

**XXIVth WORLD ROAD CONGRESS
MEXICO 2011**

UNITED KINGDOM - NATIONAL REPORT

STRATEGIC DIRECTION SESSION STA

**MITIGATING THE IMPACT OF THE ROAD SYSTEM
ON CLIMATE CHANGE**

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Abstract

The World Road Association (UK) Executive Committee has arranged for the preparation of this National Report for Strategic Direction Session A of the Mexico World Congress in 2011.

For transport, responsibility for certain high level and legislative issues (for example, vehicle safety) is retained by the UK Government and administered by the Department for Transport (DfT). However, most transport policy and operations are the responsibility of devolved administrations in Scotland, Wales and Northern Ireland. In England this responsibility remains with the UK Government in the form of DfT. Consequently, the road networks are managed by the following organisations:

- England: the Highways Agency (HA), an executive agency of DfT is responsible for the trunk road network, with the remaining network managed by local authorities;
- Scotland: Transport Scotland, the Scottish Government's transport agency, is responsible for the trunk road network with the remaining network managed by local authorities;
- Northern Ireland: the Roads Service, an executive agency of the Northern Ireland Department for Regional Development (DRD), is the sole authority for the public road network; and
- Wales: the Welsh Assembly Government is responsible for the trunk road network, with local authorities taking responsibility for local roads.

This National Report compiles information from all four organisations in order to achieve a broad and inclusive perspective on the challenges that they face in the coming years and their approaches to meeting those challenges.

This paper specifically takes into account the activities of all four jurisdictions with respect to mitigating the climate change impacts on the trunk road network during design, construction, operation and maintenance.

1. Introduction

The document sets out the key drivers, baseline conditions and targets prevailing in each devolved administration, along with a summary of initiatives implemented by each authority with respect to climate change mitigation.

The devolved governments of the UK operate within a unifying legislative and policy agenda established by the UK Government. The Government has adopted a strategic framework for managing climate change impacts in the UK, which provides the foundation from which all four administrations must operate. Relevant policy instruments include:

- Climate Change Act 2008¹
This legally binding Act creates a new approach to managing and responding to climate change across the UK, by setting ambitious targets for an 80% reduction in the UK's greenhouse gas emissions below 1990 levels by 2050. An interim reduction of 26% should be achieved by 2025. The Act provides for the institutional framework to

¹ UK Climate Change Act 2008. Available at http://www.opsi.gov.uk/acts/acts2008/ukpga_20080027_en_1.

be strengthened in support of this goal, looks to enhance the UK's ability to adapt to climate change, and establishes accountability to Parliament and the devolved legislatures. The Act introduces five year "carbon budgets", which define an emissions pathway to the 2050 target by limiting the total greenhouse gas emissions allowable in each five year period from 2008.

The 2008 Climate Change Act is significant for the agencies, as it requires the measurement and reduction of the carbon footprint associated with direct operational activities as well as in supply chains and "managed operations".

- Low Carbon Transport: A Greener Future – A Carbon Reduction Strategy for Transport²

This strategy sets the course towards a future low carbon transport system. It is intended to enable the UK to meet the requirements of the carbon budgets set under the Climate Change Act, and sets actions that the DfT will take to deliver those emissions cuts. The strategy describes how 85 million tonnes of CO₂ from domestic transport can be saved from 2018-22 by supporting a shift to new technologies and fuels, promoting lower carbon choices and using market mechanisms to encourage a shift to lower carbon transport.

- Transport Carbon Reduction Delivery Plan³

This plan aims to fulfil the commitments made in 'Low Carbon Transport: A Greener Future', by detailing who will deliver the carbon reduction policies and how. Alongside the accompanying 'Climate Change Adaptation Plan for Transport 2010-12', the document provides a detailed action plan to tackle climate change in the transport sector.

Other important national legislation which impacts upon the agencies includes the Low Carbon Transition Plan⁴ – the national strategy for moving towards an energy efficient, low carbon economy and reducing carbon emissions by 34% by 2020 in all private and public sectors of the UK, compared with 1990 levels.

The 2008 Strategy for Sustainable Construction⁵ furthermore commits to a range of construction-related targets, including for 25% of construction materials to be "responsibly sourced" by 2012.

Whilst these instruments influence the activities of all four roads administrations, they are variously interpreted and applied, as described in the following sections.

2. England : The Highways Agency

2.1. Drivers

The current HA Business Plan states that the Agency will *"ensure that we are limiting the negative impact that the network has on the environment and surrounding communities, and the solutions we deliver are consistent with the Department for Transport's goals for a sustainable transport system"*.

² Department for Transport, 2009. Available at <http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/pgr/sustainable/carbonreduction/?view=Standard>. Please note that this strategy is currently under review by the new UK Government.

³ DfT, 2010. Please note that this plan is currently under review by the new UK Government.

⁴ Department of Energy & Climate Change, 2009. Available at http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx.

⁵ Department for Business, Innovation & Skills, 2008. Available at <http://www.berr.gov.uk/policies/business-sectors/construction/sustainable-construction>.

Sustainable development principles are embedded within the HA Business Plan, a Sustainable Development Action Plan (SDAP), and a Climate Change Adaptation Strategy.

These commitments are not limited to the HA itself, but extend to the HA's entire supply chain. The HA Procurement Strategy 2009 recognises that *"Managing sustainability will become a key differentiator in the supply chain"*. This statement is recognised in HA corporate targets, as outlined below.

2.2. Baseline

The HA has developed a quantitative carbon accounting tool to enable the Agency to identify the emissions baseline (carbon footprint) associated with its activities. The objective is to provide a baseline from which targets can be set and emissions reductions realised.

The tool takes account of all greenhouse gas emissions for which the HA is responsible (either directly or indirectly through the supply chain) arising from construction, maintenance and internal operational activities, and supplies a methodology and reporting mechanism for ongoing monitoring and management of emissions within each of the HA's reporting areas.

2.3. Targets

The HA is committed to contributing to the UK Government's emissions reduction targets. The Agency's Business Plan also establishes HA-specific targets for 2010-11, including a 3% reduction in carbon emissions from direct energy and fuel usage, network energy and business travel, compared with 2008-9. This goal is in line with the UK targets. Supply chain targets are likewise established, as follows:

- All key Agency suppliers to participate in the Carbon Disclosure Project for their corporate operations by 2010;
- 15% reduction in carbon emissions from construction and maintenance processes and associated transportation by 2012 (compared with 2008 levels); and
- Key suppliers to demonstrate a positive contribution for trunk road related activity, in line with UK and Highways Agency carbon reduction targets.

2.4. Initiatives

The HA has instigated a series of initiatives to reduce the climate change impacts of its operations, in terms of reduced energy consumption, reduced output of carbon emissions, and sourcing sustainable materials. Initiatives are applicable to both strategic and operational elements of the HA's work, including:

- Carbon Framework
Together with Forum for the Future, Network Rail and supply chain partners, the HA have developed a framework for applying a whole lifecycle approach to carbon reduction in major infrastructure development and maintenance projects. The framework supports clients and project leaders to identify, manage and reduce carbon across an assumed 60-year lifetime of a project, including defining the project boundaries, categorising and quantifying emissions, developing management strategies, and creating a feedback loop for lessons learned. The framework is aligned to project management processes for road projects.

- **Midnight Switch-off**

The HA has identified road lighting as one of the greatest contributors to the Agency's operational carbon footprint. An initiative has commenced to switch off road lighting on selected sections of the motorway network between midnight and 5am, when traffic flows are low and safety would not be compromised. The HA estimates that switching off lighting could see network operational energy usage and carbon emissions reduced by 40%.

Road lighting standards were revised in 2007 to ensure that road lighting is only installed where necessary, and where capital and operating costs represent value for money compared with the environmental impact.

Looking to the future, the HA has recognised the need to how carbon considerations can be integrated into investment decisions. The baselining work is considered valuable to inform whole life design decisions.

3. Scotland : Transport Scotland

3.1. Drivers

Within the context of UK climate change policy and legislation, the Scottish Government has developed specific instruments applicable to Scotland. The Climate Change (Scotland) Act 2009⁶ sets a high level target of an 80% reduction in greenhouse gas emissions by 2050 and an interim target of 42% reduction by 2020.

Annual emissions reduction targets must be set in secondary legislation. The Act also requires that Ministers lay a report before the Scottish Parliament setting out their proposals and policies for meeting these targets. The first batch of annual targets, for 2010-2022, was due to be set by 1 June 2010 this year but on 27 May the Scottish Parliament rejected the draft order laid by Ministers. The Scottish Ministers hope to be able to lay a new annual targets order in September 2010 and it intended that the Report on Policies and Proposals be laid in draft before the Parliament as soon as practicable afterwards.

3.2. Baseline

In 2006, transport in Scotland – including international aviation and shipping – accounted for 15.0 mega-tonnes of carbon dioxide equivalent (MtCO₂e), or 24.4% of total greenhouse gas emissions.

The demand for transport in Scotland, in terms of vehicle trips, is forecast to increase by 19% between 2005 and 2022, with associated increases in road transport emissions.

3.3. Targets

The Scottish legislation does not set sectoral emissions reduction targets, but Transport Scotland recognises the fundamental role of the transport sector in contributing to overall goals. It has been estimated that transport emissions should be reduced by 3.3 MtCO₂e

⁶ Climate Change (Scotland) Act, 2009. Available at <http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact>.

(34% overall Scottish target) or 4.6 MtCO₂e (42% Scottish target) in 2020, compared with 2006 transport emissions levels.

3.4. Initiatives

The Scottish Government's Climate Change Delivery Plan⁷ sets out high level measures to meet Scotland's climate change targets in the long term. Transport is seen as one of the more challenging and costly sectors in which to reduce emissions. The target is an almost complete decarbonisation of road transport by 2050, with significant progress by 2030 through adoption of electric vehicles. A number of initiatives have been commenced, including:

- Scoping Policy Options

In 2009, the Scottish Government commissioned the University of Aberdeen, with Atkins, to consider the range of devolved policy options that could be implemented to reduce carbon emissions and quantify impact and cost. Their report⁸ suggests that Car Demand Management has the greatest potential to reduce emissions. This category of measures includes travel planning (workplace travel plans, individual travel marketing, etc.) and fiscal options that offer significant abatement potential, especially due to the scale of the target population. The analysis suggested that many of the infrastructure policy options in this category offer less potential, and that schemes involving extensive investment in the public transport network are generally less beneficial in abatement terms. It was also suggested that the full abatement potential of many technology-based measures would take longer to be realised, as turnover of the fleet leads to improvements in the average efficiency of vehicles over time.

The Scottish Government has drawn on this report to prepare a long term package of emission reduction measures for the transport sector.

- Intelligent Transport Systems

A key component of the transition to a low carbon transport system is the use of Intelligent Transport Systems (ITS) to operate the trunk road network efficiently. Systems to actively manage traffic can result in improved traffic flows and more reliable journey times. This is more cost effective than building new capacity and can reduce carbon footprint by improving traffic flow and avoiding stop-start conditions. Transport Scotland has invested over £28million in an ITS Delivery Plan.

- Design & Construction Procedures

With regard to the trunk road and motorway network, the Scottish Government's ambition is to ensure that climate change mitigation is embedded throughout the delivery cycle: including road design, construction, maintenance and operation. Investment in new infrastructure is still necessary to support the Scottish economy. This is being progressed in a way that seeks to minimise the carbon footprint and optimise public transport and cycling facilities to encourage modal shift. A number of initiatives during construction are seeking to increase the percentage of recycled/reused construction materials, increase the proportion of waste materials recycled/reused, and trialling new maintenance techniques. For example, a 'crack and seat' technique of pavement repair is being trialled on pavements containing a

⁷ *Climate Change Delivery Plan: Meeting Scotland's Statutory Climate Change Targets*, 2009. Available at <http://www.scotland.gov.uk/Publications/2009/06/18103720/0>.

⁸ *Mitigating Transport's Climate Change Impact in Scotland (MTCCI)*, 2009. Available at: www.scotland.gov.uk/Resource/Doc/282791/0085548.pdf.

cement-bound base. This method is quicker and more cost effective than conventional procedures and inhibits the reoccurrence of reflection cracking.

4. Northern Ireland : Northern Ireland Roads Service

4.1. Drivers

The Northern Ireland Executive has adopted a Sustainable Development Strategy, which sets a number of objectives with respect to delivering policy and projects more sustainably. The UK Climate Change Act is a key driver for action.

4.2. Baseline

In January 2010, the Department for Regional Development (DRD) confirmed that road transport is the largest source of carbon emissions in Northern Ireland, accounting for 29% of emissions in 2007⁹. The baseline report highlighted that total greenhouse gas emissions from road transport increased by 47% between 1990 and 2007. The private car remains the largest contributor to road transport emissions, although 50% of the increase in emissions is due to the freight sector.

4.3. Targets

Through the 2008 Programme for Government, the Northern Ireland Executive has set out its commitment to reduce Northern Ireland's greenhouse gas emissions by 25% below 1990 levels, by 2025. This has since been superseded by the 2008 UK Climate Change Act, which stipulates a 26% reduction by 2025).

4.4. Initiatives

A range of mechanisms is being implemented to combat the climate change impacts of transport in Northern Ireland, including construction, education, promotion of sustainable transport, cleaner technology, and enforcement.

Northern Ireland's transport policy is set out in the 2002 Regional Transportation Strategy¹⁰ (RTS), which identified strategic investment priorities for Northern Ireland and the Roads Service. Detailed Transport Plans were prepared to implement the strategy in Belfast, and at regional and sub-regional levels. Roads Service plays a key role in implementing these Transport Plans.

Significant emphasis is placed on facilitating modal shift. The Roads Service contributes to this through:

- A Local Transport and Safety Measures programme to improve road safety for non-motorised users;
- Delivering bus priority measures, such as bus lanes and expanded park and ride schemes, together with the dominant public transport provider, Translink;
- A Strategic Road Improvement Programme to improve journey times on critical stretches of the motorway and trunk roads, removing bottlenecks and congestion.

⁹ *Reducing Greenhouse Gas Emissions from Road Transport: Baseline Report 1990-2007*. Department for Regional Development, NI.

¹⁰ Available at

http://roadimprovements.roadsni.gov.uk/index/strategic_proposals/regional_transport_strategy_for_northern_ireland.htm.

Roads Service has also established itself as a Centre of Procurement Expertise for construction. A Construction Sustainability Action Plan has been implemented, which sets out environmental performance standards for contractors. Weighting is given to sustainability within contract evaluations, and targets are set for environmental considerations. A number of actions have been implemented to reduce energy and emissions throughout the project lifecycle:

- Roads Service is currently achieving a minimum of 10% in material value of recycled or reused content used on average across all projects;
- Solar power is being used for traffic sign lighting applications and traffic counting equipment; and
- Roads Service has signed up to the 'Halving Waste to Landfill' initiative, with a 2012 target.

The DRD is working on a Revised Regional Transportation Strategy to address the need to change travel behaviour, reprioritise road space and encourage modal shift. The Revised Strategy will address traffic-related carbon emissions and how to use the existing transportation system more effectively to accommodate future travel demands without additional environmental impacts. The DRD is working with the Department of the Environment and other stakeholders to assess the possibility of making a consortium bid to provide electric vehicle infrastructure and encourage a switch to electric vehicles.

5. Welsh Assembly Government

5.1. Drivers

The Welsh Assembly Government has a duty under section 79 of the Government of Wales Act 2006 to make a scheme setting out how it intends to promote sustainable development in the exercise of its functions. The duty also requires Welsh Ministers to:

- Keep the sustainable development scheme under review and from time to time remake or revise it;
- Publish the sustainable development scheme;
- Publish each year a report of how the proposals set out in the sustainable development scheme were implemented; and
- Following the election of a new administration, publish a report containing an assessment of how effective the proposals set out in the Scheme have been in promoting sustainable development.

The Welsh Assembly Government's current sustainable development scheme, One Wales, One Planet was published in May 2009. Transport's contribution to the delivery of the sustainable vision for Wales is set out in the National Transport Plan published in March 2010. For the motorway and trunk road network there is a recognition that it requires 'targeted and co-ordinated investment in order to improve journey time reliability and enhance road safety' and this must be carried out in a 'sustainable manner'.

5.2. Target

One Wales the programme for government of the current administration aims to achieve annual carbon reduction-equivalent emissions reductions of 3% per year by 2011.

5.3. Initiatives

The long term aim is for a decarbonised transport system in Wales. However in the short term the Welsh Assembly Government will be working to provide realistic alternatives that enable people to choose the more healthy and sustainable modes of travel. This will be achieved by:

- Improving walking and cycling infrastructure;
- Making best use of the existing road network adopting innovative approaches where appropriate such as high occupancy vehicle lanes, hard shoulder running, variable speed limits and public transport priority lanes;
- Establishing sustainable travel centres across Wales. These will build on the experience of the Cardiff sustainable travel centre initiative by ensuring better integration at interchanges and the development of strategic, multi-modal interchanges that also support park and ride, park and share and cycling. As part of the sustainable travel centre initiative, improvements will be made in the provision of travel information through for example, increased awareness of Traveline Cymru and where evidence suggests it will be effective, make increasing use of personalised travel planning;
- Integrating the impact of travel into wider decision making acknowledging that the location of key site and services has a direct influence on the need for travel, often compounding the pressure on the transport network during peak periods. The role of transport planning will be strengthened at the national, regional and local levels, during the planning of new policies, schemes and developments. In particular transport planning will play a key role in the development of 21st Century School plans and the transformation of post 16 education;
- Improving bus services: promoting Bus Quality Partnerships and Quality Contracts to enhance quality, reliability, punctuality and safety; working with the community transport sector; supporting initiatives such as demand-responsive 'dial-a-ride' Bwcabus service in Carmarthenshire; producing statutory guidance to local authorities on the civil enforcement of bus lane and moving traffic contraventions and developing the regulatory framework for bus services and community transport, and
- Improving rail services: removing on a priority basis high steps between platforms; refurbishing stations and their interchanges in partnership with stakeholders; refurbishing rolling stock to improve the actual and perceived security, level of comfort and journey times on trains; making provision for cycles on new and existing services; work in conjunction with the DfT on the programme for electrification of the Great Western Main Line and on the business case for electrification of further lines in Wales; and examine the feasibility of reopening disused railway lines.

6. Conclusion

The importance of the transport network to achieving national emissions reduction targets is irrefutable, and fundamentally linked to all stages of the design, construction, operation and maintenance of roads; from the embedded carbon of construction materials, to the direct emissions from motorised vehicles, to the energy consumed in operating and maintaining a safe and reliable network.

The UK Government has established a strong policy framework to drive climate change mitigation in the devolved administrations. There are significant challenges for all parties

in achieving emissions reductions whilst simultaneously providing the infrastructure to service a growing demand for travel. However, all four roads authorities are responding well to this framework. Progress has been made to understand and quantify the key sources of emissions related to roads, and the authorities are aspiring to meet UK emissions reduction targets via a number of measures, as appropriate to their administrative context.

Commonalities between the four approaches include:

- Identification of materials and waste as significant sources of embedded carbon, and the need to manage these areas of road design and construction;
- Identification of modal shift towards lower carbon travel options (walking, cycling, public transport) as a key method to reduce transport emissions, and the need to provide facilities to support this shift; and
- Identification of the potential for new technologies to achieve emissions reductions, via mechanisms including Intelligent Transport Systems, electric vehicles, and on-site renewable energy generation.

As the new UK Government sets out its aspirations and strategies for future energy and climate change policy it is envisaged that additional impetus may be applied to the low carbon agenda, which the roads authorities will need to address. There is no single answer to the climate change challenge, and it is likely that the current state of play represents only the start of an emerging field of enquiry: how to provide a fast and efficient transport system to service growing travel demands in a low carbon economy.

7. References

¹ UK Climate Change Act 2008. Available at http://www.opsi.gov.uk/acts/acts2008/ukpga_20080027_en_1.

² Department for Transport, 2009. Available at <http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/pgr/sustainable/carbonreduction/?view=Standard>. Please note that this strategy is currently under review by the new UK Government.

³ DfT, 2010. Please note that this plan is currently under review by the new UK Government.

⁴ Department of Energy & Climate Change, 2009. Available at http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx.

⁵ Department for Business, Innovation & Skills, 2008. Available at <http://www.berr.gov.uk/policies/business-sectors/construction/sustainable-construction>.

⁶ Climate Change (Scotland) Act, 2009. Available at <http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact>.

⁷ *Climate Change Delivery Plan: Meeting Scotland's Statutory Climate Change Targets*, 2009. Available at <http://www.scotland.gov.uk/Publications/2009/06/18103720/0>.

⁸ *Mitigating Transport's Climate Change Impact in Scotland (MTCCI)*, 2009. Available at: www.scotland.gov.uk/Resource/Doc/282791/0085548.pdf.

⁹ *Reducing Greenhouse Gas Emissions from Road Transport: Baseline Report 1990-2007*. Department for Regional Development, NI.

¹⁰ Available at http://roadimprovements.roadsni.gov.uk/index/strategic_proposals/regional_transport_strategy_for_northern_ireland.htm.