMTP covers the council areas of Belfast, Carrickfergus, Castlereagh, Lisburn, Newtownabbey and North Down and is one of three Transport Plans being developed to take forward the strategic initiatives of the RTS. The Plan sets out an integrated package of transportation proposals, to be implemented by 2015, subject to economic appraisal, funding availability and statutory processes.

The BMTP was developed in parallel with, and supports, the Draft Belfast Metropolitan Area Plan 2015 (BMAP), prepared by the Department of the Environment. Both the BMTP and BMAP were published in November 2004 thereby ensuring integration between transport and land use proposals.

A key objective of the RTS is the promotion of sustainable modes of travel such as walking or cycling and the promotion of a change of travel mode from the private car to public transport. These objectives are carried through into BMTP and measures such as Park and Ride, Quality Bus Corridors, and priority at traffic signals are proposed to promote a change of travel mode to public transport.

BMTP is based on the government's 'Guidance on the Methodology for Multi-Modal Studies' (GOMMMS). This is an objective led approach to seeking solutions to transport related problems and has ensured that a comprehensive range of solutions has been considered covering all modes of transport. The range of measures considered within the BMTP process can be subdivided into four main categories or modal themes:-

- **Walking and Cycling measures** – including quality walking routes, pedestrian areas and cycle routes;
- **Public Transport measures** – including service levels, conventional rail, light rail, guided bus, park and ride, interchanges and bus priority;
- **Highway measures** – including new or improved highways; and

- **Management measures** – including traffic management, route management strategies, parking controls, congestion charging, intelligent transport systems, travel plans, travel awareness campaigns and safer routes to school.

At the heart of the appraisal process are the five transportation objectives of:-

- Environmental impact (including air quality).
- Safety.
- Economy.
- Accessibility.
- Integration.

The appraisal process has also included distribution and equity impacts, the affordability and financial sustainability of the Plan, and practicality and public acceptability issues.

An extensive consultation exercise was undertaken as an integral part of the BMTP process, ensuring that the views of a wide range of stakeholders were taken into account in the development of the Plan. This included a working conference held in February 2003. Over 200 delegates representing a wide range of sectors including elected representatives, business, academic institutions, community and environmental groups, transport interest groups and government departments and statutory agencies attended the conference. An independent report of the conference indicated that the delegates were in broad agreement with the thrust and balance of the Plan's proposals.

Local air quality management policy guidance {LAQM PGNI (03)} sets out the DRD (NI) Roads Service air quality management duties under Part III of the Environment Order (NI) 2002. This guidance describes how road transport is a source of local air pollution and in urban areas contributes to the total emissions of nitrogen dioxide (NO_2) and particulate material (PM_{10}).

The Guidance highlights how the following can have positive effects of Air Quality:-

- Regulatory measures to cut vehicle emissions including tighter standards on both vehicles and fuels.
- Tax based measures to reduce vehicle emissions including fuel duty differential and level of exhaust emissions.
- Traffic Regulation Orders – e.g. restricting vehicular access to particular streets;

Chapter 3 - What is being done to Improve Air Quality within Belfast? (Continued)

- Traffic Calming Schemes – e.g. schemes that would dissuade traffic from 'rat running' through residential streets.
- Reallocation of road space – e.g. creation of bus lanes.
- Pedestrianisation schemes.
- Parking controls.
- Traffic Control Systems such as UTC, SCOOT and MOVA.
- Improved facilities for walking and cyclists.
- Safer Routes to Schools.
- Improved Bus Services, and Park & Ride.

DRD (NI) Roads Service has responsibility for a number of the above measures and is actively involved in implementing such measures, through either BMTP or other projects, such as Decriminalised Parking Enforcement (DPE). All such measures will have an a cumulative effect in improving the air quality of an area.

Technology also has an important role in the improvement of air quality and this is recognised in BMTP. For over 25 years, DRD (NI) Roads Service has employed the latest technology in Intelligent Transport Systems (ITS) such as the Urban Traffic Control (UTC) system in Belfast. Through UTC, which is operational in the four Air Quality Management Areas, congestion and vehicle emissions are reduced and savings in fuel are achieved.

Vehicle fleet owners also have a responsibility to assist in improving the environment and air quality of the areas through which they travel. As a fleet owner, DRD (NI) Roads Service monitors the emission levels and, where necessary, takes corrective action, uses Euro 2 or 3 standard pollution abatement equipment, evaluates the merits of alternative fuels and operates a rolling programme for the replacement for all vehicles.

The BMTP recognises that infrastructure measures and service improvements will be unable to deliver fundamental changes in travel behaviour and reduce car dependency on their own. Consequently, it is considered that measures to raise travel awareness are an essential part of the BMTP strategy. The plan contains three key measures aimed at changing travel attitudes-

- Campaigns to raise travel awareness with multi-media campaigns

undertaken on a regular basis supported by local schemes to complement new public transport initiatives.

- The promotion and development of travel plans for businesses and major travel attractors such as hospitals and education establishments, with a mandatory requirement tied to planning consents for travel plans for new commercial developments.
- Expansion of the Safer Routes to School scheme.

Taken as an overall package, the measures described in BMTP will improve air quality. Analysis has indicated that a 52% decrease in peak hour nitrogen oxides emitted by road traffic is forecast between 2001 and 2015. This decrease is attributed to reduced traffic flows, coupled with improvement in fuel technology, engine efficiency and exhaust controls.

Much of the analysis of air quality carried out by DRD Roads Service is based on the 'Design Manual for Roads and Bridges' (DMRB). This manual was introduced in 1992 in England and Wales and subsequently adopted in Scotland and Northern Ireland. It provides a comprehensive manual, which accommodates all current design standards, advice notes and other published documents relating to the design, assessment and operation of trunk roads (including motorways). Within Northern Ireland, DRD Roads Service has adopted it for use on all classes of roads.

The DMRB embodies the collective experience of the Overseeing Organisations, their agents and design organisations over many years and, as such, represents a guide to best practice. It provides technical requirements and guidance resulting from research and practical experience in the management of the trunk road network. It is continuously reviewed to keep abreast of changes in practice and developments in technology to improve safety, reduce environmental impact and to provide value for money.

A detailed methodology for the assessment of air quality is detailed in DMRB Volume 11, Section 3, Part 1. Assessments of the level of air pollution are often made with reference to air quality standards. These are usually based on the effects of pollutants on human

Chapter 3 - What is being done to Improve Air Quality within Belfast? (Continued)

health, vegetation and a number of other factors. The air quality standards operable in the UK are those specified in European Union Directives and in the UK Air Quality Strategy (AQS).

A new road scheme may change traffic flows in a number of ways, with corresponding impacts on air quality. Particular aspects of components of overall Road schemes are often perceived as having only negative effects, however in some cases the overall effect can be beneficial. If a scheme relieves congestion, it can cause vehicles to operate in ways that produce fewer emissions, so reducing overall pollution levels. This is because vehicles operate more efficiently and produce least pollution when they are driven in freely flowing traffic at moderate speeds.

The assessment of transport proposals within the BMTP process was assisted by the Belfast Transportation Model (BTM). The BTM is a multi-modal transport model of the Belfast area, which provides a detailed representation of all motorised modes of transport. The model represents the main highway, bus and rail networks, and the 2001 base year and 2015 forecast models are based on population and employment planning data.

Traffic flows predicted by the Belfast Transport Model were used in combination with the Design Manual for Roads and Bridges Screening Spreadsheet to estimate changes in both traffic generated nitrogen dioxide and particulate material at worst case receptor locations. Reductions in nitrogen dioxide levels between 2001 and 2010 ranged from 32% along the Westlink, through 37% along both the Albert Bridge and Upper Newtownards Road, to 42% along the Ormeau Road. The corresponding reduction in particulate material concentration along the M1 Motorway / Westlink corridor between 2001 and 2010 was estimated as 53%.

Background concentrations of nitrogen oxides, nitrogen dioxide and particulate material, derived from the National Atmospheric Emissions Inventory (NAEI), were subsequently input into the DMRB Screening Spreadsheet in combination with traffic flows and the resultant changes in nitrogen dioxide and particulate levels were estimated. Nitrogen dioxide reductions between 2001 and 2010 ranged from 26% at the Westlink, through 28% at both the

Albert Bridge and Upper Newtownards Road to 30% at the Ormeau Road. Particulate material concentrations along the Westlink reduced by 29% between 2001 and 2010.

Results from the DMRB Screening Spreadsheet predict that nitrogen dioxide pollutant concentrations will reduce to below the 40 μgm^{-3} annual mean National Air Quality Strategy objective on the Upper Newtownards Road by 2005 and will reduce below the 40 μgm^{-3} European Union annual mean limit value on all roads within the other three air quality management areas by 2010. The results also indicate that the annual mean particulate material pollutant concentration will reduce to below the 40 μgm^{-3} European limit value by 2005. The results also show that the annual mean particulate material pollutant concentration decrease by approximately 3% per annum over the next two years. It is expected that this reduction in the annual mean will equate to approximately 20 exceedences of the 24-hour mean particulate objective occurring per annum by the end of 2006. In addition to the physical measures, the Department for Regional Development Roads Service recognises the importance of soft factor interventions and as such, is proposing implementation of a number of initiatives aimed at changing travel attitudes. Research[2] indicates that widespread implementation of such measures in combination with complementary physical measures can lead to a reduction in peak period urban traffic of up to 21%.

The above estimates for nitrogen oxides, particulate material and traffic flows are based on the implementation of the full package of transportation measures outlined in BMTP and the attached table of proposals. However, it should be noted that the following infrastructure proposals will have the most direct impact on travel conditions within the four declared Air Quality Management Areas.

PUBLIC TRANSPORT.

Quality Bus Corridors.

- Belfast – Lisburn quality bus corridor on three routes – Falls Road, Lisburn Road and Malone Road.
- Belfast – Castlereagh Road quality bus corridor.
- Belfast – Cregagh Road quality bus corridor.

2 Goodwin et al. (2004), Smarter Choices - Changing the Way We Travel.

Chapter 3 - What is being done to Improve Air Quality within Belfast? (Continued)

- Belfast – Downpatrick quality bus corridor.
- Belfast – Newtownards quality bus corridor.
- Belfast – Bangor Road quality bus corridor.

Rapid Transit.

- The creation of a bus rapid transit network EWAY on the Upper Newtownards Road corridor.

Park and Ride.

- Kennedy Way on the Lisburn corridor.
- Cairnshill on the Saintfield Rd corridor.
- Hillmount, Dundonald on the Newtownards Rd corridor.
- Tillysburn on the Bangor corridor
- Sprucefield
- Carryduff

New and Improved Rail Stations.

- A new station at West Lisburn
- A new station at Tillysburn.

Rail Service Frequency.

- Increase in service frequency by up to 50%.

Rail Based Park and Ride.

- Lisburn station and a proposed new station in West Lisburn
- Bangor and Holywood stations.

HIGHWAY IMPROVEMENTS.

Strategic Network Capacity Enhancements.

- The widening of the M1 and Westlink from Blacks Road through to Divis Street and grade separation of the junctions on this section of Westlink.
- The widening of the A2 Sydenham Bypass
- The widening of the A55 Outer Ring Road at Knock Road.

Non-Strategic Network Schemes.

- Connsbank and Bankmore Link Roads.
- Holywood Arches Bypass.
- A new road link between Quarry Corner and East Link Road in conjunction with the EWAY rapid transit scheme.

Network Traffic Management

- Traffic management measures on the A20 Newtownards Road, inside the A55 Outer Ring Road.

Use of Intelligent Transport Systems (ITS).

- The provision of travel information, both pre-trip and on-trip to enable informed decisions to be made on the time of travel, chosen route, and mode of travel to use.
- Use of the latest technology in traffic control systems to minimise the effects of congestion and delays.
- Installation of a state-of-the-art traffic control system on the M1/Westlink corridor to improve safety, journey times and eliminate the start/stop conditions that are a feature of the current traffic flow.

Chapter 3 - What is being done to Improve Air Quality within Belfast? (Continued)

Background to Actions Proposed by Translink.

Translink is the brand name for the integrated public transport operation of Citybus, now known as Metro, Northern Ireland Railways and Ulsterbus.

The integration of public transport originally began in January 1995 when the then government announced comprehensive changes to the provision of public transport. The principal objective of the change was to encourage a commuter shift from private to public transport on a sustainable basis and to increase levels of co-ordination between bus and rail services.

Translink is now one of the largest companies in Northern Ireland with approximately 3,500 employees, over 1,450 buses, 30 trains, and a turnover in excess of £100m per annum. Over 75 million passenger journeys are made on Translink services every year.

Translink has made significant developments in enhancing and developing the public transportation network within Northern Ireland. These include re-opening the Antrim to Bleach Green Line, the purchase of new rolling stock, buses and coaches, the relaying of the Bangor and Larne lines and the refurbishment of several bus and rail stations across Northern Ireland including Bangor Bus and Rail Centre, Coleraine Bus and Rail Centre, Ballyclare Bus Centre and Magherafelt Bus Centre.

In February 2005, Translink introduced Metro, Belfast's modern bus service. Designed for ease of use, the simplified Metro network integrates Citybus and Ulsterbus services, and comprises 12 key arterial routes and an additional network of services within the greater Belfast area.

Statement of Vision.

"To provide a transformed network of coordinated bus and rail services which attracts a growing number of passengers, enjoys public confidence and is recognised for its quality and innovation".

In pursuit of this vision, Translink is committed to attracting greater numbers of customers to use public transport. With the knowledge that the use of public transport is

often a substitute for travel by private car, Translink is contributing positively to environmental well-being and the conservation of resources.

However, there are inevitable impacts upon the environment from Translink's day-to-day operations. Therefore, Translink's aim is to achieve greater understanding of these impacts at all levels and seek solutions to minimise any potentially harmful effects wherever and whenever possible, through sound principles and best practice.

As part of Translink's commitment to the pursuit of excellence and quality, a comprehensive policy has been developed that establishes a range of targets for assessing progress towards sustainable environmental improvement. The pursuit of excellence and quality is also supported by a targeted action plan, which aims to protect the health and safety of both employees and customers whilst also contributing to the future wellbeing of the environment.

Background to Actions Proposed by Belfast City Council.

Belfast City Council is the largest council within Northern Ireland, employing approximately 2,350 staff across 102 operational centres and represents the views of the 278,000 inhabitants of Belfast. In 2003, Belfast City Council published its three year Corporate Plan entitled 'Framing Our Future', in which it describes how the council might use its influence to shape the best possible future for the city over coming years. Accordingly, the council has committed itself to representing the public's views and best interests by implementing four corporate objectives, namely

- Providing civic leadership by highlighting the challenges that face the city and working with others to achieve co-ordinated solutions.
- Improving quality of life, now and for future generations, creating a cleaner, more attractive, safer and healthier city, with a strong economy.
- Promoting good relations encouraging fair treatment, understanding and respect for people of all cultures.
- Delivering Best Services providing high quality, value for money services, when and where people need them.

Therefore, although Belfast City Council recognises that the most significant initiatives for improving air quality are likely to come from the Department for Regional Development Roads Service, Translink and the Department of the Environment Planning Service, it can nonetheless propose a range of measures to minimise the impact of its operations upon air quality across Belfast.

Furthermore, in striving to deliver a better Belfast for all inhabitants, Belfast City Council has engaged in a range of key projects to encourage economic development, provide better education, tackle social issues such as deprivation, improve community safety and protect the environment. Consequently, in developing proposals for the Action Plan, Belfast City Council has also considered how such projects might contribute to both reducing atmospheric pollution levels and fulfilling its corporate objectives.

Reduction of Belfast City Council Carbon Emissions.

As a result of the Kyoto Protocol and the implementation of an agreement amongst European member states, the United Kingdom has adopted a target of reducing its greenhouse gas emissions by 12.5% below 1990 levels between 2008-2012 and also has the goal of reducing its domestic emissions of carbon dioxide by 20% below 1990 levels by 2010.

In 2000, Belfast City Council's building energy usage resulted in the generation of 21,000 tonnes of carbon dioxide however, by switching to a green energy tariff, implementing a range of energy efficient technologies including the introduction of combined heat and power plants and energy management practices, this figure has been reduced to 15,000 tonnes per year during 2004.

Furthermore, burning off methane from the north foreshore landfill site generates approximately 20,000 tonnes of carbon dioxide each year. The council has recently taken over responsibility for the site and is now considering the installation of electricity generating equipment, with the possibility of using the supplementary heat for waste processing and building heating. This would displace 20,000 tonnes of carbon dioxide generation from local power stations and offset carbon emissions from the heat used. It is anticipated that this plant could be operational by 2006.

Chapter 3 - What is being done to Improve Air Quality within Belfast? (Continued)

Belfast City Council's fleet of vehicles produces around 2,700 tonnes of carbon dioxide each year. These emissions are minimised by employing the most modern vehicle technology, introducing a rigorous vehicle maintenance programme and by installing a new fuel management system in 2005. Additionally, there is also an opportunity for the Fleet Management Unit to support those proposals outlined within the Air Quality Action Plan themes, as well as the broader crosscutting issue of sustainable development. Belfast City Council is continuing to improve its use of alternative fuels including liquefied petroleum gas (LPG) and hybrid petrol electric vehicles and driver training is ongoing resulting in more economic fuel usage. It is hoped that these measures will reduce fuel consumption costs as part of efficiency savings sought by the council.

Chapter 4 - The Air Quality Action Planning Steering Group

The Air Quality Action Planning Steering Group.

The members (refer to Appendix 2 for a full member list) of the Air Quality Forum Action Planning Steering Group have proposed a series of wide-ranging actions, which they feel will result in significant air quality improvements. To aid with the public consultation process, Belfast City Council has recognised the benefit of grouping related proposals into a series of broad themes, which are outlined as follows:

1. Walking and cycling initiatives.

Walking and cycling initiatives are intended to encourage members of the public to consider either walking or cycling instead of using their car and include:

- The promotion of cycling initiatives and the increased provision of cycling facilities at both Belfast City Council and Translink premises.
- The provision of improved walking and cycling facilities in residential neighbourhoods due to the introduction of localised traffic calming measures.

2. Initiatives to encourage increased levels of public transport use.

These proposals are designed to create an improved public transport system within Belfast, which provides an effective alternative to car usage, and include:

- The introduction of the new Belfast Metro bus service, which promises both improved reliability and service frequency.
- The creation of a number of park and ride sites across the city backed by quality bus corridors.
- Improved rail services including new stations, new trains and a more frequent service.
- Better customer service through the provision of 'real time' passenger information and the introduction of an integrated ticket system.
- The introduction of bus priority lanes, a bus replacement programme and the provision of new buses, leading to higher standards of customer comfort.

3. Smarter vehicle management initiatives.

These are measures which large organisations such as Belfast City Council

and Translink can implement in order to minimise air pollution caused by their fleet activities and include-

- Routinely testing fleet vehicles to ensure that they comply with emission standards at all times.
- Fitting pollution abatement equipment to large or older vehicles.
- Employing the cleanest vehicle fuels including LPG, CNG or ultra low sulphur diesel.
- Introducing a rolling vehicle replacement programme to ensure that pollution from older vehicles is minimised.
- Employing a specialist contractor to decommission 'end of life' vehicles thus minimising environmental impacts.

4. Green energy initiatives.

Green energy proposals refer to those measures that Belfast City Council and its partners might introduce to minimise the environmental impact of their operational activities across Belfast and include:

- The supply of Belfast City Council buildings with electricity generated from renewable sources.
- The adoption of the Belfast City Council Carbon Reduction Programme to reduce 'greenhouse' gas emissions.

5. Policy initiatives.

Policy initiatives include those proposals that Belfast City Council could introduce in order to better support the development or regeneration of Belfast over coming years and include:

- Developing effective travel planning for council employees.
- Supporting the regeneration of Belfast City through the Arterial Routes programme and by providing 'expert advice' to the Department of the Environment Planning Service.
- Minimising air pollution across Belfast through enforcement duties.
- Improving the character of Belfast's urban environment including ambient air quality through structured tree planting.

6. Highway improvement initiatives.

Highway measures proposed by the Department for Regional Development Roads Service, in order to improve the quality of the road network within Belfast include:

- Widening of the M1 motorway and Westlink from Blacks Road to the Divis

Street junction with the construction of grade separated junctions at both Broadway and Grosvenor Road.

- The introduction of minor road revisions across Belfast that will lead to reduced traffic congestion and correspondingly lower pollution levels.
- The introduction of localised traffic calming and management measures which will provide greater priority for cyclists and pedestrians.
- The operation of a 'state of the art' traffic control system to manage traffic movements across greater Belfast.
- Reducing the number of cars entering Belfast City centre by restricting residential and non-residential car parking provision and by better managing 'on street' parking.

Marketing or education initiatives.

Marketing and education initiatives are intended to heighten the publics' awareness of air pollution issues within Belfast and encourage the public to consider alternatives to private car usage. They include-

- The promotion of Active Living Weeks, Bike to Work and Safer Routes to Schools initiatives.
- The provision of free vehicle emissions tests for the public.
- The provision of 'real time' air quality information to the public.
- The development of workplace or residential travel plans.
- The development of a Code of Conduct for managing bonfire sites.
- Promotion of the Belfast City Council 'Smoke Hotline'.

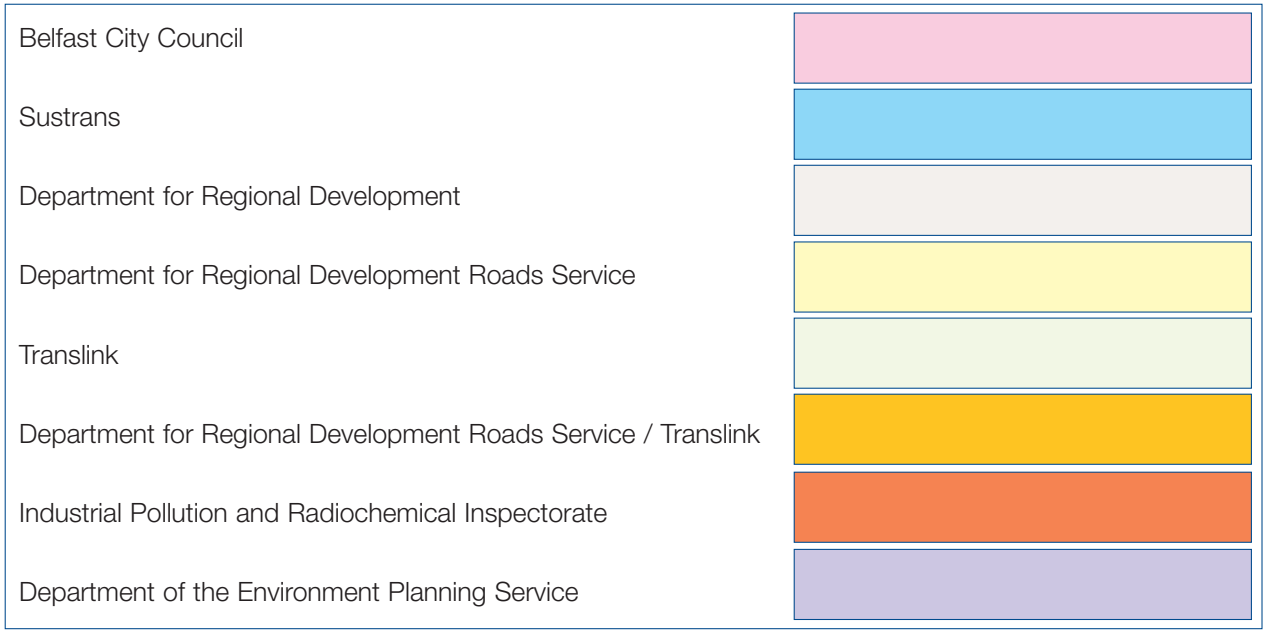
Chapter 5 - Prioritisation of Air Quality Action Plan Proposals

Prioritisation of Air Quality Action Plan Proposals.

To aid in prioritising the action plan proposals, timescales for implementing the proposed actions have been classified as either short, medium or long-term, costs have been scaled from 1 to 7, one being the most expensive and impact has been classified from 1 to 10, 1 having the least impact. By multiplying the value assigned to a proposal's impact by the value describing its cost, a rudimentary cost-benefit analysis has been completed that indicates whether it is cost effective to implement a given measure. The classification scheme is summarised in the following table:-

Cost	1 (> £100 million)	2 (£50-100 million)	3 (£10-50 million)	4 (£1–10 million)	5 (£500k – 1 million)	6 (£100k – 500k)	7 (< £100k)
Impact	1		→ → → → →			10	
Timescale	Short (1-2 years)	→ → → → →		Medium (3-5 years)	→ → → → →		Long Term (6+ years)

Additionally, an indication of potential negative or positive environmental, economic or social consequences of the proposed actions has also been included. Furthermore, the proposed actions have also been colour coded according to the relevant organisation to ease identification and are assigned as follows:-



For more detailed information about individual action plan proposals, including costings, timescales and expected benefits or disbenefits, please refer to the subsequent tables.

Table 5.1- Initiatives to Promote Greater Levels of Walking and Cycling within Belfast.

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1) Improvements in the provision of walking and cycling facilities	Continue to promote healthy travel, bike to work day etc in partnership with other agencies	Promote and support cycling initiatives through the Belfast City Council Active Living Initiatives.	Belfast City Council	S	3	7	21	Reduced peak hour congestion levels.	Potential lack of facilities for cyclists at workplace.
		Promote the Walk and Bike to Work Days.		S	1	7	7	Encourages commuters to consider alternate transport options	Cycling and walking may be perceived as unsafe in large Cities.
		Promote availability of the Belfast by Bike map	Sustrans	S	2	7	14	Heightened awareness of cycle routes	Cycling and walking may be perceived as unsafe in large Cities.
		Install cycle parks at Council buildings	Belfast City Council	M	3	7	21	Provision of secure parking for bicycles.	Problems transporting large packages from site to site.
		Promote the availability of Cycle Usage Mileage for Council employees.		M	3	7	21	Encourages more Council employees to consider the use of a bicycle for their job.	Issues with transporting sensitive documents. Response times may be lengthened.

Table 5.1- Initiatives to Promote Greater Levels of Walking and Cycling within Belfast. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Improvements in the provision of walking and cycling facilities	Continue to promote healthy travel, bike to work day etc in partnership with other agencies	Secure and promote the availability of an enhanced cycle usage mileage allowance for Council employees.	Belfast City Council	M	3	7	21	Encourages more Council employees to consider the use of a bicycle for their job.	Issues with transporting sensitive documents. Response times may be lengthened.
		Install cycle shelters at Translink locations.	Translink	M	4	7	28	Promotion of alternative transport amongst the public. Provision of secure parking for bicycles.	Resource implications in supporting and promoting a range of initiatives. Threat of bikes being stolen
	The integration of walking and cycling considerations within the planning process.	In working towards sustainable development, Planning Service is committed to the integration of land use planning and transportation. The promotion of walking and cycling through Development Plans and Planning Policy Statements forms part of this commitment and is ongoing.	Department of the Environment Planning Service	L	4	7	28	Provides for commuters to consider alternate transport options.	Cycling and walking may be perceived as unsafe in large Cities.

Table 5.1- Initiatives to Promote Greater Levels of Walking and Cycling within Belfast. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Improvements in the provision of walking and cycling facilities	Enhanced facilities for walking and cycling	Providing improved facilities for walking and cycling as a result of traffic calming on local roads. Establishing a quality-walking network focused on each of the main urban centres and main transport corridors, linking public transport nodes, local trip generators and attractors in and around each urban centre. Establishing a comprehensive cycle network complementing existing provision for cyclists with networks focused on the main urban centres and main transport corridors, linking public transport nodes, local trip generators and attractors in and around urban centres.	DRD Roads Service	S	8	3	24	Introduction of networks to encourage greater walking and cycling. Encourage increased walking & cycling resulting in fewer car trips, less congestion & emissions. Walking & cycling has health benefits. Target: An increase of 20% in number of walking trips for journeys <2 miles by 2012. Target: A 300% increase in the number of cycling trips from 2000 base year.	Roads Service is providing the infrastructure for sustainable transport modes such as walking and cycling. The forecast benefits are dependent on the usage of the implemented measures.

Table 5.2 - Initiatives That Will Encourage Increased Public Transport Patronage Within Belfast.

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1) Improvements in public transport provision.	Metro Network	Implementation of a new Metro bus operation for the Greater Belfast Area.	Translink	S	6	-	-	Improved punctuality and service reliability to meet published commitments. Attracts more travellers to bus services.	Increasing the regularity of services on some routes may necessitate reducing or cutting others from the network.
	Integrated Ticketing Project.	Introduction of improved ticketing services including Smartlink cards and improved Integrated Ticketing		S	2	1	2	Provides for commuters to consider alternate transport options.	-

Table 5.2 - Initiatives That Will Encourage Increased Public Transport Patronage Within Belfast. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Improvements in public transport provision.	Quality Bus Corridors (QBCs)	Implementation of an extensive Quality Bus Corridor (QBC) network with: ◆ Bus priority measures; ◆ Service frequency improvements of up to 50% compared to existing levels; ◆ Modern high quality low floor buses; ◆ Improved bus stop facilities including real time passenger information plus improved access to bus stops; ◆ Bus lane enforcement cameras; and ◆ QBCs implemented on 14 sets of routes including the following corridors:- ◆ Belfast-Antrim corridor on two routes - Antrim Rd. and using the M2 (City Express); ◆ Belfast-Lisburn corridor on 3 routes - Falls Rd., Lisburn Rd and Malone Rd.; ◆ Belfast to West & North Belfast on 3 routes - Springfield Rd., Shankill Rd. & Crumlin Rd.; ◆ Belfast-Castlereagh Rd. corridor; ◆ Belfast-Cregagh Rd. corridor; ◆ Belfast-Downpatrick corridor on Ormeau/Saintfield Rds. – enhance existing facilities; ◆ Belfast-Newtownards corridor on Upper Newtownards Rd. ◆ Belfast to Bangor corridor on Holywood / Bangor Roads ◆ Belfast-Carrickfergus corridor on Shore Rd.	DRD Roads Service \ Translink	S	9	2	18	Introduction of QBCs and associated infrastructure along with improvements in bus services will contribute to increased bus patronage and a reduction in the numbers of cars and emissions. Target: a 15% increase in morning peak bus speeds on radial routes compared to 2001. Target: An increase of 28% in the number of public transport trips made by bus in the morning peak from 2001.	The forecast benefits are dependent on the usage of the implemented measures. If targets are not realised then it is likely that congestion will increase.

Table 5.2 - Initiatives That Will Encourage Increased Public Transport Patronage Within Belfast. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Improvements in public transport provision.	Orbital Bus Corridors	Introduction of new orbital bus routes to complement the radial QBC network	DRD Roads Service	M	3	4	12	New infrastructure combined with additional bus services will contribute to increased bus patronage, which in turn helps to ease congestion and reduce emissions.	The forecast benefits are dependent on usage of the implemented measures. If targets are not realised then it is likely that congestion will increase.
	Taxi Services	Providing improved facilities for taxis at major bus and rail stations in the BMA. Providing bus priority as part of the rollout of the Quality Bus Corridor network will also assist taxis.		S	1	6	6	Integration of taxi services with other forms of public transport will enhance public transport options, create opportunities to increase patronage and consequently contribute to a reduction in the numbers of cars and emissions.	-

Table 5.2 - Initiatives That Will Encourage Increased Public Transport Patronage Within Belfast. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Improvements in public transport provision.	Bus Priority on the Strategic Highway Network.	Implementing bus priority measures on the M2 in the Antrim Corridor between Fortwilliam and York Street and on the Sandyknowes on-slip southbound to supplement that already on the M1 in the Lisburn Corridor between Stockmans Lane and Broadway junctions.	DRD Roads Service	S	7	4	28	Bus priority measures will improve speed and reliability of service and will contribute to increased bus patronage generating less congestion and emissions. Bus priority measures on the road network in appropriate locations provide reduced journey times for bus/coach services and complements park-and-ride proposals.	There are potential safety implications for Busways using Motorway Hard Shoulders.

Table 5.2 - Initiatives That Will Encourage Increased Public Transport Patronage Within Belfast. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Improvements in public transport provision.	Rapid Transit	The creation of a bus rapid transit network EWAY on the Upper Newtownards Road corridor.	DRD	M	4	2	8	Introduction of a bus or rapid transit network will contribute to less cars on this route and consequently less congestion and emissions.	-
	Demand Responsive Rural Bus Services	The introduction of Demand Responsive Transport – including variable route and dial-a-ride services, both integrated with conventional fixed route bus services and community transport services.		M	1	4	4	New bus services will increase flexibility for passengers and encourage increased bus patronage, which in turn will help to ease congestion and reduce transport emissions.	-

Table 5.2 - Initiatives That Will Encourage Increased Public Transport Patronage Within Belfast. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Improvements in public transport provision.	Park and Ride	Development of Park and Ride Schemes Roads Service, in conjunction with Translink. will further develop Park and Ride Schemes, providing an alternative to using the car for journeys into central Belfast The following local sites served by dedicated bus/rapid transit services have been identified for implementation within the BMTP Plan period: ◆ Fortwilliam on the Antrim and Carrickfergus Corridors. ◆ Kennedy Way on the Lisburn Corridor. ◆ Cairnshill on the Saintfield Road Corridor. ◆ Millmount, Dundonald on the Newtownards Road Corridor. ◆ Tillysburn on the Bangor Corridor. It is expected that existing bus services will use sites such as: ◆ Sprucefield. ◆ Sandyknowes. ◆ Carryduff.	DRD Roads Service \ Translink	S	8	3	24	Park & ride facilities served by bus or rapid transit introduced in conjunction with parking restraint measures in central Belfast will reduce car volumes on radial routes and consequently congestion & emissions. Target: This in combination with other measures will lead to a reduction of 54% by 2015 of the car mode share of motorised journeys compared to 60% in 2001.	The creation of park and ride facilities may encourage an increase in traffic volumes in the vicinity of the chosen Park and Ride site. However, these areas are generally on the periphery of built up areas where air quality is not generally an issue.

Table 5.2 - Initiatives That Will Encourage Increased Public Transport Patronage Within Belfast. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Improvements in public transport provision.	Other local bus services and long distance bus/coach services.	Incremental roll-out of measures and improvements to include: ◆ increased service frequencies on core routes, ◆ cross town/city linking services, ◆ regular interval timetables and integrated ticketing, ◆ integration with rail services, ◆ modern accessible buses, ◆ new routes to access developments, ◆ redevelopment of Smithfield Square bus station in Lisburn and enhancement of Joymount bus stands in Carrickfergus.	DRD	S	2	4	8	Improvements to service frequencies for longer-distance bus and coach services on radial routes to and from Belfast supported by improved integration with local and rural bus services and by bus priority measures on certain sections of the strategic road network will lead to increased bus patronage, which in turn helps to ease congestion and reduce emissions.	The forecast benefits are dependant on usage of the implemented measures.

Table 5.2 - Initiatives That Will Encourage Increased Public Transport Patronage Within Belfast. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Improvements in public transport provision.	Urban Community Transport	Improvements to make transport more accessible to people unable to use conventional public transport services, including those with disabilities.	DRD	M	1	4	4	The expansion of Urban Community Transport services will increase flexibility for passengers and encourage bus patronage, which in turn should reduce car parking in urban centres, ease congestion and reduce emissions.	The forecast benefits are dependant on usage of the implemented measures.
	Rail service frequency and service pattern changes	Increase in service frequencies up to 50% with additional trains focused on providing more express services. To be implemented by Translink		M	2	2	4	Improvement in rail frequencies on all routes in the BMA will encourage increased rail patronage, which will in turn help to ease congestion and reduce emissions.	-

Table 5.2 - Initiatives That Will Encourage Increased Public Transport Patronage Within Belfast. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Improvements in public transport provision.	New and improved rail stations	New or re-located rail stations provided as follows: A new station west of Lisburn. A new station at Tillysburn to serve Belfast City Airport. Measures to improve access to other stations in the BMA. Other improvements to infrastructure for other interchanges within Belfast city centre including sites at Great Victoria Street and Gamble Street.	DRD	L	2	3	6	Maximise the value of investment in the rail network by increasing catchment areas and by supporting development & regeneration through the provision of new stations / interchange facilities. New / relocated rail stations should encourage increased walking and cycling to the stations. Increased rail patronage will help to ease congestion and reduce emissions.	-

Table 5.2 - Initiatives That Will Encourage Increased Public Transport Patronage Within Belfast. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Improvements in public transport provision.	Rail-based park-and-ride.	The following sites have been identified for provision of park-and-ride facilities: ◆ Carrickfergus station, and Greenisland halt and a relocated Jordanstown station. ◆ Lisburn station and a proposed new station west of Lisburn. ◆ Bangor and Holywood stations. Increase in parking provision at other stations by formalising existing parking arrangements along with pick up/set down areas, and providing new parking spaces where feasible.	DRD	M	2	4	8	Expansion of existing park-and-ride provision at rail stations should increase rail patronage, which in turn helps to ease congestion and reduce emissions. Target: An increase of 67% in the number of public transport trips made by rail in the morning peak from 2001 in combination with other measures.	The creation of park and ride facilities may encourage an increase in traffic volumes in the vicinity of the chosen Park and Ride site. However, these areas are generally on the periphery of built up areas where Air Quality is not generally an issue.

Table 5.2 - Initiatives That Will Encourage Increased Public Transport Patronage Within Belfast. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Improvements in public transport provision.	Technology (ITS)	The following Intelligent Transport Systems measures expected to be implemented in support of other transport initiatives: ◆ real time passenger information and Integrated ticketing system for the public transport system; ◆ implementation of travel information dissemination systems; ◆ motorway control and incident detection systems on the strategic highway network; ◆ Variable Message Signing (VMS) in conjunction with park-and-ride and parking provision; ◆ Linking of systems through Urban Traffic Management and Control (UTMC).	DRD Roads Service	S	8	3	24	Encourage greater use of public transport and consequently a reduction in car numbers and emissions. Better Traffic Management results in less congestion and pollution from stationary vehicles.	-
	Bus	Bus Revenue Support to include funding for:- ◆ Concessionary fares. ◆ Fuel duty rebate. ◆ Other NITHC costs. Bus Replacement Programme to provide new buses with high standards of comfort and accessibility and reduce the average age of fleet to 8 years.	DRD	S	2	1 3	2 6	Promote and increase the usage of public transport, which will help to reduce the number of private cars with a subsequent reduction in congestion and emissions.	The forecast benefits are dependant on usage of the implemented measures.

Table 5.2 - Initiatives That Will Encourage Increased Public Transport Patronage Within Belfast. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Improvements in public transport provision.	Rail.	Rail Revenue Support to include ongoing funding for:- ◆ Concessionary fares ◆ Public Service Obligation ◆ Other NITHC costs. Railways Task Force Consideration to include provision for rolling stock, infrastructure and safety measures. Railways Capital and Rolling Stock grants:- ◆ ongoing investment in railway infrastructure including track and routine maintenance; ◆ maintenance of the existing rolling stock; ◆ Provide new trains.	DRD	M	2	1 1 2	2 2 4	Promote and increase the usage of public transport, which will contribute to the reduction in the number of private cars with a consequent reduction in congestion and emissions.	-

Table 5.3 - Initiatives That Will Promote Better Vehicle Fleet Management.

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1) Vehicle emission testing	Reduce numbers of highly polluting Council vehicles on the road.	Test fleet vehicle emissions whenever routine servicing is carried out.	Belfast City Council	S	2	7	14	Reduced nitrogen dioxide, particulate and carbon emissions	Additional capital and maintenance costs, lost operational time.
	Reduce numbers of highly polluting Translink vehicles	Test fleet vehicle emissions. Metro and Ulsterbus vehicles already being tested as part of PSV requirements and internal engineering procedures.	Translink	S	3	7	21	Reduced nitrogen dioxide, particulate and carbon emissions	Additional capital and maintenance costs, lost operational time.
(2) Cleaning up Belfast City Council vehicles	Retrofitting pollution abatement equipment to Council heavy goods vehicles	Fitting of particulate traps to refuse collection vehicles, depending upon the EURO classification of the vehicle.	Belfast City Council	S	2	7	14	Reduce emission levels of particulate material.	Additional capital costs and maintenance implications
(3) Cleaning up Translink vehicles	Retrofitting pollution abatement equipment to older vehicles	Fitting of Oxidation Catalysts to older vehicles. Plans are in progress to replace substantial numbers of older vehicles with Euro 3 engine vehicles, which will reduce the impact of a project to fit oxidation catalysts. Therefore, in view of costs and remaining vehicle life, especially in Belfast, efforts will be concentrated on bus replacement.	Translink	M	3	7	21	Significant benefits obtained in smoke reductions and perceived odours.	Not recommended in view of the remaining life of vehicles, particularly in Belfast.

Table 5.3 - Initiatives That Will Promote Better Vehicle Fleet Management. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(4) The use of cleaner fuels.	Use of ultra low sulphur diesel and unleaded petrol.	Apply to Council fleet – can be implemented on approximately 80% of the Belfast City Council fleet	Belfast City Council	S	2	7	14	Reduced pollution levels emitted by Council vehicles.	Not every vehicle is compatible with the latest fuel technology.
	Use of Ultra Low Sulphur Diesel	Use Ultra Low Sulphur Diesel across the bus fleet. Citybus worked with BP to convert the fuel supply chain to ULSD throughout Northern Ireland in 1999	Translink	S	2	7	14	Conversion to ULSD has an immediate effect in reducing the amount of smoke and odour from buses. It also permits the use of CRT exhaust systems on Euro 2 buses.	-

Table 5.3 - Initiatives That Will Promote Better Vehicle Fleet Management. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(5) The introduction of newer cleaner vehicles and alternative fuels.	Use of LPG fuel by Belfast City Council vehicles	Initial purchase of 2 LPG fuelled Ford Connect light duty vehicles for Council use.	Belfast City Council	S	2	7	14	Reduced exhaust emissions. Reduced noise and pollution levels, greater fuel efficiency. Opportunity to promote the practicality, and benefits of hybrid vehicles.	Government's long-term fuel tax policies uncertain. Capital purchase cost premium. Specialist knowledge required to maintain hybrid vehicles.
	Purchase of hybrid petrol vehicle for Belfast City Council use	Purchase new hybrid petrol/electric cars to replace existing vehicles & evaluate the resulting emission reductions and fuel consumption savings.		S	2	7	14		
	Biodiesel	Evaluate the feasibility of introducing biodiesel across the bus fleet. During 2000, Ulsterbus carried out tests on biodiesel, a diesel fuel equivalent made from reprocessed cooking oil.	Translink	L	2	7	14	Fuel operated satisfactorily in older buses, delivering lower opacity smoke emissions than ULSD, however, biodiesel can increase output of other pollutants.	Limited assurance of supplies - issues with engine manufacturers. Increased susceptibility of fuel laundering. Not recommended until available from a major supplier.

Table 5.3 - Initiatives That Will Promote Better Vehicle Fleet Management. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(5 contd.) The introduction of newer cleaner vehicles and alternative fuels.	LPG and CNG	Investigate the use of Liquefied Petroleum Gas (LPG) and Compressed Natural Gas (CNG). Many alternatives to diesel continue to be available.	Translink	S	4	7	28	LPG has the advantages of being quieter than diesel and generally produces lower exhaust emissions however, emission performance is surpassed by latest diesel with CRT. CNG offers similar advantages to LPG.	Typically an LPG bus costs 20%-30% more than a diesel vehicle to purchase and will cost approximately 40% more on a pence per mile basis. Whilst CNG offers similar benefits to LPG, it requires very large fuel tanks and a very expensive compression plant for refuelling. It also has similar cost disadvantages as LPG even after full refund of fuel duty.

Table 5.3 - Initiatives That Will Promote Better Vehicle Fleet Management. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(5 contd.) The introduction of newer cleaner vehicles and alternative fuels.	Use of LPG fuel by Translink works vehicles	Investigate use of LPG when purchasing new works vehicles. Translink will consider the use of LPG fuelled vehicles when purchasing new works vans and other vehicles.	Translink	M	1	4	4	Reduce exhaust emissions. Reduce noise and pollution levels.	Government's long-term fuel tax policies uncertain. Capital purchase cost premium. Specialist knowledge required for maintenance.
(6) Vehicle upgrading programme to comply with tightening Euro emission standards.	Rolling vehicle replacement programme for Belfast City Council vehicles.	Introduce requirement to purchase vehicles complying with the prevailing Euro standard.	Belfast City Council	S	2	7	14	Reduced noise and pollution emissions, greater fuel efficiency.	Inability to accurately calculate life cost of vehicles.
	Rolling vehicle replacement programme for Translink bus fleet.	Introduce requirement to purchase vehicles complying with the prevailing Euro standards. In Place. An additional £50 million pound investment will also introduce approximately 300 new buses.	Translink	S	5	4	20	Reduced noise and pollution emissions, greater fuel efficiency.	-
	Establish Belfast City Council vehicle replacement programme	Programmed replacement of cars every 4 years, light duty vehicles (less than 7.5 tonnes) every 5 years and those vehicles weighing greater than 7.5 tonnes every 7 years.	Belfast City Council	S	2	6	12	Less maintenance required for newer vehicles	Capital cost of periodically purchasing new vehicles.

Table 5.3 - Initiatives That Will Promote Better Vehicle Fleet Management. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(7) Vehicle scrappage programme	Establish an end of life vehicle policy for Translink vehicles.	Seek contractor to decommission end of life vehicles.	Translink	S	2	7	14	Environmentally friendly disposal of end of life vehicles.	Capital costs. Relatively few contractors able to offer service.
	Establish an end of life policy for Council vehicles.	Seek contractor to decommission end of life vehicles.	Belfast City Council	S	1	7	7	Environmentally friendly disposal of end of life vehicles.	Capital costs. Relatively few contractors able to offer service.
(8) Vehicle Fuel Efficiency	Establish a programme to enable vehicle fuel consumption efficiency to be improved.	Purchase software to enable a baseline survey to be undertaken and subsequent fuel usage logging to be introduced.		S	2	7	14	Software will enable better fleet management operations and increase vehicle fuel use efficiency	Initial capital costs and resource requirements.
	Establish a programme to enable Translink fleet fuel consumption efficiency to be assessed and improved.	Conduct review of current fuel monitoring procedures and establish recommendations.	Translink	S	1	7	7	Systems will enable Translink to manage fleet operations, increase fuel efficiency and highlight issues with bulk fuel storage and delivery.	Initial capital costs and resource requirements. Cost of automated system is high, without appreciable environmental impacts.

Table 5.3 - Initiatives That Will Promote Better Vehicle Fleet Management. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(8 contd.) Vehicle Fuel Efficiency	Establish a Belfast City Council fleet management action plan.	Improve procedures for recording and monitoring fuel usage.	Belfast City Council	M	2	7	14	Estimated cost savings of £7,000 per annum.	Resource implications.
	Establish a mobile plant and infrastructure plant management plan	Establish a baseline study of fuel usage by mobile plant used within Belfast City Council's Parks & Cemeteries Service Section.		M	2	7	14	The baseline study will permit Belfast City Council to monitor and more carefully manage the quantities of fuel used in its mobile plant to derive best practicable efficiency.	Resource implications.
		Establish a baseline study of fuel usage by mobile plant / infrastructure plant used within Translink's Infrastructure & Property Department.	Translink	M	1	7	7	Baseline study will permit the Infrastructure Department to monitor and manage the quantities of fuel used in mobile plant.	Initial capital costs and resource requirements

Table 5.3 - Initiatives That Will Promote Better Vehicle Fleet Management. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(9) Use of various additives or additional devices to reduce fuel consumption / emissions	Evaluate industry trends / experience	Monitor and trial additives or additional devices to reduce fuel consumption and emissions.	Translink	L	1	6	6	Reduced fuel consumption and lower emissions	Few trials have been successful to date, despite various trials reported through the CPT
(10) Rail vehicle rolling stock replacement	Planned replacement of 75% of Northern Ireland Railways fleet with new vehicles	Latest technology engines used, meeting most stringent emission legislation. First vehicles now in service.		S	4	4	16	Reduced noise and pollution emissions, greater fuel efficiency.	Costs may have to be passed on to commuters through fare increases.

Table 5.4 - Initiatives That Will Encourage Large Organisations to Consider Greener Energy Options

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1) Adoption of an environmentally friendly fuel source for Council buildings	Power Council buildings with electricity generated from a renewable source such as wind power.	Reduce pollution levels by switching the electricity tariff in Council buildings to an environmentally friendly tariff based upon renewable energy.	Belfast City Council	S	1	7	7	Lower pollution levels resulting from the Council's power usage. The ability to promote greener power sources.	-
(2) Reduce carbon dioxide emissions	Adoption of the Belfast City Council Draft Carbon reduction programme.	Adoption of the carbon reduction programme and implementation of recommendations.		S	1	7	7	Reduction in carbon emissions as resulting from council operations.	Capital cost of installing and operating generators at the north Foreshore site.
		Manage landfill gas generation at the Belfast City Council North Foreshore site.		L	1	5	5	Generation of electricity from methane gas at the North Foreshore Site offsetting the Council's power requirements.	Time and resource implications of purchasing and operating the electricity generation system.

Table 5.4 - Initiatives That Will Encourage Large Organisations to Consider Greener Energy Options (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(3) Reduce carbon dioxide emissions	Adoption of the Belfast City Council Draft Carbon reduction programme.	Introduce combined heat and power plants at selected Council facilities.	Belfast City Council	S	1	5	5	Reduction in emissions of greenhouse gases. Energy savings.	Initial capital cost of installing combined heat and power plants.
(4) Adopt an environmentally friendly fuel source for Translink properties	Power Translink properties / locations with electricity generated from a renewable source such as wind power.	Reduce pollution levels by switching the electricity tariff at Translink properties / locations to an environmentally friendly tariff based upon renewable energy.		L	1	7	7	Lower pollution levels resulting from Translink's power usage. The ability to promote greener power sources.	Uncertainty on future of renewables market due to tariffs imposed by OFREG & NIE.

Table 5.5 - Implementation of Policies That Will Contribute To Lower Air Pollution Levels.

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1) Revisions to the Belfast City Council Transport Policy	Review current Belfast City Council Transport Policy.	Develop an updated Environmental Package transport policy, which reflects the Council's aspirations both operationally and strategically for air quality management and carbon reduction programmes.	Belfast City Council	M	3	7	21	Reduced pollution arising from Council activities at locations across Belfast.	Reluctance of Council employees to give up their cars.
		Adoption and implementation of a travel plan for the Council owned Gasworks Business Park in partnership with both the site developers and occupiers.		M	4	7	28	Reduced Council contribution to vehicle pollution throughout Belfast and in particular in the Ormeau Road air quality management area.	Before promoting travel plans amongst its employees, Belfast City Council must encourage the improved provision of public transport.
		Manage landfill gas generation at the Belfast City Council North Foreshore site.		M	4	7	28	The promotion of green transport amongst people working in Belfast	Options such as walking and cycling are traditionally seen as unsafe in large cities.

Table 5.5 - Implementation of Policies That Will Contribute To Lower Air Pollution Levels. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Revisions to the Belfast City Council Transport Policy	Review current Belfast City Council Transport Policy.	Participate in Active Living Weeks in conjunction with the Investing for Health Strategy.	Belfast City Council	S	3	7	21	Promotion of alternative green transport amongst the general public	Cycling and walking is traditionally seen as unsafe within the City
(2) Implement the Belfast City Council Arterial Routes programme.	Support the regeneration of Belfast's major arterial routes as part of a regional regeneration agenda.	Develop and implement integrated regeneration plans for designated Arterial Routes across the City (including the lower Ormeau Road) in order to tackle problems of economic, social, physical and environmental decline.		M	2	7	14	Reduced journeys and ambient pollution levels. Improved health amongst the public.	Cycling initiatives need to be supported by public transport providers such as train and bus operators.
(3) Support the planting of greater numbers of trees across Belfast	Belfast City Council Parks Department	Over the past two decades, Belfast City Council has worked in partnership with the DRD Roads Service to double the tree population across the City by planting some 6,500 street trees. Belfast City Council currently manages in excess of 12,500 trees on behalf of the DRD Roads Service and continues to plant young trees in our parks as well as planting semi mature trees at street locations. This year, 47 semi mature trees will be planted along the Ardoyne Road as part of an Environmental Improvement Scheme.	Belfast City Council / Forest of Belfast	M	3	7	21	Trees not only improve the urban environment from a visual perspective but also reduce levels of ambient pollutants and greenhouse gases.	To remove significant levels of ambient pollution, large planted areas of trees would need to be created across Belfast.

Table 5.5 - Implementation of Policies That Will Contribute To Lower Air Pollution Levels. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(4) Land Use Planning	Use of the Planning System to ensure that developments do not lead to a deterioration of air quality and that all potential mitigation measures are considered. Influence policy development for the city through the development of corporate policies and responses to promote more sustainable development.	Include air quality considerations in responses to the Planning Service. Produce guidance for Belfast City Council staff on air quality and land use planning in line with recommendations contained within the National Society for Clean Air 2004 document - Development Control: Planning for Air Quality.	Belfast City Council	S	5	7	35	Potential socio-economic impact. Possible general environmental impact.	Perceived reduction in development opportunities may have an impact upon the capital cost of the development.
		Lobby for the development of a memorandum of understanding between the Planning Service and Belfast City Council.		M	6	7	42		
		Development and implementation of a Master Plan for Belfast based on sustainable development principles.		L	5	7	35		

Table 5.5 - Implementation of Policies That Will Contribute To Lower Air Pollution Levels. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(5) Industrial Pollution Control	Local abatement and emission control	Regulation of Part C processes under the Industrial Pollution Control (NI) Order 1997 & Pollution Prevention & Control Regs. (NI) 2003	Belfast City Council	S	3	7	21	Reduced ambient pollution levels.	New industrial processes may be discouraged in AQMAs.
		Regulation of Part A & B processes under the Industrial Pollution Control (NI) Order 1997 & Pollution Prevention & Control Regs. (NI) 2003	IPRI	S	1	7	7	Reduced ambient pollution levels.	New industrial processes may be discouraged in AQMAs.
(6) Enforcement within smoke control areas	The reduction of emissions from domestic fossil fuel burning.	Enforcement control under the Clean Air (NI) Order - introduction of programmed inspections in the winter months for domestic smoke emissions. Carry out informal sampling of solid fuels at bagging plants within Belfast for sulphur content having regard to the Sulphur Content of Solid Fuel Regulations (Northern Ireland) 1998.	Belfast City Council	S	3	7	21	Reduced sulphur dioxide and particulate emissions.	-
(7) Nuisance policy for dealing with burning at domestic and commercial premises.	Reduce pollution arising from the burning of either commercial or domestic garden waste.	Regulate under the Public Health (Ireland) Act 1878 and the Pollution Control and Local Government (NI) Order 1978.		S	1	7	7	Reduces the amount of pollution resulting from uncontrolled burning at commercial and residential premises.	-

Table 5.6 - Highway and Road Improvements That Will Contribute To Lower Air Pollution Levels.

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1) Highway Improvement	Strategic highway network capacity enhancements	The following proposals have been identified as priorities for implementation within the Plan period are as follows:- • The widening of the M1 and Westlink from Blacks Road through to Divis St-to provide three dual lanes of carriageway. On this section, junctions with the non-strategic highway network will be grade-separated complemented by a segregated bus-way facility between Broadway & Roden St. Enabling easy northbound access to the Europa Bus Station; • The widening of the M2 from 2 lanes to 3 lanes between Sandyknowes and Greencastle junction including the improvement of Sandyknowes junction (M2/A8); • The widening of the A2 at Greenisland on the Carrickfergus corridor from one lane in each direction to two lanes in each direction; • The widening of the A2 Sydenham Bypass between Tillysburn and the M3 Lagan Crossing from a 2-lane dual carriageway to 3-lane dual carriageway; • The widening of the A55 Outer Ring Road at Knock Road from one lane in each direction to 2 lanes in each direction with right turning provision.	DRD Roads Service.	S M L L M	10 8 8 9 9	2 3 3 3 4	20 24 24 27 36	These schemes can safely and efficiently cater for longer-distance movements to, from and between different parts of the Belfast Metropolitan Area and by attracting traffic onto the strategic highway network they reduce congestion and emissions on the local network.	Short-term increases in localised congestion during the construction process, which may be accompanied by increases in air pollution.

Table 5.6 - Highway and Road Improvements That Will Contribute To Lower Air Pollution Levels. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1contd.) Highway Improvements	Non-strategic highway network schemes.	The following proposals have also been identified within the BMTP Plan period:- • Connsbank Link – a new link road between the Newtownards Road / Holywood Arches and the A2. • Holywood Arches bypass. • A new road link between Quarry Corner and East Link Road in conjunction with the EWAY rapid transit scheme providing an alternative to the existing A20 through Dundonald. • Bankmore Link – between Dublin Road and Cromac Street in Belfast.	DRD Roads Service.	M	7	3	21	Road schemes will:-provide traffic relief, support environmental improvements in the urban centres and support developments / regeneration. They hence reduce congestion and emissions on the local network.	Short-term increases in localised congestion during the construction process, which may be accompanied by increases in air pollution.
	Strategic highway network traffic management.	Route Management Strategies, supported by ITS, progressively implemented on the strategic network including minor improvement measures to improve efficiency and safety with particular focus on the A20 Upper Newtownards Road on sections outside the Outer Ring Road, the A24 Saintfield Road on sections outside the Outer Ring Road, and the A55 Outer Ring Road.		M	7	3	21	Traffic management measures will improve the safety & efficiency of the strategic highway network and by reducing stop-start, driving conditions reduce emissions.	If Route Management Strategies are not implemented congestion will increase with an adverse effect on Air Pollution.

Table 5.6 - Highway and Road Improvements That Will Contribute To Lower Air Pollution Levels. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Highway Improvements	Non-strategic highway network traffic management.	The progressive implementation of: • traffic calming measures on local roads and in residential areas • Traffic management measures on local and distributor roads to improve the flow of traffic, in conjunction with improvements to the strategic road network and the implementation of significant public transport alternatives. • Traffic management measures in Belfast city centre comprising the reduction of existing road capacity within the core of the city centre enabling the reallocation of space to pedestrians, cyclists and public transport and supporting improvements to the city centre environment. • Traffic management measures on the A20 Newtownards Rd, inside the A55 Outer Ring Road, to reduce the attractiveness of this route for use by strategic traffic and provide greater priority for local movements, walking/cycling and public transport, implemented in conjunction with the planned major public transport improvement in the form of EWAY.	DRD Roads Service.	S	8	2	16	Traffic management measures will reduce negative traffic impacts on the road network, with an emphasis on residential areas and urban centres. Traffic calming / management schemes will help to improve air quality by encouraging walking and cycling, by protecting access roads from through traffic and by promoting environmental improvements. These measures reduce local traffic volumes and hence emissions.	Traffic calming measures in residential areas may cause more start stop motoring thereby increasing vehicle emissions.

Table 5.6 - Highway and Road Improvements That Will Contribute To Lower Air Pollution Levels. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Highway Improvements	Advanced Traffic Control Strategy for M1/Westlink.	Operation of a state of the art traffic control system to manage traffic in Greater Belfast including:- • Variable Message Signs • Telematics to manage highway speeds, headway and incidents. • CCTV traffic flow monitoring	DRD Roads Service.	M	8	4	32	Minimise delays to traffic using M1/Westlink. Reduce congestion and improve air quality.	-

Table 5.6 - Highway and Road Improvements That Will Contribute To Lower Air Pollution Levels. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Highway Improvements.	Parking Measures	Implementation of a parking policy focused on central Belfast comprising: • Modification of existing parking restrictions for on-street parking and – where appropriate – set parking charges to discourage long-stay parking and maximise the use of short stay spaces; • Conversion of all uncontrolled on-street parking spaces to controlled spaces in a defined Controlled Parking Zone covering central Belfast and its immediate walk-in catchment area; • More effective enforcement and management of parking made possible by Decriminalised Parking Enforcement (DPE) which will enable responsibility for parking enforcement to be passed from the Police Service of Northern Ireland (PSNI) to DRD; • Reduction in the number of public off-street parking spaces provided for long-stay (i.e. commuter use) by turning over car parks to other forms of use and by setting charge structures that discourage long-stay use; • Use of land use planning controls to: reduce the number of temporary car parks on derelict land; and to restrict the development of new private-sector public car parks.	DRD Roads Service.	S	7	4	28	Implementation of a parking policy focused on central Belfast that enables more effective parking controls to be applied and supports other demand management measures that seek to reduce peak car trips to the city centre. More effective enforcement will reduce congestion and subsequent emissions arising from illegally parked vehicles or vehicles using the road space incorrectly. Parking charges could be used if appropriate, to discourage trips into the city centre therefore reducing congestion and pollution.	Balance required between competing City Centre needs.

Table 5.6 - Highway and Road Improvements That Will Contribute To Lower Air Pollution Levels. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1 contd.) Highway Improvements.	Parking Measures	Restriction of the further increase in the growth in Private Non-Residential (PNR) parking – that associated with commercial premises such as offices and shops – by imposing maximum parking standards to developments that restrict the number of PNR spaces that can be provided. This would be enforced through planning agreements that restrict developers to certain design principles. Restricting the number of parking spaces provided at new residential developments by imposing maximum parking standards; Schemes to provide motorists with opportunities to park their cars and share other transport to their destination. Residents only parking with restrictions as to who is permitted to park by using a system of parking permits which will be available to local residents and businesses	DRD Roads Service.	S	7	4	28	Control of on street parking will result in fewer car parking spaces being available in the Belfast City centre zone thereby reducing the likely number of cars entering the city centre and resulting in increased air quality benefits.	Balance required between competing City Centre needs.
	Capital Investment	Street Lighting programme to improve safety and upgrade old systems.		S	3	4	12	Improved lighting will help overcome some safety issues and encourage more trips by walking and cycling.	-

Table 5.7 - Marketing and Education Initiatives That Will Raise the Issue of Air Pollution amongst the Public.

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(1) Revisions to the Belfast City Council Transport Policy	Review current Belfast City Council Transport Policy.	Participate in Active Living Weeks in conjunction with the Investing for Health Strategy.	Belfast City Council	S	3	7	21	Promotion of alternative green transport amongst the general public	Cycling and walking is traditionally seen as unsafe within the City
(2) Develop a policy to tackle pollution from bonfires	Establish a protocol for Belfast City Council to tackle pollution from bonfires	Piloting of an agreed Community Code of Conduct for managing bonfire sites.		S	3	7	21	Reduction in the overall number and size of bonfires	Particularly hard to get community support for such an initiative due to political and historical perspectives.
	Belfast City Council to develop a policy to tackle pollution from bonfires	Educate the community on the types of material which should be burnt on bonfires		S	3	7	21	Reduction of pollution from bonfires particularly as a result of burning tyres	-
		Agree target dates for the collection and build up of material		S	3	7	21	Reduction in the quantities of material being burned in bonfires	-

Table 5.7 - Marketing and Education Initiatives That Will Raise the Issue of Air Pollution amongst the Public. (Continued)

Option	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(3) Educational Initiatives.	Education campaign for young people highlighting the health problems related to air pollution	Develop and deliver a targeted education campaign via the Council's web site or published material.	Belfast City Council	M	3	7	21	Younger people are able to influence parental attitudes.	May have a limited audience.
	Continue to promote healthy travel, bike to work day etc in partnership with other agencies	Establish working partnerships with relevant health promotion bodies.		S	1	7	7	Promoting and supporting existing initiatives will enable a greater audience to be reached	Resource implications in supporting and promoting a range of initiatives.
		Promote the Safe Routes to Schools initiative and new routes.	Sustrans	M	2	7	14	Encourages safer and more sustainable transport to and from schools	-

Table 5.7 - Marketing and Education Initiatives That Will Raise the Issue of Air Pollution amongst the Public. (Continued)

	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(3 contd.) Educational Initiatives.	Explore the possibility of a public display with real time air quality information.	Provide real-time air quality information via the Council's web site or on a public display system.	Belfast City Council	M	1	7	7	Provision of real time air quality information and publicity initiatives will allow the public to make informed decisions about their transport choices.	When air pollution levels are low, people may not continue to use alternative means of transport.
	Develop the use of advertising space at Lombard Street air quality monitoring station.	Promote air quality issues via posters at the Belfast City Centre AURN Site.		S	2	7	14		
	Provide free emissions testing supported by promotional material for car owners.	Implement a programme of voluntary emissions testing for car owners and develop supporting promotional literature.		S	2	7	14	Provides the Council with a platform with which to directly highlight vehicle pollution with drivers.	Time and resource locations. Difficult to find suitable public testing locations.

Table 5.7 - Marketing and Education Initiatives That Will Raise the Issue of Air Pollution amongst the Public. (Continued)

	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(3 contd.) Educational Initiatives.	Promote the use of alternative fuels and vehicle types via the Energy Saving Trust.	Promote emissions testing amongst large organisations in Belfast.	Belfast City Council	M	2	7	14	Wide scale emission testing will ensure more highly polluting vehicles can be identified.	Resource and equipment requirements to implement a vehicle-testing programme.
	Encourage members of the public to report smoke emissions from chimneys with smoke control areas.	Promote the Belfast City Council Smoke Hotline for reporting smoky chimneys within Smoke Control Areas.		S	1	7	7	Allows smoke emissions to be identified when they occur.	-
(4) Nuisance policy for dealing with burning at domestic and commercial premises.	Reduce pollution arising from the burning of either commercial or domestic garden waste.	Implement further work to publicise the health effects of pollution from domestic and commercial burning.		M	1	7	7	Reduces the amount of ambient pollution resulting from uncontrolled burning at commercial and residential premises.	-

Table 5.7 - Marketing and Education Initiatives That Will Raise the Issue of Air Pollution amongst the Public. (Continued)

	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(4 contd.) Nuisance policy for dealing with burning at domestic and commercial premises.	Development and implement a policy for dealing with commercial and domestic bonfires.	Promote composting at Civic Amenity Facilities to reduce the need for domestic bonfires.	Belfast City Council	S	1	7	7	Initiatives will lead to the reduction of air pollution from fugitive sources.	-
		Implement annual education programme for Tyre Distributors to encourage environmentally friendly disposal.		S	1	7	7		
(5) Air Pollution Monitoring	Undertake ambient pollution monitoring throughout Belfast in order to identify areas of poor air quality.	Install and operate air quality monitoring equipment at potential locations of potential poor air quality throughout the City.		S	2	7	14	Areas of poor air quality can be identified and policy introduced to tackle them.	Resource implications. Suitable sites to locate monitors are not always available.
	Evaluate monitoring from ambient pollution monitors throughout Belfast.	Compare ambient air pollution monitoring levels against the health-based National Air Quality Strategy Objectives.		S	2	7	14	Informs the need to declare future Air Quality Management Areas.	-

Table 5.7 - Marketing and Education Initiatives That Will Raise the Issue of Air Pollution amongst the Public. (Continued)

	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(6) Sustainable Energy Promotion	Support sustainable (renewable) energy, energy efficiency and low carbon transport promotions	Belfast City Council will work in partnership with and provide financial support to the Energy Saving Trust Advice Centre, which provides high quality, free, accessible, independent, timely, impartial and personalised advice and information to householders, car owners, fleet managers, registered social landlords, the NIHE and District Councils. This will embrace renewable energy, energy efficiency and low carbon transport advice. The services offered by the Energy Saving Trusts' Advice Centre include field visits through to marketing and promotional events, all with the objective of increasing awareness of how energy saving can be achieved.	Belfast City Council & Belfast Energy Efficiency Advice Centre	S	1	7	7	Increased awareness of the sustainable (renewable) use of energy, energy efficiency and low carbon transport advice leading to reductions in the emissions of greenhouse gases.	-

Table 5.7 - Marketing and Education Initiatives That Will Raise the Issue of Air Pollution amongst the Public. (Continued)

	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(7) Travel Management	Changing Travel Attitudes	Support and promote Travel Plans, implemented through planning agreements or conditions on planning permission. Implement a BMA-wide travel awareness campaign supplemented by localised campaigns in conjunction with the implementation of major public transport schemes. Implementation of the Safer Routes to School initiative.	DRD Roads Service	S	8	4	32	Travel Plans encourage changes in travel behaviour and reductions in car dependency, leading to reduced congestion and emissions. Well targeted campaigns help to influence people's travel behaviour leading to reductions in congestion and emissions Encouraging walking, cycling or use of public transport can help reduce congestion and improve air quality. Research shows that widespread implementation of these measures, in combination with complementary physical measures, can lead to a reduction in peak period urban traffic of up to 21% - Goodwin et al. (2004), Smarter Choices - Changing the Way We Travel.	-

Table 5.7 - Marketing and Education Initiatives That Will Raise the Issue of Air Pollution amongst the Public. (Continued)

	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(8) Translink Transport Campaign	Review of current Translink transport options & promotions	Develop an Environmental information leaflet, which reflects Translink's operational and strategic aspirations for air quality management, carbon reduction programmes, and other related environmental issues.	Translink	S	1	7	7	Reduced pollution arising from Translink activities at locations across Northern Ireland.	-
	Review of current Translink transport options & promotions - i.e. Corporate Commuter Initiative.	Review and further development of Translink partnerships with public sector organisations and large employers with a view to encouraging commuters to switch to public transport.		S	3	7	21	Promotion of alternative transport amongst employers, employees and the public.	-

Table 5.7 - Marketing and Education Initiatives That Will Raise the Issue of Air Pollution amongst the Public. (Continued)

	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(8 contd.) Translink Transport Campaign	Review of current Translink transport options & promotions	Participate in Active Living Weeks in conjunction with the Investing for Health Strategy.	Translink	S	4	7	28	Promotion of alternative transport amongst the public.	Threat of bikes being stolen.
(9) Translink Education Initiatives.	Continue to promote healthy travel, bike / walk to work day etc in partnership with other agencies.	Establish working partnerships with relevant health promotion bodies.		S	1	7	7	Promoting and supporting existing initiatives will enable a greater audience to be reached.	Resource implications in supporting and promoting a range of initiatives.
		Promote the Walk and Bike to Work Days.		S	2	7	14	Encourages commuters to consider alternative transport options.	Threat of bikes being stolen.
		Promote availability of Cycle Maps / Cycle Ways. Work with organisations such as Sustrans in the promotion of cycle maps etc through Translink locations.		S	3	7	21	Heightened awareness of cycle routes.	Threat of bikes being stolen.

Table 5.7 - Marketing and Education Initiatives That Will Raise the Issue of Air Pollution amongst the Public. (Continued)

	Approach	Action	Lead Authority	Timescale	Impact	Cost	Cost Effectiveness Score	Wider Benifits	Possible Disbenefits
(9 contd.) Translink Education Initiatives	Develop the use of advertising or promotional space at Translink operational centres to promote air quality issues.	Work in conjunction with other interested parties to promote air quality issues. Use of Translink locations to display air quality monitoring information, air quality updates via Translink TV screens at Central Station, use of Central Station to display environmental related art work, school projects etc.	Translink	S	4	7	28	Provision of air quality / environmental information and publicity initiatives will allow the public to make informed decisions about their transport choices.	When air pollution levels are low people may not continue to use alternative means of transport.

Chapter 6 - Consultation

Belfast City Council and the major contributors to the Air Quality Action Plan recognise that ambient pollution levels can only be successfully reduced across the city if the proposals outlined within the plan gain the widespread support of all stakeholders including the general public. Therefore, in developing this air quality action plan, Belfast City Council consulted with a diverse range of relevant authorities and stakeholder groups at various stages throughout the process.

Initially, Belfast City Council reviewed the local air quality management policy guidance document LAQM.PGNI(03), which recommends that air quality issues should be dealt with in a manner, which encourages effective multidisciplinary partnership working. Therefore, Belfast City Council invited a range of relevant organisations and bodies to collaborate in the development of the air quality action plan via the Belfast Air Quality Forum. However, it soon became clear that rather than canvassing the views of each participant, a selection of representatives could more effectively represent the member organisations and consequently, a steering group was established, tasked with co-ordinating and producing the air quality action plan.

The local air quality management policy guidance document LAQM.PGNI(03) also states that effective consultation and interaction with the public is integral to preparing an effective air quality action plan and it advocates the use of innovative projects to engage local stakeholders. Therefore, to ensure full stakeholder participation, Belfast City Council elected to perform a Health Impact Assessment upon the contents of the air quality action plan. A Health Impact Assessment is an approach, endorsed by the Department of Health, which initially allows both the direct and indirect impacts of proposals to be identified and subsequently provides an opportunity for stakeholders to make suggestions that will minimise any negative aspects and also improve the way in which plans are implemented. If the stakeholder suggestions are subsequently adopted into the action plan, then it is possible to protect and improve the health and well-being of people likely to be affected by the proposals.

The Health Impact Assessment process was facilitated by a recognised expert in the field, Ms. Erica Ison, Specialist Practitioner in

Health Impact Assessment (affiliated to the Public Health Resource Unit, Oxford University) with the assistance of Belfast Healthy Cities, which is also recognised for its participative approach to engaging stakeholders and designing inclusive consultation processes.

A stakeholder Health Impact Assessment was held in Belfast City Hall, a further two community based workshop seminars were held within two of the air quality management areas and workshops based around the Health Impact Assessment process were held in schools in the other two air quality management areas.

In addition to the Health Impact Assessment approach, a range of other innovative methods of engaging the public, businesses, community groups and relevant organisations was also employed.

The draft air quality action plan was formally published and 500 copies were circulated to community groups, libraries, schools, religious groups, education establishments, statutory organisations and trade bodies seeking comments.

An article was also placed in the August 2005 edition of the Belfast City Council City Matters magazine, which is delivered to every household within Belfast. The article publicised the development of the air quality action plan and invited residents to highlight their level of their support for each of the seven policy areas.

The draft Air Quality Action Plan was also available to download from the Belfast City Council website and was supported by an online survey and questionnaire throughout the duration of the consultation process.

Outcome of the Health Impact Assessment Process.

Given the number of participants in the Health Impact Assessment and the array of views expressed, Belfast City Council has elected to publish a separate report outlining the outcome of the process. However, in collating the outcome of the Health Impact Assessment process, a number of common themes emerged from the workshops and these are summarised as follows:-

Initiatives to Promote Greater Levels of Walking and Cycling within Belfast.

On the basis of impacts on health and well-being, stakeholders in the communities consulted were generally in support of the various initiatives to promote walking and cycling in Belfast, but they expressed concerns that encouraging cyclists to use busy arterial routes would cause them to be exposed to increased levels of air pollution. However, although residents were in favour of greater provision of cycle routes and walkways, they did not support the conversion of disused railway routes for this purpose, preferring to see them converted to rapid transit routes.

Stakeholders were also in favour of traffic-calming measures, but suggested that traffic-calming measures needed to be designed and introduced in such a manner so as to avoid any negative impacts on health as a result of traffic-calming itself, e.g. increased air pollution from stop start motoring, and increased antisocial behaviour in young drivers.

Initiatives That Will Encourage Increased Public Transport Patronage Within Belfast.

With regard to those initiatives that are designed to promote an increased use of public transport, stakeholders from the M1/Westlink were generally supportive of them on the basis of health impact. However, comments were raised about the appropriate and effective location of Park & Ride sites, and concerns were expressed about the loss of amenity that could be suffered by residents living in the vicinity of the EWAY on the Newtownards Road. Specific suggestions were also made about the need for more affordable public transport, especially for those people in vulnerable groups, e.g. people on a low income and their families. Support was also strongly expressed for the improvement of taxi facilities due to perceived health benefits in terms of increased safety and access, which this service provides to vulnerable groups, despite the potential increases in both air and noise pollution.

Initiatives That Will Promote Better Vehicle Fleet Management and Will Encourage Large Organisations to Consider Greener Energy Options.

Stakeholders were supportive of the inclusion of fleet management and green energy initiatives within in the plan on the basis of their positive impacts on health. However, they suggested that both Belfast City Council and Translink could act as role models amongst other organisations and champion these approaches to improving air quality, thereby improving health. Furthermore, it was also suggested the impacts of the draft action plan could be enhanced if both the Council and Translink were to consider route planning for their vehicles and purchasing fleet vehicles with more than one function.

Implementation of Policies That Will Contribute To Lower Air Pollution Levels.

Stakeholders were supportive of the implementation of those policies designed to reduce ambient air pollution but felt that the plan could be strengthened by the addition of two further initiatives namely; the use of Belfast City waterways for transportation purposes and lobbying to make the European Union Directive on the Energy Performance of Buildings mandatory.

Highway Improvement Initiatives.

The response from stakeholders in the M1/Westlink Corridor and Ormeau Road AQMAs was somewhat mixed with respect to the health impacts of the proposed highway and road improvements designed to reduce air pollution levels. There was a lack of support for capacity improvements to the strategic highway network, particularly along the M1/Westlink corridor, because it was felt that this could involve not only construction impacts, but also road widening and displacement of some people in the existing community who live in the vicinity of the roads. These actions were judged to have potentially negative impacts on residents' health and well-being, whereas it was pointed out that car users would experience only benefits. The local community also highlighted the likely end result of making improvements to road capacity would be an increase in the number of car trips made, and ultimately an increase in traffic volume and air pollution, even though in the short term such improvements

might increase traffic flow and decrease air pollution levels. Similar concerns over the health impacts of the non-strategic highway network scheme for the Bankmore Link.

However, there was broad community support for initiatives concerning strategic and non-strategic highway network traffic management, although the possibility of residents in the vicinity of the strategic highway network experiencing differentially negative impacts on their health and well-being was raised. In addition, suggestions were made about appropriate and effective measures for traffic calming with respect to non-strategic highway network traffic management. There was also support for parking measures to restrict motor vehicle access to Belfast City centre, but community participants were clear that the parking needs of residents should be taken into account, particularly for those people from vulnerable groups for whom access is a problem, e.g. people with a physical disability, older people, and women with small children.

Marketing or Education Initiatives.

Stakeholders were supportive of marketing and education initiatives designed to raise public awareness of air pollution issues but made a number of suggestions about how communication with the public could be improved in order to increase the probability that people will act upon the advice they receive and not simply ignore it. These included greater use of the local press to publicise upcoming events, establishing greater numbers of community partnerships, providing talks or presentations to residents or community groups at residents' or community group meetings and not relying upon leaflets to disseminate information as they may be mistakenly treated as junk mail.

Outcome of the Public Consultation via Belfast City Matters Magazine and Belfast City Council website.

Belfast City Council routinely publishes a quarterly magazine entitled City Matters, which is circulated to all households within Belfast and provides information regarding the council's activities. It was felt that this publication provided the most effective medium through which to reach all 130,000 households within Belfast. Therefore, in the August 2005 edition, Belfast City Council invited households to review the draft action

plan and indicate their support for the seven key policy areas or to suggest other actions, which might be incorporated within the final air quality action plan. Residents were able to submit their views via a freepost address or an online questionnaire provided on the Belfast City Council website.

In total, 448 replies were received by Belfast City Council with 80% of respondents supporting those measures designed to encourage greater levels of both walking and cycling amongst commuters and 79% supporting the need for greater use of public transport. 64% of respondents supported Belfast City Council's and its partner organisations' plans to introduce cleaner fuels for use in both their buildings and vehicles, 26% supported the view that awareness of air quality issues needs to be raised amongst the general public through targeted education and 18% stated that air quality problems should be tackled through greater use of legislation. 9% of respondents supported the view that air pollution should be addressed by improving or extending the road network.

A further 11% of respondents proposed additional measures to those already outlined within the draft air quality action plan. Suggestions to improve the level of public transport patronage included a more frequent and efficient public transport system, with subsidised fares, increasing the provision of quality bus corridors and designating specific days or weeks where public transport must be used in place of the private car. Respondents also felt that there was need for better advertising of the Translink Metro and Ulsterbus services. However, concern was also expressed that in bus stations, buses are routinely allowed to idle at their stands with engines running, needlessly exposing commuters to diesel fumes.

Members of the public also stated that there was a need for greater provision of safe cycle routes and footpaths particularly on major arterial routes, but that these needed to be supported by the availability the better cycle facilities at journey's end including changing facilities and secure storage. It was also reported that cyclists are considered a source of congestion during rush hours and consequently need to be segregated from road traffic.

Respondents stated that reliance upon the private car could be lessened by encouraging car sharing, providing more park and ride sites, introducing financial penalties such as congestion charging, increased road tax / fuel costs, making cars more expensive to purchase and by introducing more pedestrian zones. They also felt that where cars had to be used, they should utilise the cleanest possible fuels including electricity and that engines should be routinely turned off whenever a car is stationary. One respondent felt that Belfast should implement the Athens approach to tackling car congestion by allowing even numbered cars into the city on particular days of the week and allowing odd numbered cars access on the other days. Others thought that illegal parking by cars and delivery vehicles on arterial routes resulted in significant congestion and that it should be rigorously targeted by increased numbers of Traffic Wardens.

Respondents also felt that other sources of pollution including bonfires needed to be more effectively targeted. One respondent simply stated that bonfires should not be permitted since they generate significant amounts of air pollution and the clean up costs have to be borne by ratepayers.

Consultation Responses from Organisations.

The draft air quality action plan was also forwarded to a wide range of statutory organisations, health boards, community and church groups, trade bodies and education establishments seeking their comments upon the proposals.

Belfast City Council Waste Management Service.

Belfast City Council's Waste Management Service commented upon those sections of the action plan relating to its fleet operations, waste processing and the forthcoming development of the Dargan Road North Foreshore landfill site. Whilst largely supportive of the action plan contents, the Waste Management Service made particular reference to the Council's plans to offset its existing electricity costs by generating electricity from landfill gas and highlighted the beneficial reductions in green house gas emissions associated with this proposal.

Furthermore, the Waste Management Service also commended those proposals,

designed to reduce the public's reliance upon the private car for transport and to encourage the use of cleaner fuels in Belfast City Council vehicles and plant.

The Planning Service.

The Planning Service confirmed that as a principal contributor to the action plan, it is committed to the integration of land use planning and transportation and the promotion of walking and cycling through its numerous development plans and planning policy statements.

Eastern Health and Social Services Board.

The Eastern Health and Social Services Board reported that it supports the actions outlined within the air quality action plan and feels that they can make a significant contribution to health improvement. Additionally, the Board stated that it felt that the Action Plan would contribute to both the Investing for Health initiative and the promotion of physical activity through a reduction in the use of the private car for transport. The Eastern Health and Social Services Board also stated that it is developing a workplace travel plan in line with the recommendations of the action plan and would be keen to work with other city centre organisations in this regard.

Department of Enterprise, Trade and Investment.

The Department of Enterprise, Trade and Investment reviewed the draft air quality plan and submitted a number of typographical revisions, which were subsequently incorporated into the action plan.

Department for Regional Development Roads Service.

The Department for Regional Development Roads Service, as a major contributor to the draft air quality action plan, expressed concerned that Belfast City Council had been unable to gain significant commitments to improve air quality from other large organisations within Belfast. Nonetheless, the DRD Roads Service affirmed its continuing support for all the proposals outlined within the air quality action plan.

Belfast City Centre Management.

Belfast City Centre Management described its mission as drawing together statutory organisations, businesses and the voluntary sector in a bid to deliver a safer more attractive and accessible Belfast City Centre. Consequently, Belfast City Centre Management reported that it is wholly supportive of the proposals designed to improve air quality across Belfast, particularly in city centre locations where workers, visitors and shoppers are regularly present.

However, Belfast City Centre Management expressed concern that the air quality monitoring site located in the city centre at Lombard Street conflicts with its vision of an attractive city centre and requested that the site be either moved to another location or enclosed in a bid to prevent flyposting and graffiti.

Nonetheless, Belfast City Centre Management affirmed that it would be delighted to assist with implementation of the strategy since it represents approximately 550 businesses.

Northern Ireland Cycling Initiative.

The Northern Ireland Cycling Initiative stated that in promoting cycling as a healthier cleaner alternative to the car, it campaigns for improved cycling infrastructure, and the linking of homes to work school, shops, public transport and other amenities. The Northern Ireland Cycling Initiative reported that it welcomes the various proposals outlined in the air quality action plan but feels that the measures do not go far enough. The Northern Ireland Cycling Initiative advocates area wide speed reductions to 20 mph in a bid to improve walking and cycling conditions and states that walking and cycling must be placed at the core of transport planning rather than being regarded as a troublesome 'bolt on'.

With regard to the action plan content, the Northern Ireland Cycling Initiative stated that proposals to improve roads and highways would inevitably generate increased traffic volume by maximising network capacity along specific routes, thereby leading to localised congestion and increased traffic pollution. It advocates directing resources to affect modal shift and increase constraints on the motorcar.

Furthermore, the Northern Ireland Cycling Initiative commented that the majority of commuter traffic entering Belfast on a daily basis comes from adjoining Council areas and that the plan does not address this problem. The Northern Ireland Cycling Initiative also highlighted the apparent lack of political leadership, sustainable transport champions or car constraint within the action plan.

The Queen's University of Belfast.

The Queen's University of Belfast stated that it welcomed and supported the proposals outlined within the air quality action plan, commenting that those actions proposed by the Roads Service and Translink will directly assist the University in delivering its travel planning objective of encouraging staff and students to visit by more sustainable modes.

Energy Saving Trust.

The Energy Saving Trust reported that the provision of grants, which would assist Belfast City Council in fitting pollution abatement equipment to its vehicle fleet, is currently being considered by the European Union. Furthermore, the Trust also stated that the introduction of combined heat and power plants at Council properties might be assisted by the Department for Finance and Personnel's Energy Efficiency Fund. The Energy Saving Trust concluded by referring the action plan contributors to a range of practical information available on the Trust's website at www.est.org.uk.

The Northern Ireland Federation of Housing Associations.

The Northern Ireland Federation of Housing Associations reported that it represents 45 independent voluntary organisations, which benefit the community by providing both affordable accommodation and housing services to those in greatest housing need. Its members manage almost 30,000 units of accommodation, build in excess of 1,300 dwellings each year and have undertaken a diverse range of projects responding to the needs of our evolving society over the last twenty-five years.

With regard to the action plan, the Federation stated that although the plan appears to have a strong emphasis on greater levels of walking and cycling alongside increased use of public transport,

it also addresses the promotion of better vehicle fleet management and greener energy options within organisations. The Federation reported that it is happy to support such initiatives and urged Belfast City Council to be pro-active in highlighting and promoting these across both the public and private sectors.

The Federation also commented that it would encourage the promotion of continued and improved working relationships between the voluntary housing movement and other agencies. It felt that this was particularly important in identifying innovative ways to improve the level of air quality, especially where housing associations are involved in new developments within the Air Quality Management Areas.

Belfast Air Quality Action Planning Steering Group.

Members of the Air Quality Action Planning Steering Group expressed the view that many of the action plan proposals, designed to reduce ambient nitrogen dioxide and particulate levels, could also have the additional benefit of reducing greenhouse gas emissions, i.e. policies designed to reduce the adverse impact of road transport upon on air quality by tackling congestion and encouraging a shift to public transport, walking and cycling could also reduce carbon dioxide emissions.

However, the Group also felt that in view of recent global increases in the cost of crude oil and our own depleting North Sea oil and gas stocks, there may be a future opportunity for the action plan to promote the use of more sustainable sources of fuel for domestic, industrial and transport use. This viewpoint compliments the recommendations contained within the Department of Trade and Industry Energy White Paper entitled "Our Energy Future - Creating a Low Carbon Economy".

The February 2003 Department of Trade and Industry Energy White Paper entitled "Our Energy Future - Creating a Low Carbon Economy" states that, much of the UK's economically viable deep-mined coal is likely to be exhausted within ten years. Furthermore, it estimates that by around 2006, the United Kingdom will be a net importer of gas, by 2010, a net importer of oil and by 2020, the UK could be dependent on imported energy for three quarters of its total primary energy needs.

As the United Kingdom shifts from being a net energy exporter to being once again a net energy importer, the White Paper also warns that the country may become potentially more vulnerable to price fluctuations and interruptions to supply caused by regulatory failures, political instability or conflict in other parts of the world.

However, the White Paper also highlights that these potential problems can be overcome by developing a diverse energy economy – having many sources of energy, many suppliers and many supply routes. The paper also advises that renewable, smaller-scale distributed energy sources such as micro combined heat and power plants or fuel cells can help the United Kingdom avoid over-dependence upon imports and can make it less vulnerable to global instability.

Other Submissions.

Belfast City Council also received a range of submissions citing the environmental benefits associated with tree planting, including improving the visual environment, suppressing dust and absorbing air pollution. A number of the submissions cite scientific papers however; it is not proposed to review the content of each paper at this juncture but rather to provide an overview of the submissions.

The International Tree Foundation.

The International Tree Foundation submitted a list of twelve environmental benefits of trees including abilities to:-

1. Replace carbon dioxide with oxygen in the atmosphere.
2. Initiate the water cycle.
3. Create microclimates.
4. Form fertile soils.
5. Reduce soil erosion.
6. Control river regimes.
7. Create wildlife habitats.
8. Speed land restoration.
9. Provide a source of both timber and fuel.
10. Create recreational facilities.
11. Enhance the urban environment.
12. Provide a visual stimulus.

The International Tree Foundation also asserted that it is universally accepted that trees improve the quality of urban life and have been included in a range of other air quality action plans for that specific reason. It also stated that trees are more effective sinks then other land surfaces including grassland and that larger healthy trees can remove up to 70 times more air pollution than smaller trees.

The Foundation also stated that trees can help to remove airborne particles particularly where streets or roads are tree lined and in urban locations, where there is 100% tree cover, short-term improvements in air quality of up to 15% ozone, 14% sulphur dioxide, 13% particulate matter and 8% nitrogen dioxide can be obtained.

Therefore, in conclusion, the International Tree Foundation requested that the following actions be included within the completed air quality action plan.

- Sustain existing tree cover and where mature trees have to be removed, ensure replacement by a sufficient number of younger trees with the same pollution removal potential.
- Increase the numbers of healthy trees.
- Plant banks of trees including evergreen conifers such as the Scots Pine along motorways.
- Surround housing developments by banks of trees.
- Plant trees along streets in residential areas in air quality management areas.

The Woodland Trust.

The Woodland Trust highlighted that the Government's sustainable development policy includes a range of headline indicators, specifically relating to woodland preservation or development. The Trust reported that woodlands have the capacity to reduce ambient greenhouse gases levels through carbon sequestration whereby trees absorb carbon dioxide, release oxygen and store carbon thus making an important contribution to the management of climate change. The Trust also stated that trees have the capacity to absorb other ambient pollutants including sulphur dioxide, carbon monoxide, nitrogen dioxide and particulate material and to cleanse air by intercepting and slowing particulate material. The Woodland Trust concluded by stating that it

hoped that the completed air quality action plan would contain additional measures to increase tree cover across Belfast.

Trees for Cities.

References to the Trees for Cities programme were also received from a number of consultees. In common with the International Tree Foundation and the Woodland Trust, Trees for Cities advocate widespread tree planting in a bid to tackle global warming, create social cohesion and enhance cities. However, whilst the consultees acknowledged that planting trees on gap sites along arterial corridors would have a minimal impact upon ambient pollution levels, they nonetheless stated that an opportunity existed for Belfast City Council to improve the quality of life for residents living in such locations by increasing living boundaries.

Belfast City Council (The Forest of Belfast) Response to Consultation Comments Regarding Tree Planting.

The importance of 'Green Longs' and in particular the role of trees in improving public health has been widely promoted and is one of the main reasons why the Belfast City Council Forest of Belfast partnership was developed. The Forest of Belfast promotes tree planting and tree care throughout the Greater Belfast area and encourages greater awareness of the value of trees.

The Forest of Belfast partnership recognises that trees have an important role in improving air quality by trapping particulate matter, by absorbing carbon dioxide and releasing oxygen. Leaves also produce a fine mist of water vapour, which attracts dust particles, making the area under trees noticeably less dusty. Trees also provide shade, which is important in reducing solar radiation that can cause skin cancer.

Studies have shown that walking amongst trees and in woods has a benefit in reducing stress levels. People recovering from major surgery have also been shown to benefit from having a view of trees from their hospital bed.

The Forest of Belfast partnership also acknowledges that planting and caring for trees should be an integral part of the air quality action plan for Belfast and feels that the urban forestry model in which all tress,

whether in public or private locations, are viewed as a tree resource to be developed by a wide range of organisations in partnership, and is the most appropriate way to develop this resource. It is felt that trees should be planted throughout Belfast, although one of the more obvious locations to increase tree cover as part of an air quality strategy is adjacent to major roads. Additional benefits of planting tree belts alongside roads include reducing noise pollution and camouflaging elevated roadways.

Therefore, in conclusion, it should be noted that over the past two decades, Belfast City Council has worked in partnership with the Department for Regional Development Roads Service to double the tree population across the Belfast by planting some 6,500 street trees. Belfast City Council currently manages in excess of 12,500 trees on behalf of the DRD Roads Service and continues to plant young trees in all our parks as well as planting semi-mature trees in various street locations. This year, 47 semi-mature trees will be planted along the Ardoyne Road as part of an Environmental Improvement Scheme. Consequently, a commitment has been included as an action within Table 5 - implementation of policies that will contribute to lower air pollution levels.

Translink Response to the Consultation Comments Regarding Provision of Public Transport Services across Belfast.

The Air Quality Action Plan consultation has been the culmination of an extensive process involving a broad section of interested parties and it is hoped that the development process, consultation, and implementation of the plan will continue to broaden the public's awareness of air pollution across Belfast and beyond. The action plan proposals, whilst not necessarily specifically focused on the air quality management areas, will nonetheless support Belfast City Council's goal of improving air quality within the designated areas and across Belfast as a whole. By encouraging greater levels of walking and cycling, improved public transport, better roads and highways, the plan creates a forum for greater awareness. As such, it should be noted that Translink has already been working on the majority of its actions for many years. With increasing environmental legislation and industry standards, our quest

for improved passengers numbers through improved services, and, after years of under-investment, finances for new rolling stock, buses and coaches, and passenger facilities, Translink's corporate goals fit neatly into improving air quality, and environmental quality, in Belfast and throughout Northern Ireland.

Translink supports the actions of Belfast City Council and our fellow stakeholders in developing the Belfast City Air Quality Action Plan and welcomes Belfast City Council's continuing support for improvement initiatives brought forward by Translink. We look forward to working in partnership with Belfast City Council to create the necessary improvements.

Translink Specific Responses to the Consultation Process.

- Translink offers a range of discounted fares for schoolchildren, students, those out of work actively seeking employment and dependent on the circumstances, discounted or free travel is available for those with disabilities. Senior citizens can also apply to Translink for their free travel card.

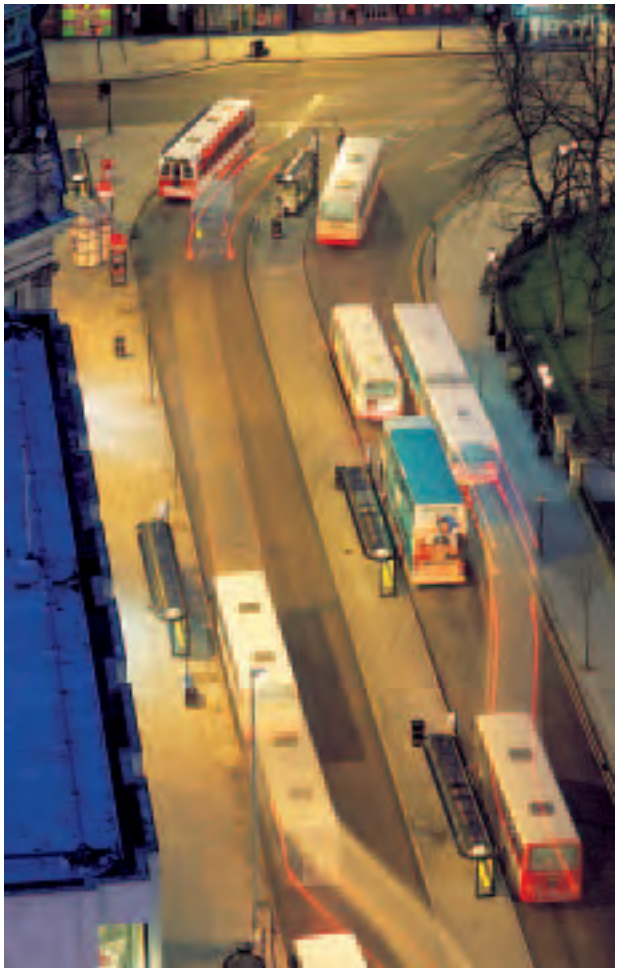
- The Marketing Division is responsible for the development, promotion, quality assurance and communication of all Translink services. Translink marketing activity is directed by a significant body of market research. The main studies are investigations into barriers experienced by passengers and non-passengers when using public transport, passenger expectations of the network's attributes and a price / demand elasticity model for all segments of the Translink bus and rail system. Therefore, marketing activities are targeted to address those barriers which have been identified as the most significant in preventing additional public transport usage and which are most readily within the control of Translink in the immediate to short term. Moreover, the marketing program focuses on the major brands and flagships within the Translink portfolio and specifically targets the most important market segments in terms of current and potential patronage, with discrete promotional packages.

- Regarding the medium to long term, marketing has a role within the overall strategic development of Translink in designing and refining significant new product developments, which address the structural weaknesses of the total product on offer. These quantum improvements in product are the means by which significant improvements in overall patronage and modal shift will be achieved.

- Finally, marketing has a quality assurance responsibility through the management of the Charter monitoring process and enactment of its results' implications.

- The issue of bus idling will be tackled through a marketing and awareness campaign throughout the Translink Bus Division. Posters and associated materials are currently being devised via our Bus Division Health, Safety and Environmental Manager and our Marketing Department, fully supported by the Bus Division General Manager.

Translink welcomes the responses and views made by the Tree Foundation, Woodland Trust, and Trees for Cities. It should be noted that as a contribution to the Health Impact Assessment process, Translink provided 80 trees for the two schools involved, which were planted with assistance from Belfast City Council.



Photograph Courtesy Roads Service

Chapter 7 - Monitoring and Reporting on the Implementation of Actions.

Monitoring and Reporting on the Implementation of Actions Proposed by Translink

As the primary provider of public transport services in Northern Ireland, Translink is uniquely placed to encourage the use of public transport as the preferred method of transport thus contributing to reduced road transport emissions. To make public transport attractive, we have a responsibility to satisfy the travelling public's demands relating to quality, reliability, cost and frequency of transport services. Through the Translink Corporate Plan 2004/2005, "Better Services for More People", we have demonstrated how we aim to achieve this, however, there is also a growing awareness that we should all contribute to playing a part in improving the quality of the environment in which we live. We want Translink to play its part and our Corporate Environmental Plan and Environmental Policy will assist us in achieving this goal.

With specific relation to air quality, the organisation has consistently sought to improve fuel efficiency and reduce emissions from its vehicles. Buses are purchased in line with the latest and best available emission standards and the promised future investment in new buses will ensure continuing environmental improvements.

Within the greater Belfast area, the new Metro service means better services for more people, improved reliability and frequency, more seats, and a simplified network. These measures along with the easy to use and understand timetable are intended to increase public transport usage and promote a modal shift from private to public transport. The organization is also well underway with its CAF (*Construcciones y Auxiliar de Ferrocarriles S. A.*) 3000 programme, which will see 23 new train sets entered into service by the end of 2005. The trains, like the buses, have also been purchased in line with the latest environmental requirements, and enable the withdrawal of much older and less efficient rolling stock.

Even with these achievements, our commitment as an environmentally responsible organisation will continue. We recognise that there are still improvements to be made and have recently formed a Senior Management Environmental Team to help co-ordinate programmes and plans. The Air Quality Action Plan is one such plan, which

will be tracked through the aforementioned committee ensuring its progress at all levels to the specified timetable.

Monitoring and Reporting on the Implementation of Actions Proposed by the Department for Regional Development Roads Service.

Since all the actions proposed by the Department for Regional Development Roads Service form part of the Belfast Metropolitan Transport Plan, progress with implementation is already routinely monitored by the Department for Regional Development. Summary reports detailing implementation progress are routinely circulated to district councils on a six-monthly basis. Consequently, the Department for Regional Development Roads Service feels that this approach represents the most appropriate route by which to monitor and report upon the implementation of its air quality action plan components.

Monitoring and Reporting on the Implementation of Actions Proposed by Belfast City Council.

To ensure that Belfast City Council's contributions to the air quality action plan are implemented by relevant dates and to provide a medium for other contributors to report on the implementation of their actions, the council has elected to convene the Air Quality Forum Action Planning Steering Group on a six-monthly basis. During meetings, steering group members will be able to present progress reports on their own proposals and consider the implementation of measures.

It should also be noted that Belfast City Council has also chosen to monitor and report progress with the air quality management process via its corporate plan. One of the Council's current priorities is the creation of a healthy city and it is considered that improving air quality is an integral part of this process. Therefore, although Belfast City Council actions will be delivered through various departments, the overall implementation of the action plan will be reviewed and reported on a six monthly basis via corporate plan updates.

Additionally, the Environment (Northern Ireland) Order 2002 places a statutory duty upon local authorities to undertake further periodic reviews and assessments of air quality in coming years. The Department of the Environment has already published a

Chapter 7 - Monitoring and Reporting on the Implementation of Actions. (Continued)

timetable for this process covering the period 2005 – 2010. As part of this review and assessment timetable, local authorities are required to submit progress reports to the Department in April 2007, 2008 and 2010 and complete screening or detailed assessments in the intervening years. The Department has also published guidance indicating that progress reports should include information on the implementation of the air quality action plan.

Therefore, Belfast City Council will monitor implementation of the air quality action plan via regular meetings of the Action Planning Steering Group and internal corporate reporting. It will also periodically report progress with implementation of the action plan to the Department via progress reports. For more information on the organisations represented on the Action Planning Steering Group, please refer to **Appendix 2.**

Photograph Courtesy Roads Service

Appendix 1 – Air Pollutants Addressed by the National Air Quality Strategy and the European Union Air Quality Framework Directive.

Particulate Material (PM_{10}).

Whilst the majority of pollutants considered within the National Air Quality Strategy are individual chemicals, particulate material is formed via a variety of methods and therefore may have a range of additional toxic chemicals entrained within it. Consequently, studies of particulate material within the United Kingdom have revealed three distinct methods of formation namely; primary particles formed from combustion processes, secondary particles formed from atmospheric sulphate and nitrate salts and coarse particles formed from soils, rocks or biological material.

Due to its wide-ranging composition, airborne particulate material is known to have a diverse range of detrimental health effects including impact upon both the cardiovascular and respiratory systems. Indeed, the Expert Panel on air Quality Standards has stated that exposure to sustained high concentrations of particulate material may even lead to premature deaths amongst those with pre-existing lung or heart conditions. Consequently, a 24-hour mean objective of 50 μgm^{-3}, not to be exceeded more than 35 times per annum has been established together with an annual mean of 40 μgm^{-3}, both to be achieved by the 31st December 2004. Recently, a longer-term objective 24-hour mean objective of 50 μgm^{-3}, not to be exceeded more than 7 times per annum and an annual mean of 20 μgm^{-3} have also been established however, these are objectives are not currently included within the regulations for local air quality management.

Nitrogen Dioxide.

All combustion processes produce a range of nitrogen oxides including nitric oxide and nitrogen dioxide, which are collectively referred to as NOx. Within the United Kingdom, emissions from road transport are the predominant source of nitrogen dioxide, which is known to have adverse health effects.

At relatively high concentrations, nitrogen dioxide acting as an oxidising agent is known to cause inflammation of the airways and evidence suggests that long-term exposure may also detrimentally affect lung function. Consequently, two air quality objectives have been established for nitrogen dioxide, which reflect these characteristics; a 1-hour objective of

Appendix 1 – Air Pollutants Addressed by the National Air Quality Strategy and the European Union Air Quality Framework Directive. (Continued)

200 µgm^{-3} not to be exceeded more than 18 times per annum and an annual average of 40 µgm^{-3}, both to be achieved by the 31st December 2005.

Sulphur Dioxide.

Within the United Kingdom, the principal source of sulphur dioxide is the combustion of fossil fuels including coal and heavy fuel oils.

Whilst sulphur dioxide is a gas under normal temperature and conditions, it is soluble in water forming an acidic solution that can be oxidised to sulphuric acid. Due to these acidic properties, sulphur dioxide can cause constriction of the airways by affecting the nerves in the respiratory tract, especially amongst those people suffering from asthma or lung disease. The effects of exposure to sulphur dioxide occur almost immediately and consequently a range of air quality objectives have been established to protect the general public over varying exposure periods; a 15 minute mean of 266 µgm^{-3} not to be exceeded more than 35 times per annum, to be achieved by the 31st December 2005, a 1 hour mean of 350 µgm^{-3} not to be exceeded more than 24 times per annum and a 24 hour mean of 125 µgm^{-3} not to be exceeded more than 3 times per annum both to be achieved by the 31st December 2004.

Carbon Monoxide.

Carbon monoxide is a gas, formed during the incomplete combustion of carbonaceous fossil fuels. When exposed to carbon monoxide, the human body preferentially forms carboxyhaemoglobin within blood thus reducing the body's ability to transport oxygen to the tissues and preventing vital cellular biochemical reactions. Members of the public, who already have pre-existing circulatory disorders, are particularly at risk from exposure to carbon monoxide.

The Expert Panel on Air Quality Standards has established a standard of 11.6 mgm^{-3} to be measured as a maximum daily running 8-hour mean and this has been adopted as the National Air Quality Strategy objective to be achieved by the 31st December 2003. The objective is designed to safeguard both the general public and those susceptible individuals with circulatory problems and is regarded as a level at which harm is unlikely to occur.

Appendix 1 – Air Pollutants Addressed by the National Air Quality Strategy and the European Union Air Quality Framework Directive. (Continued)

Benzene.

Benzene is an aromatic hydrocarbon compound, which is primarily formed in the environment by the combustion of petroleum fuels in motor vehicles. Benzene is naturally broken down in the atmosphere however; this process occurs over a period of days and as a result of this persistency, the majority of population exposure in the United Kingdom arises from the air that we breathe.

Benzene is readily absorbed into the body when breathed into the lungs and its chemical properties mean that it is then preferentially absorbed into fatty tissues including the brain and bone marrow. Studies of industrial workers exposed to benzene have demonstrated an increased risk of leukaemia and therefore benzene is classed as a genotoxic carcinogen.

As a result of benzene's carcinogenic nature, no absolutely safe ambient level can be established. Nonetheless, the Expert Panel on Air Quality Standards has suggested that a running annual mean of 16.25 μgm^{-3} represents a particularly small risk to the population as a whole. Therefore, this level has been adopted as the National Air Quality Strategy objective to be achieved by the end of 2003. However, an objective of 3.25 μgm^{-3} has also been recently established affording the Northern Ireland population even greater long-term protection. This objective is to be complied with by the end of December 2010.

1, 3-Butadiene.

The dominant source of 1,3-butadiene within the environment is the combustion of petroleum fuels in motor vehicles although commercial liquid petroleum gases also contain significant quantities. Under ambient conditions, 1,3-butadiene is a gas and therefore human exposure principally arises from the air, which we breathe.

Short-term exposure to 1,3-butadiene results in irritation of the eyes, nose and throat however, long term exposure results in cancer of the lymphoid and blood forming tissues, lymphomas and leukaemias. Consequently, it is classed as a genotoxic carcinogen.

The Expert Panel on Air Quality Standards has again recognised that no completely safe ambient level can be established but has set a standard of 2.25 μgm^{-3}, measured as a running annual mean. This has been adopted as the objective for the National Air Quality Strategy to be achieved by the end of 2003.

Appendix 1 – Air Pollutants Addressed by the National Air Quality Strategy and the European Union Air Quality Framework Directive. (Continued)

Lead.

Since the withdrawal of leaded fuel from sale in January 2000, ambient lead emissions have been largely confined to specific industrial processes. Exposure to high concentrations of lead results in disruption of haemoglobin formation, which affects the body's ability to transport oxygen. Lead can also have a detrimental effect upon kidneys, gastrointestinal tract, joints, and the reproductive system.

Whilst an objective of 0.5 μgm^{-3} has been established, to be achieved by the end of 2004, the government has also recognised that ambient levels should be reduced to as low a level as practicable. Therefore, a second objective of 0.25 μgm^{-3} has been established and is to be achieved by the end of 2008.

Ozone.

Ozone is not directly formed via any man made process, but is a by-product of atmospheric chemical reactions under the action of sunlight. Atmospheric ozone is formed via the action of ultra violet light upon oxygen and as such, it acts as an atmospheric barrier to ultra violet radiation. At lower atmospheric levels, ozone can also be formed by the interaction of nitrogen oxides and volatile organic chemicals released during combustion. Production can also be stimulated by the presence of greenhouse gases such as methane and carbon monoxide.

Ozone is a persistent chemical and can remain in the atmosphere for prolonged periods. Consequently, ozone measured at a particular site may have been formed at another location and been transported there by prevailing winds. Therefore, a local authority, which identifies elevated concentrations of ozone within its area, may be unable to introduce suitable local control measures to regulate its formation. The government has recognised the problem of transboundary pollution and has committed the United Kingdom to achieving the national emission limits for 'greenhouse gases' as outlined within the Gothenburg Protocol. Reductions in 'greenhouse gas' emissions are expected to have an appreciable effect upon the formation of summertime smogs.

Consequently, although ozone can have a detrimental health effect upon the public, it has not been included within the current regulations for local air quality management.

Appendix 1 – Air Pollutants Addressed by the National Air Quality Strategy and the European Union Air Quality Framework Directive. (Continued)

Relatively short term exposure to ozone results in inflammation of the eyes and nose whereas longer-term exposure over a period of hours can lead to damage of the respiratory tract.

The Expert Panel on Air Quality Standards recommended an air quality objective for ozone of 100 μgm^{-3} measured as a running 8-hour mean, not to be exceeded more than 10 times per annum and to be achieved by the end of 2005. The panel concluded that if this objective is achieved, then the highest 8-hour concentration will not exceed 200 μgm^{-3}, a level at which significant adverse health effects have been observed.

The National Air Quality Strategy Objectives are summarised in the following table together with the date by which each is to be achieved.

Photograph Courtesy Roads Service

Appendix 1 – Air Pollutants Addressed by the National Air Quality Strategy and the European Union Air Quality Framework Directive. (Continued)

Pollutant	Concentration	Assessed As	Date to be Achieved
Benzene (C_6H_6)	16.25 μgm^{-3}	Running annual mean	31st December 2003
	3.25 μgm^{-3}	Running annual mean	31st December 2010
1,3-butadiene (C_4H_6)	2.25 μgm^{-3}	Running annual mean	31st December 2003
Carbon monoxide (CO)	11.6 mgm^{-3}	Maximum running 8 hour mean	31st December 2003
Lead (Pb)	0.5 μgm^{-3}	Annual Mean	31st December 2004
	0.25 μgm^{-3}		31st December 2008
Nitrogen Dioxide (NO_2)	200μgm^{-3} not to be exceeded more than 18 times per annum.)	1 hour mean	31st December 2005
	40 μgm^{-3}	Annual Mean	31st December 2005
Particulate Material (PM_{10})	50 μgm^{-3} (not to be exceeded more than 35 times per annum.)	24 hour mean	31st December 2004
	40 μgm^{-3}	Annual Mean	31st December 2004
	50 μgm^{-3} (not to be exceeded more than 7 times per annum.)	24 hour mean	31st December 2010
	20 μgm^{-3}	Annual Mean	31st December 2010
Sulphur Dioxide (SO_2)	350 μgm^{-3} (not to be exceeded more than 24 times per annum.)	1 hour mean	31st December 2004
	125 μgm^{-3} (not to be exceeded more than 3 times per annum.)	24 hour mean	31st December 2004
	266 μgm^{-3} (not to be exceeded more than 35 times per annum.)	15 minute mean	31st December 2005
Ozone (O_3)	100 μgm^{-3} (not to be exceeded more than 10 times per annum.)	Daily maximum of running 8 hour means	31st December 2005

N.B. The air quality strategy objective for ozone and the 2010 objectives for particulate material are currently provisional and not included within the current regulations for local air quality management.

Appendix 1 – Air Pollutants Addressed by the National Air Quality Strategy and the European Union Air Quality Framework Directive. (Continued)

The European Union Air Quality Framework and Daughter Directives also prescribe a series of limit values for ambient air pollutants, which all member states must meet. Therefore, the National Air Quality Strategy has a key role to play in helping the United Kingdom government to meet its responsibilities under these directives. The current European Union limit values are summarised in the following table together with the date by which each must be achieved.

Pollutant	Concentration	Assessed As	Date to be Achieved
Benzene (C_6H_6)	5 μgm^{-3}	Annual Mean	1st January 2010
Carbon monoxide (CO)	10 mgm^{-3}	Maximum daily 8 hour mean	1st January 2005
Lead (Pb)	0.5 μgm^{-3}	Annual Mean	1st January 2005
Nitrogen Dioxide (NO_2)	200μgm^{-3} (not to be exceeded more than 18 times per annum.)	1 hour mean	1st January 2010
	40 μgm^{-3}	Annual Mean	1st January 2010
Particulate Material (PM_{10})	50 μgm^{-3} (not to be exceeded more than 35 times per annum.)	24 hour mean	1st January 2005
	40 μgm^{-3}	Annual Mean	1st January 2005
	50 μgm^{-3} (not to be exceeded more than 7 times per annum.)	24 hour mean	1st January 2010
	20 μgm^{-3}	Annual Mean	1st January 2010
Sulphur Dioxide (SO_2)	350 μgm^{-3} (not to be exceeded more than 24 times per annum.)	1 hour mean	1st January 2005
	125 μgm^{-3} (not to be exceeded more than 3 times per annum.)	24 hour mean	1st January 2005
Ozone* (O_3) *Concentrations are target values, which should be met as far as possible by the specified date.	120 μgm^{-3} (not to be exceeded more than 25 times per annum averaged over 3 years.)	Maximum daily 8 hour mean	2010
	120 μgm^{-3}	Daily maximum of running 8 hour mean within a calendar year	2020 Long Term Objective

Appendix 2 – Organisations Represented on the Belfast Air Quality Action Planning Steering Group.

1. Belfast City Council.
2. Belfast Education and Library Board.
3. Department for Regional Development (Northern Ireland) Roads Service.
4. Department of Health, Social Services and Public Safety.
5. Department of the Environment Planning Service.
6. Eastern Health and Social Services Board.
7. Energy Saving Trust.
8. Freight Transport Association.
9. North and West Belfast Health and Social Services Trust.
10. Northern Group Systems Environmental Health.
11. Northern Ireland Housing Executive.
12. Translink.

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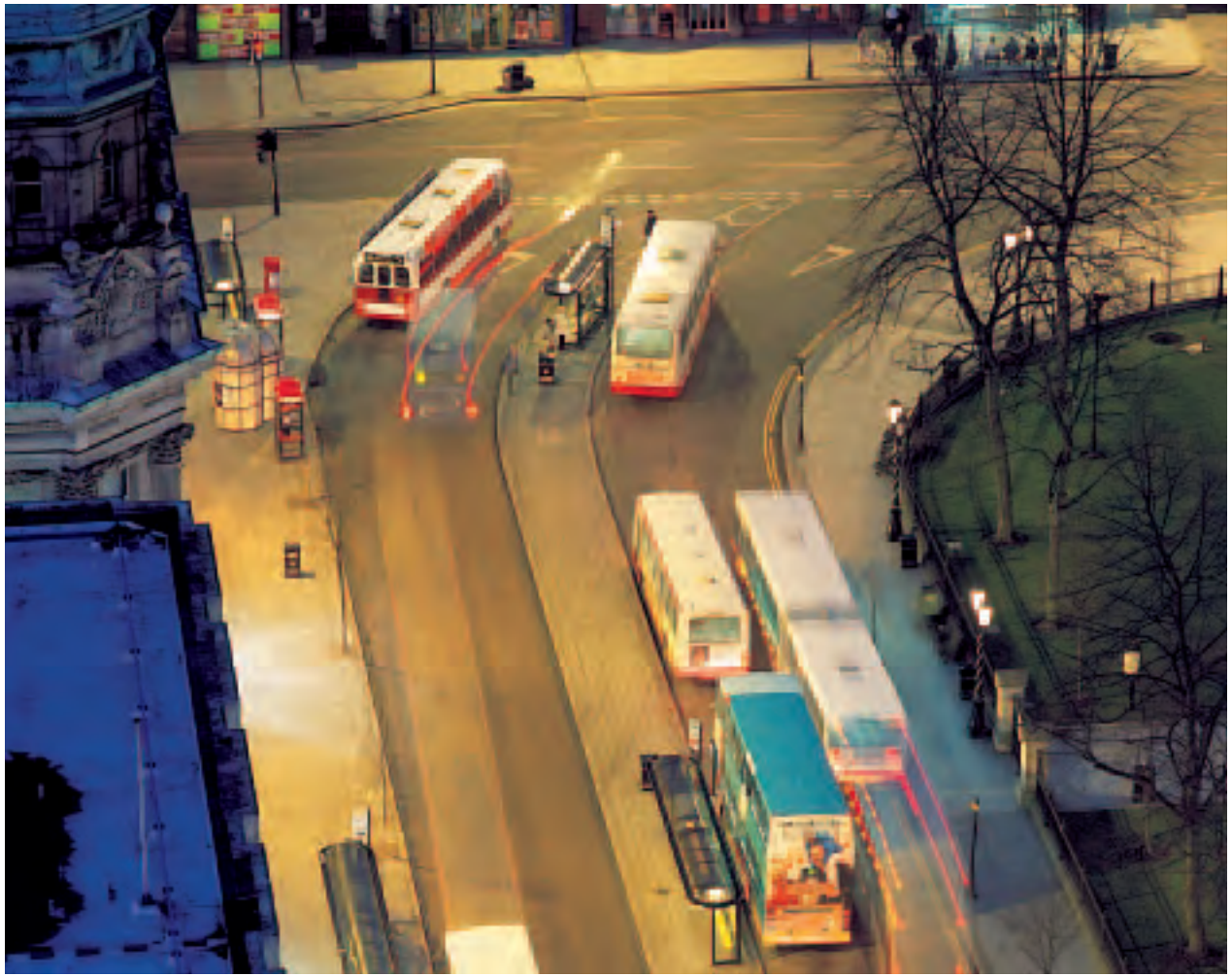
General Consumer Council for Northern Ireland. (2002). Gas Watch. Consumers' Experiences of Natural Gas in Northern Ireland. General Consumer Council for Northern Ireland: Belfast.

Goodwin, P. Cairns, S. Sloman, L. Newson, C. Anable, J. Kirkbride, A. (2004). Smarter Choices – Changing the Way We Travel. Final report of the research project: 'The influence of soft factor interventions on travel demand'. Department for Transport: London.



Photograph Courtesy Roads Service

Glossary.

AQMA	Air quality management area.
AURN	Automatic urban and rural network.
BMAP	Belfast Metropolitan Area Plan.
BMTP	Belfast Metropolitan Transport Plan.
CAF	*Construcciones y Auxiliar de Ferrocarriles* - manufacture and supply of equipment and components for railway systems.
CPT	Confederation of Passenger Transport
CNG	Compressed natural gas.
CO	Carbon monoxide.
DMRB	Design Manual for Roads and Bridges.
DoE	Department of the Environment.
DRD	Department for Regional Development.
EWAY	Rapid transit scheme.
Hotspot	Narrowly defined geographical area within an air quality management area where pollutant concentrations are predicted to exceed National Air Quality Strategy Objectives.
ITS	Intelligent transport system.
LAQM.PGNI(03)	Local air quality management policy guidance.
LAQM.TG(03)	Local air quality management technical guidance.
LPG	Liquefied petroleum gas.
mgm^{-3}	milligrammes ($1x10^{-3}$ grammes) per cubic metre.
MOVA	Microprocessor optimised vehicle actuation.
NAEI	National Atmospheric Emissions Inventory.
NAQS	National Air Quality Strategy.

Glossary. (Continued)

NETCEN	National Environmental Technology Centre.
NITHC	Northern Ireland Transport Holding Company.
NO	Nitric oxide / nitrogen monoxide.
NO_2	Nitrogen dioxide.
NOx	Nitrogen oxides.
O_3	Ozone.
OFREG	Office for the Regulation of Electricity and Gas.
PM_{10}	Particulate material with a diameter of less than 10µm.
QBC	Quality bus corridor.
Ribbon	A linear geographical area along an arterial transport route.
RTS	Northern Ireland Regional Transportation Strategy 2002 – 2012.
SCOOT	Split cycle offset optimisation technique.
SO_2	Sulphur dioxide.
Sustrans	Sustainable transport charity.
μgm^{-3}	microgrammes ($1x10^{-6}$ grammes) per cubic metre.
ULSD	Ultra-low sulphur diesel.
UTC	Urban traffic control.

Web Links.

Belfast City Council.
http://www.belfastcity.gov.uk/

Belfast Metropolitan Area Plan.
http://www.planningni.gov.uk/AreaPlans_Policy/Plans/BMA/BMAP_Home.htm

Belfast Metropolitan Transport Plan.
https://pronet.wsatkins.co.uk/Bmtp/

CAF (Construcciones y Auxiliar de Ferrocarriles S. A.)
http://www.caf.es/ingles/productos/proyecto.php?id=532&cod=5&sec=desc

Department for Environment, Food and Regional Affairs.
http://www.defra.gov.uk/

Department for Regional Development.
http://www.drdni.gov.uk/

Department for Regional Development (Northern Ireland) Roads Service.
http://www.roadsni.gov.uk/

Environment and Heritage Service, Northern Ireland.
http://www.ehsni.gov.uk/

Health Promotion Agency.
http://www.healthpromotionagency.org.uk

National Society for Clean Air and Environmental Protection.
http://www.nsca.org.uk/

National Atmospheric Emissions Inventory.
http://www.naei.org.uk/

Northern Ireland Planning Service.
http://www.planningni.gov.uk/

Regional Transportation Strategy for Northern Ireland 2002 - 2012
http://www.drdni.gov.uk/DRDwww_Strategies/current.asp?id=str17

Sustrans.
http://www.sustrans.org/

Translink.
http://www.translink.co.uk/

United Kingdom National Air Quality Information Archive.
http://www.airquality.co.uk/

Belfast City Council
Pollution Control Section
Cecil Ward Building
Belfast