

The State of Ireland 2013

A review of infrastructure in Ireland

COMMUNICATIONS

WASTE

WATER AND FLOODING

ENERGY

TRANSPORT

As we are the professional body for engineers and engineering in Ireland, Engineers Ireland represents almost 24,000 members drawn from every discipline of engineering.

We have been representing the engineering profession since 1835. As one of the oldest and largest professional bodies in Ireland, Engineers Ireland is an invaluable resource in providing professional expertise to the benefit of all sections of Irish society.

Our members are vital to the conception, construction, maintenance and development of all key areas of infrastructure in Ireland.

Director General's Foreword

This report is an independent assessment of infrastructure in Ireland in 2013.

Based on our first assessment report produced in 2011, members of Engineers Ireland have once again gauged the existing quality and future needs of the Republic of Ireland's infrastructure.

I would like to thank them for their time and commitment in producing this updated report. Now in its third year, this report is a commentary on Ireland's infrastructure rather than a piece of original research.

The ambition of the report is to offer a fair and accurate appraisal of the current state of infrastructure in Ireland. The report also outlines the actions which we believe are vital to improve the condition of that infrastructure. It underlines the importance of long-term planning in sustainable economic development, increasing competitiveness and in improving the lives of all Irish citizens.

In preparing this report we are cognisant of our country's financial difficulties and the limited resources available but we still believe that every effort should be made to invest in productive infrastructure, which will always have a positive payback. Quite clearly this is a view supported by the EC, ECB and IMF, which on their ninth review of the Government's economic programme in January/February 2013 stated that "accelerating the implementation of investment projects.....could also help to address the unemployment challenge in a timely manner".

Very clearly, given the country's fiscal constraints, a process of prioritisation needs to be undertaken with respect to the recommendations outlined in this report.

Therefore, this expert advice is intended to inform those who make investment decisions about infrastructure in Ireland: politicians at national and local level, civil and public servants, regulatory bodies and trade organisations. Our essential aim is to contribute to the debate on Ireland's future, to stimulate that debate and to recommend actions vital to the future prosperity of Irish society as well as informing the general public.

This is the third year of The State of Ireland report and the annual reports aim to create a framework that can measure Ireland's success in improving its international competitiveness through productive infrastructure. Too often in Ireland, the best of plans are delayed or not carried through to fulfilment: this must change. This report is our contribution to the challenge of strengthening Ireland by identifying the future needs of infrastructure investment and addressing existing deficiencies.



John Power
Chartered Engineer
Director General

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Why Infrastructure Matters:

Almost every aspect of Irish life depends on the quality of our infrastructure

It is clear that productive infrastructural development is central to economic prosperity. If Ireland is to prosper, infrastructural development across every aspect of the economy will be an essential part of the process.

Our prosperity and the future prospects of our children depends on the continued ability of this country to attract inward investment and to trade our goods and services internationally. In both cases, our competitiveness is paramount and is hugely dependent on the quality, efficiency and reliability of our infrastructure.

Aside from its economic importance, infrastructure is the cornerstone of modern society. We rely upon treatment plants and water mains to supply us with drinking water; energy plants and gas pipelines for heat and light; broadband to connect us to

the worldwide web; roads, rail and ports to deliver the goods we buy and sell; and a waste management network to recover renewable resources.

In recent times Ireland has been subject to extreme weather and repeat incidences of severe flooding, which have highlighted just how vital infrastructure is to the smooth running of modern Irish society. Failure to maintain and invest in vital infrastructural services can only increase Ireland's vulnerability to disruptive events. Indeed, history demonstrates that societies have become more and more dependent on the quality of their infrastructure. It seems certain that this dependence will continue to increase in the coming decades. The accelerating pace of change as well as its sheer unpredictability accentuates the challenge in addressing

infrastructural needs. The challenge of maintaining and developing the capacity of infrastructure to meet the future needs of Irish society is further sharpened by the simultaneous need to address climate change.

In the pursuit of a low-carbon society, the sustainability of infrastructure and the way infrastructure can facilitate environmentally friendly initiatives at all levels is of essential importance. This report provides an independent assessment of what we need to do to protect and develop the sophisticated and inter-dependent system upon which the people of Ireland rely. When we published our first The State of Ireland report in 2011, our ambition was to help to prioritise the productive infrastructure and projects that are most critical to our future. While we retain that

Grading System

Analysis of key areas of infrastructure includes a straightforward grading system. Engineers Ireland has assessed each area of infrastructure using the following grades:



Well maintained, in good condition, appropriate capacity and planning for future development.



Acceptable standard, properly maintained, able to meet demand, though investment needed in the next five years.

Ireland 2013



ambition, Engineers Ireland also recognises that, in these times of economic hardship in Ireland, not all infrastructural programmes can be supported, no matter how desirable they may be. It is impossible to ignore the simple fact that we have faced increased economic hardship since 2011 and spending cuts which affected all areas of Irish society. The obligations entered into under the EU/IMF Programme of Financial Support in late 2010 curtail the ability of government to make decisions, not least because of the financial restraints related to the continued commitment to reduce the annual budget deficit to 3% of GDP by 2015. In November 2012, the Department of Finance delivered an update of the Medium-Term Fiscal Statement estimating that the fiscal adjustment necessary to

close the gap between tax and spending would be just over €8.5bn over the three year period 2013-2015. Inevitably, capital spending on infrastructure-related programmes has been and will be affected. Indeed, from the high of 2008, current capital spending has declined year on year to reach just €3.4 billion for 2013; this is a fall of more than 60%. A late 2011 report from the Department of Public Expenditure and Reform concluded that the core focus of capital investment would be the upkeep of existing infrastructure, rather than investment in new projects. In parallel with these changes in investment priorities, the report also committed the Government to the procurement of greater non-traditional funding sources for infrastructure via

Public Private Partnerships (PPPs) and the sale of suitable state assets through NewERA and the Strategic Investment Funds. Engineers Ireland acknowledges the reality of the need to reduce public expenditure and close the deficit. Nonetheless, capital investment is vital to meet the Government's desire to stimulate the economy. Crucially, vital skills are being lost to the Irish economy and the Irish construction industry through the absence of major infrastructural projects. This report is intended as our contribution to the debate on building the future of Ireland. It recognises the challenges facing the country and sets out fundamental steps which should be taken to meet those challenges.



Inadequately maintained, unable to meet peak demand, and requiring significant investment.



Below standard, poorly maintained, frequent inability to meet capacity and requiring immediate investment to avoid adverse impact on the national economy.



Unacceptable condition, insufficient capacity, and already impacting on the national economy.

Key Recommendations 2013

ENERGY

TRANSPORT

Overall grade

B

Overall grade

C

Well planned and properly executed investment in infrastructure will yield a dividend for Ireland.

This outlay is essential for attracting inward investment in the future and for improving the quality of life for Irish people.

These are the key recommendations which Engineers Ireland believes are vital to the recovery and future prosperity of Ireland:



Status: Energy infrastructure in Ireland has served the country well in the past but is now facing significant challenges, including security of supply, competitiveness and meeting carbon emissions targets.

Vision: The strategic development, taking cognisance of today's financial constraints, of a reliable, competitive, sustainable supply of energy to meet the needs of Irish society and its economy, and possibly provide a source of income through the export of natural energy resources.

12-Month Recommendations

- Review the planning process to remove the high planning risk for energy infrastructure projects that are vital to security of energy availability.
- Commence the seismic survey of Ireland's offshore area to identify potential fossil fuel resources.
- Fast track the new North-South Interconnector to allow energy transfers and bolster security of supply.

Five-Year Recommendations

- Continue to diversify Ireland's energy sources to include a mix of fossil and sustainable sources as per the EU Renewable Energy and Fuel Quality directives.
- Develop facilities to import liquefied natural gas.
- Increase the storage capacity of oil stocks to facilitate fuel switching from five to 30 days.

Sector	Grade
Electricity	B+
Gas	B
Petroleum products	B



Status: Ireland's transport system is of mixed quality, where top quality signature projects sit alongside much poorer infrastructure.

Vision: The development of an integrated and competitive transport network which meets the needs of a growing economy by providing internal and external connectivity of the very highest standard.

12-Month Recommendations

- Develop an alternative to the recently shelved National Spatial Strategy in consultation with stakeholders.
- Publish the new ports policy and proceed with implementing the recommendations.
- Restore investment in transport to at least 2012 levels.

Five-Year Recommendations

- Accelerate the prioritisation of investment in infrastructure projects to increase Ireland's competitiveness and address the unemployment challenge.
- Invest in cycling infrastructure in towns and cities and explore tourism revenue as a source of funding for some of these works.
- Agree standards for data formats and communication protocols for integrated traffic systems to enable information sharing.

Sector	Grade
Road: Motorways	B
Road: Other routes	D
Rail	D
Airports	B
Sea ports	C

WATER AND FLOODING

Overall grade **C**



Status: Ireland retains many natural advantages and investment over the last decade has helped to improve water quality, which had been deteriorating. Challenges remain, however, not least in flood protection and in mitigating the effects of climate change.

Vision: The expansion of a safe, healthy, plentiful supply of water at low cost is fundamental, as is the management of the quality of water resources. The improvement of resilience to the increased dangers of flooding.

12-Month Recommendations

- Commence programme to install meters in domestic premises.
- Begin inspection of registered domestic waste water treatment systems.
- Progress the Flood Studies Update system by end of 2013 and publish the flood risk maps.

Five-Year Recommendations

- Reduce unaccounted for water (UFW) to 30% nationally and reduce carbon footprint of water services by 20%.
- Complete the Catchment Flood Risk Assessment and Management (CFRAM) plans nationally by 2015.
- Achieve the 2015 targets for “good” water quality status as adopted in the River Basin Management Plans.

Sector	Grade
Water supply and wastewater	C
Water quality	C
Flooding	C

WASTE

Overall grade **B-**



Status: The industry is proactively moving towards an integrated approach to waste management and to a position where waste is considered a resource which can generate energy and employment while retaining an ongoing commitment to recycling.

Vision: An integrated approach for the management of residual waste, taking into account recycling ambitions and the need to meet EU objectives.

12-Month Recommendations

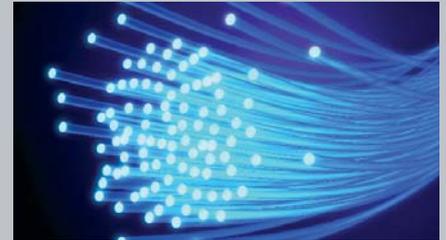
- Ensure that new regulation to strengthen the current waste collection permit system is brought into force.
- Reorganise the configuration of the groupings of local authorities for waste management into three new regions and put into place planning frameworks for these regions through the preparation of new waste management plans.
- Progress the development and construction of waste recovery treatment capacity options, such as the Dublin waste-to-energy facility.

Five-Year Recommendations

- Have in place the correct mix of waste capacity infrastructure to manage non-hazardous and hazardous wastes, which ensures that the State meets its statutory requirements.
- Roll-out of the organic waste collection system to households and businesses in line with statutory thresholds to allow further development of biological treatment capacities including anaerobic digestion.
- Work with third level institutes to develop waste and resource management modules as part of civil and environmental engineering courses to ensure this area is serviced with appropriately educated graduates.

COMMUNICATIONS

Overall grade **B+**



Status: The deficiencies of Ireland’s communications infrastructure prevent it from meeting producer and consumer needs.

Vision: Ireland needs to have a fast and reliable communications infrastructure which drives the knowledge economy and compensates for our peripheral status.

12-Month Recommendations

- Clarify immediately the impact on Ireland of the EU budget cuts on the Connecting Europe Facility.
- Continue the delivery of infrastructure necessary for advanced broadband nationwide and bring regional broadband costs down to match rates and speeds available in Dublin.
- Support the delivery of a transatlantic submarine cable and connect Ireland’s ‘dark fibre’ network.

Five-Year Recommendations

- Continue to bring broadband costs down and achieve EU and UK norms within five years.
- Achieve universal high-speed broadband to substantially all parts of the State by 2016 through the continued development of the next generation networks as well as satellite-based access services.
- Ireland’s national and regional broadband infrastructure should be in the top five of European league tables in terms of availability, uptake and speed by 2016.

RECOMMENDATIONS 2013

12-Month

Review the planning process to remove the high planning risk for energy infrastructure projects that are vital to security of energy availability.

Commence the seismic survey of Ireland's offshore area to identify potential fossil fuel resources.

Fast track the new North-South Interconnector to allow energy transfers and bolster security of supply.

Five-Year

Continue to diversify Ireland's energy sources to include a mix of fossil and sustainable sources as per the EU Renewable Energy and Fuel Quality directives.

Develop facilities to import liquefied natural gas

Increase the storage capacity of oil stocks to facilitate fuel switching from five to 30 days.

Sector	Grade
Electricity	B+
Gas	B
Petroleum products	B

Overall grade

B

ENERGY

The prosperity of the Republic of Ireland depends on the quality of its energy infrastructure. Generating heat and electricity is central to the operation of Irish society and the economy. The demand to reduce carbon emissions to already agreed targets presents a major challenge to the energy industry. Further, the basic matter of guaranteeing security of supply must also be addressed through planning and investment. And, on top of that, the cost of providing energy is fundamental to our national competitiveness and job creation.

Three major aspects of energy infrastructure are analysed here: electricity; natural gas; and, petroleum products.

Electricity

Electricity is vital to virtually every aspect of people's lives and to the economy, particularly with the development of the knowledge economy and, in the future, the transport sector. An increase in the use of indigenous resources for this electricity and the decarbonisation of same is critical to the medium- to long-term health of the Irish economy.

What is the current state of the infrastructure?

Given the sharp downturn in electricity demand since 2008 and the likelihood that economic growth will be lower in the near future than was previously envisaged, Ireland's existing electricity infrastructure is largely capable of meeting short- and medium-term demand. During 2012 demand for electricity was again dampened.

Growth in capacity to produce renewable energy from wind continued in 2012.

Under the EU's 20:20:20 strategy, however, Ireland has to supply 20% of its final energy consumption from renewable sources and, according to our own national policy, 40% of our electricity generation must come from renewables by 2020.

Electricity infrastructure in Ireland is, on the whole, well maintained and safe, meeting international standards. There has been very substantial investment in Ireland's power generation facilities in the past ten years, with

the result that existing generation capacity is potentially sufficient to meet projected needs for the next decade.

Nonetheless, based on national projections for 2020 targets, more flexible power generation and electricity storage will be needed to match the intermittency of renewable electricity.

Older, less efficient power generation plants should be retired to allow new, more efficient plants to operate on a cost-effective basis; this has been signalled by EirGrid in its latest Generation Capacity Statement.

In addition, the ESB has spent in excess of €4 billion in upgrading Ireland's transmission and distribution networks in the past decade.

In 2012 EirGrid completed construction of its 500MW East-West Interconnector between Ireland and Britain. The Interconnector provides an increased opportunity to trade electricity between the island of Ireland and the market in Great Britain.

Ireland's electricity transmission network was constructed to meet relatively low transmission requirements, with the exception of the Moneypoint lines to Dublin. The recent addition of a considerable amount of wind-powered generation located in areas that are remote from population centres has changed the transmission requirements.

Accordingly, a number of the low-capacity lines are now being upgraded.

There are, however, locations in the country, particularly in the north west and south west,

where the transmission network is relatively weak and is incapable of supporting either major industrial projects or major renewable energy development at present. In some instances network development may be required to precede confirmed generation demand and the network owner must be permitted to be proactive in this respect within regional planning policy.

In general, Ireland's electricity infrastructure is capable of supporting current demand for electricity, but it will need to be significantly reinforced to provide a network capable of supporting a more de-carbonised society. The ESB is currently rolling out an electric vehicle charging infrastructure across Ireland which will contribute to the Government target of 10% electric cars by 2020 and assist with decarbonisation.

What does the future hold?

To meet Ireland's 2020 targets, full support must be given to the Better Energy Programme, the National Renewable Energy Action Plan and the Eirgrid 2025 plan. In addition, the transition to sustainable financing mechanisms in the domestic and non-domestic sectors must be progressed.

Also, the new REFIT 3 programme, which supports up to 150MW of biomass-fuelled combined heat and power (CHP) projects, is to be welcomed. There is now significant uncertainty as to both the direction and scale of population movements in the coming decade leaving it more difficult to anticipate how demographic change will contribute to infrastructure requirements. Further, there have been very significant technical advances in recent years, which will contribute to reducing electricity demand and related emissions in the future, including developments in lighting, appliances, smart meters, smart homes and distributed generation. There are other challenges to overcome, Ireland has the advantage of access to wind, ocean and wave energy resources, but the challenge is to harness these resources and to integrate them into the existing infrastructure.

Operating a power system with very high levels

of wind generation presents particular challenges to system stability that need to be addressed. EirGrid and Systems Operator Northern Ireland (SONI) have embarked upon a multi-year programme "Delivering a Secure, Sustainable Electricity System" (the DS3 programme), which is designed to ensure that we can securely operate the power system with increasing amounts of variable non-synchronous renewable generation over the coming years.

The renewable resources available in Ireland have opened up an opportunity to harness these resources for exporting to other markets, most notably Great Britain. The Memorandum of Understanding signed by the Minister for Communications, Energy and Natural Resources and by the UK Secretary for Energy and Climate Change commits both governments to complete their considerations of how Irish renewable energy resources might be developed to the mutual benefit of Ireland and the UK. This opens up the possibility for far greater levels of renewable generation in Ireland than would otherwise be required to meet the needs of the Irish population only.

What actions do we need to take?

Grants for energy conservation measures in industry were removed during 2011, while grants for insulation and home energy generation were reduced. Allowing for the current economic climate, these decisions should be reversed.

Transmission and distribution systems must be operated and maintained to the highest standard. Following on from the Ireland-UK MoU, the State must seek to develop market and regulatory mechanisms to facilitate Irish electricity exports to Great Britain.

In terms of investment requirements, the new North-South Interconnector should be fast-tracked. Other major transmission projects such as Grid West and Grid Link are equally important in facilitating Ireland's 2020 renewable energy targets and in ensuring security of supply in the longer term.

The planning process in Ireland can be

especially challenging for the delivery of overhead transmission lines, wind farms and other network assets. We must address planning issues if we are to deliver infrastructure necessary for the common good. The depletion of oil reserves, concerns about energy security and the environmental threat of greenhouse gases mean that Ireland cannot exclude consideration of nuclear power in the longer term. Indeed, if we do not see a nuclear power plant on the island of Ireland, we are likely to depend on nuclear power in some sense via interconnector(s) to the UK and Europe.

Natural gas

One-third of Irish households and many commercial premises, schools, hospitals and industries rely on gas for heating. While Ireland has a significant mix of coal, oil and gas power plants available, gas has become the preferred fuel of choice due to its cost competitiveness and low carbon emissions.

What is the current state of the infrastructure?

Ireland's gas infrastructure meets the best international standards. This infrastructure has adequate capacity to meet all projections of demand and is capable of supporting projected economic development. Following the completion of high pressure transmission pipelines such as the Interconnector 2 linking Scotland and Ireland, the pipeline to the west, the Galway-Mayo pipeline and the south-north pipeline, there is now the potential to build out the low pressure distribution network around these pipelines. There is adequate spare capacity in the system to accommodate this and the capacity should be fully utilised given the improved international outlook for both gas availability and prices.

The extension and development of gas infrastructure in Ireland has contributed substantially in helping to reduce carbon emissions from Ireland in the industrial,

commercial and residential sectors, but particularly in the power generation sector.

What does the future hold?

One of the key missing elements is the completion of the Corrib gas field project, which is essential for securing Ireland's gas needs as it has the potential to meet up to 60% of Ireland's requirements at peak production. Gas from the Corrib field is due on stream in late 2014/early 2015 and it is imperative that this timeline for completion is not delayed. Steps should be taken to further safeguard Ireland's future gas supplies by ensuring that an efficient and robust regulatory regime is in place to support ongoing offshore exploration and to allow for the safe development of unconventional gas reserves which exist here. A second key element is the development of further gas storage facilities. At present there is a single gas storage facility in Ireland located off the south coast. This facility has the capacity to store only 3.5% of Ireland's annual gas consumption, whereas the average strategic gas storage capacity in mainland European countries is 20%. One would expect that the country at the end of the pipeline would have the highest storage capacity and not the lowest.

What actions do we need to take?

The national infrastructure is extensive and major centres of population are well supported by infrastructure. There are, however, a number of towns and areas in cities that are not supplied with natural gas. The availability of gas could make a noteworthy contribution to communities that do not already have it, by facilitating a significant reduction in both energy costs and in greenhouse gas emissions. Gas emits 40-50% less CO₂ than coal or peat and 25% less than

diesel. Nonetheless, in terms of future network extensions, these should continue to be evaluated on an economic basis, always taking into consideration the need for a robust and reliable network. Future planning needs to address the question of whether there is the demand to extend gas to every town in Ireland and where it is not economic to do so due to lack of demand, measures to stimulate this demand should be implemented.

A 2011 report by the Western Development Commission which examined the benefits of extending the gas grid to a further eleven towns in the north west estimated that €20.6 million could be saved annually in fuel costs between commercial and domestic gas users if gas were available as an option in these towns. Consideration should be given to similar studies being carried out in other regions of the country to assess the potential benefits and to inform national gas infrastructure strategy. To diversify Ireland's natural gas supply network, it is important to develop a port facility for the importation of liquefied natural gas. The development of gas from renewable resources should also be considered, including from landfill sites, wastewater facilities and from grass-based bio-methane.

One of the most difficult energy sources to substitute for a greener, more cost effective, and more secure alternative are petroleum products for road transportation. Compressed natural gas (CNG) used on the transport network, offers an alternative to such petroleum products. To facilitate diversification of fuels used in road transport, it should be Government policy to ensure that liquefied natural gas for freight vehicles is available

throughout the motorway network.

As a first step, there is an opportunity to convert fleet vehicles such as city bus fleets which are used close to their base depots to CNG, and locating the re-fuelling infrastructure in these depots. This model has been implemented successfully in many European cities and a 2012 trial on a bus in Cork city proved the benefits of the concept in Ireland also. There is also potential to develop indigenous biofuels from a number of sources to complement or replace compressed natural gas as a fuel for vehicles in the future, further reducing the need for imported gas.

Petroleum products

Petroleum products are the key source of transport energy in Ireland. A secure supply of these products is essential for mobility and for economic activity. Considerable volumes of oil are also consumed in major industrial units. In addition, significant amounts of gas, oil and kerosene are still used for heating in areas outside the gas service areas.

What is the current state of infrastructure?

In respect of petroleum products, the facilities for importation are adequate, as are the storage facilities for commercial use. In terms of commercial oil stocks, the sustained high cost of oil and the volatility in international oil prices has resulted in significant challenges for the commercial oil companies in maintaining high levels of oil inventory. In line with Government policy, the National Oil Reserves Agency (NORA) has undertaken a process of rebalancing Ireland's strategic oil reserves onto the island of Ireland. This programme is continuing, with both new and refurbished storage facilities planned for the future. Ireland has only one oil refinery, located at Whitegate, Co. Cork. This refinery supplies about one-third of Ireland's total oil consumption and is mandated to be in

operation until mid-2016. However, post 2016, its future is uncertain. In recent years there has been a significant decline in the number of refineries operating in the EU. In light of this and the uncertainty relating to Whitegate, in 2011 the Government commissioned a "Study of the Strategic Case for Oil Refining Requirements of the Island of Ireland". The findings and recommendation of this study are likely to be published in 2013.

What does the future hold?

Very little fuel oil is now used for electricity generation in Ireland. While some 65% of Ireland's power generation comes from natural gas, an adequate stock of oil is required to be immediately available for fuel switching in the event of a disruption to gas supply. Currently, there is only enough oil to run for about five days.

There is a move to convert some of the fuel oil storage facilities at older oil-fired power stations, which are no longer in operation, or are planned for closure in the near future, for the storage of lighter oil products. This could significantly improve the security of our electricity supply system.

This process is in its early stages and will require a significant investment in refurbishment, new infrastructure, and the oil stocks themselves in order to provide meaningful levels of alternative oil supply in the event of a gas supply disruption.

The Irish economy is particularly vulnerable to serious price shocks, which could have a dramatic impact on the country's GDP. The danger of a sudden oil price rise presents a further risk to the economy. Indeed, the impact would most likely be more severe on Ireland than on other European countries, because of our high dependence on oil imports. This was

evident from political events in North Africa and the Middle East during 2011 and 2012. Therefore, the benefits to be derived from the discovery and production of oil from offshore oil wells in Ireland's sea domain are considerable. While the story of oil and gas exploration offshore Ireland has largely been one of sporadic activity, there have recently been some more positive developments. DCENR recently announced a major seismic survey in the Irish offshore area and the next few years appear to be particularly significant for Irish exploration and production. The Atlantic Margin Licensing Round which offered substantial acreage off the west coast, resulted in the award of 13 licences. These options will expire in October 2013, at which stage the success or otherwise of the round will be clearer.

What actions do we need to take?

To minimise risks to Ireland in respect of petroleum products, the State needs to diversify and use sustainable sources for as much of its energy needs as it can. A clear and coherent plan needs to be pursued to meet this ambition. Oil is the primary fuel source for home heating and supplies approximately two-thirds of the heating market. A reduction in this level of dependency on oil for heating is required. The National Retrofit Programme should in particular be fully supported as it aims to retrofit up to one million homes by 2020.

Increased levels of biofuel in transportation fuels (ethanol in petrol, and biodiesel in motor diesel) will steadily displace equivalent volumes of hydrocarbon fuels. However, it must be borne in mind that the vast majority of biofuels, like fossil fuels, are also imported. The 2012 mandatory level of 4% biofuels in motor fuels

will rise over time to closer to 10% by 2020, and this will assist this initiative. The pace of such increase will of course have to be developed in harmony with approved changes to EU motor fuel specifications. The introduction of a grant to allow for the modification of petrol engine cars so that they become flexi-fuel and can receive bio-ethanol or petrol should be considered. Equally, investigation should be undertaken of agricultural capability for bio-ethanol and bio-diesel production. The development of more sustainable energy is laudable and, if acted upon responsibly, the pace of such development will be steady but most likely slower than we'd like. In the meantime we should not lose sight of the fact that we are an island nation with no pipeline connections to mainland Europe, wholly reliant on oil imports entirely by ship. Improvement in oil storage infrastructure is therefore key. The extent to which such improvement will be required is likely to be influenced by the future of the Whitegate Refinery, and the continuity of NORA's programme for the development of further storage on the island of Ireland. The capacity to fuel switch should be increased from the current five days to 30 days. Exploration drilling has been at a historically low level for the past few years and the State is a long way short of the intensive drilling programmes that would support the development of an indigenous offshore industry. To increase exploration activity, a regulatory and administrative regime should be maintained which gives confidence to investors and which facilitates a predictable field development process so that all stakeholders have a clear understanding of the issues involved and how they are to be addressed. Offshore Ireland needs to be promoted more to the international oil and gas industry. Proactive steps should be taken by relevant industry organisations, public representatives, Government departments and State agencies to increase public understanding of the industry and to assure potential applicants for licences that their presence and their investments are welcome.



RECOMMENDATIONS 2013

12-Month

Develop an alternative to the recently shelved National Spatial Strategy in consultation with stakeholders.

Publish the new ports policy and proceed with implementing the recommendations.

Restore investment in transport to at least 2012 levels.

Five-Year

Accelerate the prioritisation of investment in infrastructure projects to increase Ireland's competitiveness and address the unemployment challenge.

Invest in cycling infrastructure in towns and cities and explore tourism revenue as a source of funding for some of these works.

Agree standards for data formats and communication protocols for integrated traffic systems to enable information sharing.

Sector	Grade
Road: Motorways	B
Road: Other routes	D
Rail	D
Airports	B
Sea ports	C

Overall grade



TRANSPORT

For much of the history of independent Ireland, investment in transport infrastructure was inadequate. Substantial improvements have been made since the end of the 1990s. Developing a transport infrastructure which meets the requirements of Irish society and the Irish economy is essential to the future prosperity of the state. Critical to this is an integrated approach to road, rail, air and sea transport. According to the IMF, EU and ECB, implementation of investment programmes should be accelerated, not cut.

Roads

This section refers to the State's road network and its use for both private and public transport. Across all modes from walking to HGV travel, 96% of all trips take place on the road. A reduction in general traffic volumes over the last five to six years and improvement in journey times has brought traffic volumes to where travel demand is just below network capacity.

What is the current state of the infrastructure?

In terms of motorway, substantial improvements have been made over the last number of years. Ireland now has a radial motorway network out of Dublin that is on a par with those in Europe. The inter-urban links to Dublin are new and in good condition. The new motorways are well maintained and have appropriate capacity. No new rest stops were opened in 2012. Investment in roads has been targeted at upgrading roads where there is highest demand. This strategy of investment means Ireland's motorways are certainly capable of meeting demand. One caveat is that Ireland's motorways invariably link to Dublin. Links between other cities are much less impressive. The Cork to Limerick road, for example, is of relatively poor quality. Significant investment is needed in terms of connecting Galway, Cork, Limerick and Waterford to each other. The Atlantic Corridor is yet to be advanced sufficiently. The funding available to operate, maintain and improve the national road network has been reduced in recent years. In January 2012 the Department of the

Environment, Community and Local Government (DECLG) published the Spatial Planning and National Roads Guidelines for Planning Authorities. As defined in this document, the primary purpose of the national road network is to provide strategic transport links between the main centres of population and employment including key international gateways such as the main ports and airports and to provide access between all regions.

There is a considerable difference between inter-urban motorways and other roads. This is likely to remain given the NRA's statement that it is unlikely any major schemes will be constructed in the years 2013 to 2016. Beyond the motorways, Ireland's remaining road network is in very variable condition and is not capable of meeting usual demand, certainly not to an international level. On such roads there is significant congestion, especially at peak periods. For example, the links that pull the rest of the traffic onto the motorways are not of sufficient quality, or are non-existent. The lack of investment is clearly demonstrated by only one new strategic road project which commenced construction in 2012 – the N5 Ballaghaderreen bypass with the N11 and N7 improvement schemes start dates being postponed.

The quality of non-motorway infrastructure has deteriorated and has been repaired only on a patchwork basis. Roads that were repaired and strengthened in the 1990s are now due for maintenance again, as there has been insufficient investment in maintenance of

national roads over the last 10 years and a similar situation for regional and local roads with a 40% reduction in the last five years. The recent severe winters have also damaged many of our roads. There is a need to implement a Road Management System to manage deficiencies in the road surfaces and manage roadworks and excavations as well as road markings and signs in both urban and rural areas.

In 2010, the National Roads Authority (NRA) rolled out a significant maintenance strengthening and rehabilitation programme. However, austere budgetary measures have seen this programme reduced significantly, with a further very large reduction in 2013. Funding for regional and local roads are also being reduced with a reduction of 40% to 50% from the peak in 2008. The reduction is even greater in real terms since the mid 1990s with the result of an increasing backlog in maintenance and investment and a lower quality network to service the country. On a more positive note, the results of a comprehensive study of the pavement condition of the regional road network carried out for the Department of Transport, Tourism and Sport and the NRA in 2011/12 were published in 2012. These showed there had been a substantial improvement in the quality of the regional road network since the last study in 2004.

What does the future hold?

Ireland's national secondary roads and regional roads are in need of a substantial overhaul, and the priority should be secondary roads that connect the primary network. Many of these roads are in poor condition. The pavement condition study will provide a foundation for allocation of funding on a needs basis and funding implications for local authorities into the future but there is no national agreement on performance for maintenance of these roads. Reduced budgets mean that local authorities have insufficient resources to maintain their road networks in acceptable condition. The NRA's Eirspan bridge programme with local authorities to maintain

and repair the thousands of bridges across the network carried out capital works in 2012. With the development of modern roads, hundreds of gantries and tall poles, all of which could cause serious damage in the event of their collapse, will be brought within the inspection and renewal programme over the coming years.

What actions do we need to take?

Capital expenditure by the Department of Transport and Tourism in 2013 will drop by €314 million to €900 million. Funding for national road restoration and improvements will fall from €605m in 2012 to €278m in 2013, €288m in 2014 and €253m in 2015. The scale of this reduction is unprecedented and it is unacceptable that there will be no new projects in the short-to-medium term. If the Government does not reverse that decision, it is most unlikely that there will be any new projects commenced in the short to medium term. Therefore, it becomes imperative that maintenance regimes are put in place to continue improving the quality of national primary and secondary roads, and regional roads, while further work needs to be done to connect the main road network to air and sea ports. The development of rest and refuelling stations needs to continue on the motorway network.

Ideally, the road system should be developed further to link the coastal cities of Waterford, Cork, Limerick and Galway (The Atlantic Corridor) but this is obviously very much dependent on our future financial outlook and will have to be advanced in the context of prioritisation.

Urban areas require substantial investment to move towards a low-carbon sustainable model. This will involve investment in bus lanes, cycle lanes, pedestrian facilities and facilities for the mobility-impaired. There is also a major deficit in park-and-ride facilities. Currently, Irish road infrastructure is not geared towards environmental and low carbon concerns. Significant investment is needed to draw people out of their cars for even part of their

journey. There are major policy initiatives to develop cycling across Ireland, including the introduction of cycle lanes in new roads. The ambition is that 10% of all trips should be made by bicycle. In particular, it is hoped that many city trips will be made by bicycle – cycling now accounts for some 8.8% of all journeys into Dublin city centre. Funding of €4.5 million was awarded to urban areas under the Active Travel Towns programme in 2012 with approximately €6 million being made available in 2013. Bord Fáilte has supported the development of tourist cycle loops out of various tourist towns like the Great Western Greenway in the west of Ireland.

The National Journey Planner, which avails of ITS integration, allows journeys of all modes to be planned throughout the country. For example, real time passenger information for multiple operators, integrated ticketing, and passive safety systems like school speed warning signs all utilise ITS expertise. Dublin City Council's traffic data open platform – Dublinked – enhances the traffic system in the capital. However there is a lack of cohesion with each city and the National Roads Authority developing separately and evolving its own traffic control system with no standard for the data format. Agreed standards for data formats and communication protocols should be developed collaboratively.

There is an overall need to develop a national ITS strategy to co-ordinate technologies, infrastructure and investment while ensuring value for money.

Rail

The Luas BXD project which will link the existing Luas lines in Dublin city centre is the only major piece of transport infrastructure to get the green light in 2012. Work is due to commence this year.

What is the current state of the infrastructure?

Although the Luas, the Dart and inter-city trains are fully utilised at peak times, they are

usually capable of meeting demand. Irish heavy rail infrastructure is generally well maintained following the installation in places of new track to facilitate higher train speeds and increased commuter demand; this work needs to be continued across the network. The Railway Safety Capital Investment Programme increase from €108 million to €199 million has ensured vital asset renewal works including track renewal and upgrading bridges. With projects like the DART Underground, Kildare Route Project Phase 2 and the Navan Railway line deferred for the near future, there are currently no plans to increase capacity on any of the lines. The light rail system in Dublin appears to be well maintained. The main deficit in terms of both light and heavy rail in Dublin is still connectivity, but with the enabling works for the Luas BXD scheduled to commence in 2013 some progress on this issue is likely in the foreseeable future.

The extension of the rail spur to Dublin Port has facilitated access for rail freight to ship side thereby improving competitiveness.

What does the future hold?

Irish rail infrastructure is not geared to address environmental and low carbon concerns. It is not designed to take people out of their cars or to drive a significant modal shift. It is not sufficiently attractive to travel by train. The dispersed nature of the population does not facilitate the economic development of the passenger network and makes it difficult for the train system to compete with road travel. Even in terms of the development of park-and-ride facilities, the basic infrastructure to support greater

use of the train is largely absent, and where it is available pricing strategies often deter usage. In this, Ireland lags a long way behind the rest of Europe. This is partly a function of geography and of the reality that Ireland is a small island, with a dispersed population. The launch of Iarnród Éireann's 'Rail Vision 2030' has given some insights into the future of the rail network in Ireland including extending the DART to Dublin Airport from Clongriffin Station.

What actions do we need to take?

If a modal shift in the use of transport is envisaged, then rail is not capable of supporting projected economic development. Further investment is needed to get people out of their cars and onto bus and rail. Such investment should also attempt to link up the existing rail facilities, particularly in Dublin. The government's decision to defer funding for Metro North, Dart Underground, the Navan Railway Line and the Western Rail Corridor leaves the LUAS BXD line as the only major project that will be undertaken. Allowing for this, planning must still recognise the future desirability that the rail network can be linked up in an efficient manner and with other transport modes. Decisions need to be taken and communicated. While rail in its current state is capable of meeting current demand, the system needs further development to improve the linkages between the major centres of population. The business case for extending the DART to Dublin Airport has been developed and it is estimated that within 15 years 9.4 million passengers per annum would use the DART extension. This project



should be accelerated - not deferred.

The impending end of the EU derogation for the separation of rail infrastructure and management of the operation of trains in May 2013 will certainly have an impact on the future of planning for the rail network.

Airports

Ireland is an open economy with substantial inward investment. This investment relies in large part on the ability to access Dublin and the regional gateways from international air transport hubs. International air connectivity is critical for tourism and business travel, and our reliance on our airports was clearly demonstrated in April 2010 when volcanic ash closed Irish and European air space temporarily.

What is the current state of the infrastructure?

Irish airports and air traffic control systems are well maintained and the Dublin Airport Authority (DAA) and the Irish Aviation Authority (IAA) continue to invest to maintain the safety and security of the infrastructure. The new terminal buildings are important State assets, and their value will be seen in the medium-to-longer term as traffic volumes increase again. The DAA has plans to develop a second runway and this investment will be required, albeit perhaps not in the short term but when a business case for its development is put forward. The development of the inter-urban motorways has put increased pressure on air transport within Ireland. As road travel times have improved, prospective





air passengers are less willing to spend time waiting in airports for flights. The impact on development given the recent merger of a newly independent Shannon Airport with a restructured Shannon Development Company to form a commercial entity has yet to be seen.

What does the future hold?

If Ireland's export-driven economic recovery is to continue, then we will see a return to growth in our airports. In many respects, the recent completion of the new terminals in Dublin and Cork has Ireland well positioned to accommodate such growth. However, airport infrastructure takes a long time to deliver and we must not lose sight of the need to progress connectivity and further infrastructure developments to avail of opportunities.

The regional airports will continue to face pressure as internal air transport competes with improved road transport travel times. Operating subsidies paid to regional airports by Government have been reduced including a cessation of funding for Sligo and Galway airports from the end of 2011. Funding for Ireland West Airport Knock, Waterford, Donegal and Kerry will remain until the end of 2014. These airports, however, are crucial for foreign access to peripheral areas of the country, and are therefore vital for inward investment in those areas.

What actions do we need to take?

In the short-to-medium term we need to continue to invest in the maintenance of our airports and protect these assets to support economic recovery. In the longer term we need to plan so as to exploit opportunities

that present themselves and continue to rectify weaknesses in our existing infrastructure and travel experience. Smaller regional airports should be maintained because of their importance for the economic development of Ireland outside of Dublin.

Sea ports

Ireland's commercial sea ports are vital for most exports and imports, as well as for the tourism sector. Furthermore, our marine infrastructure includes both large and small fisheries harbours and small leisure harbours. The Ports of Dublin, Shannon Foynes and Cork have now been included as Core Ports in the overall Connecting Europe Framework with possible support for new investments likely to emerge in coming years.

What is the current state of the infrastructure?

The commercial ports are generally well maintained by the port companies, such as Dublin Port and Port of Cork. There has been significant investment in the larger fisheries harbours in recent years, such as Killybegs and Castletownbere. While there has been some investment in the smaller harbours, like Cill Rónáin Harbour and Inis Móir, there remain many small quay walls around the coast that are in need of repair and replacement. Following a decline in recent years the volume of traffic through ports has more or less stabilised with export growth emerging in some sectors. More importantly, the changing market conditions are driving the need to invest in new port infrastructure, for example, the international trend towards larger vessels.

What does the future hold?

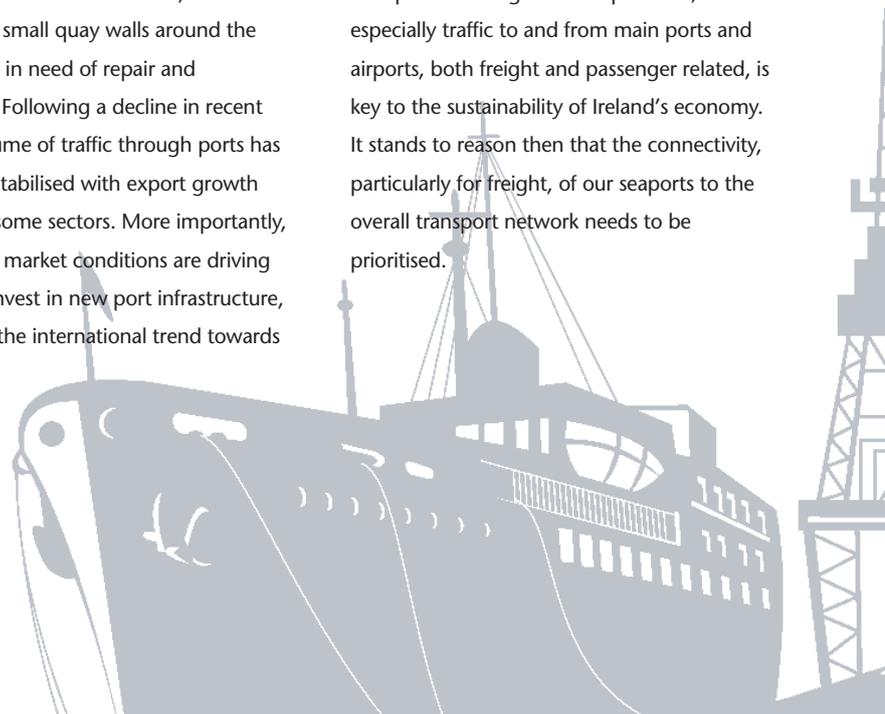
The changing market conditions and logistics will fuel the need for new or expanded facilities availing of deeper water opportunities but will require better hinterland connections. Inner city renewal will also push more port activities out of city centres and release valuable land for development.

However, port infrastructure tends to be large and can take many years from planning to delivery; therefore, ports must plan far in advance for such infrastructure. The completion in 2013 of a new ports policy offers the opportunity to develop a strategy which will drive policy in this area for the foreseeable future.

What actions do we need to take?

Ireland needs to develop its commercial ports to facilitate larger vessels which can deliver economies of scale and improve overall national competitiveness. It is imperative, also, to streamline the statutory planning process to ensure that this infrastructure can be delivered in an integrated and timely fashion.

Strategic traffic in the context of the national roads primarily comprises major inter-urban and inter-regional traffic which contributes to socio-economic development. The transportation of goods and products, especially traffic to and from main ports and airports, both freight and passenger related, is key to the sustainability of Ireland's economy. It stands to reason then that the connectivity, particularly for freight, of our seaports to the overall transport network needs to be prioritised.



RECOMMENDATIONS 2013

12-Month

Commence programme to install meters in domestic premises.

Begin inspection of registered domestic waste water treatment systems.

Progress the Flood Studies Update system by end of 2013 and publish the flood risk maps.

Five-Year

Reduce unaccounted for water (UFW) to 30% nationally and reduce carbon footprint of water services by 20%.

Complete the Catchment Flood Risk Assessment and Management (CFRAM) plans nationally by 2015.

Achieve the 2015 targets for "good" water quality status as adopted in the River Basin Management Plans.

Sector	Grade
Water supply and wastewater	C
Water quality	C
Flooding	C

Overall grade



WATER AND FLOODING

Most nations face a crisis of water supply in the coming decades and many also face the challenge of rising sea levels. These are global issues and Ireland is better placed than most to meet them; however, the country must defend these natural advantages.

Three aspects of water in Ireland are considered here: water supply and wastewater; water quality in the natural environment, and flood management.

Water Supply and Wastewater

Raw water is taken from the natural environment and then treated, stored, and distributed through pipes into people's homes. After use, it is then collected as wastewater, treated again and returned as clean water to rivers or coastal waters.

What is the current state of the infrastructure?

Following an independent assessment by PricewaterhouseCoopers, the DECLG announced in April 2012 that Irish Water would be established as a public utility to manage Ireland's water supply supported by a water regulator. The Water Services (Amendment) Bill in July 2012 addressed the issue of domestic waste water treatment systems to comply with EU legislation.

In accordance with EU directives, and with part-funding from central government through the Water Services Investment Programme, local authorities have made significant progress in the last 15 years in the improvement of public water and wastewater infrastructure. As the EU Commission Review of the Urban Waste Water Treatment Directive from December 2011 demonstrates, there remains a great deal of work to be undertaken, particularly in the areas of monitoring and sampling. The Urban Waste Water Discharges update report published by the Environmental Protection

Agency (EPA) in June 2012 stated that 42% of waste water treatment plants did not meet all waste water quality standards or EPA guidelines.

In parallel, the Rural Water Programme has been instrumental in the improvement of private group water schemes. The need remains to add tertiary treatment in many areas to address issues such as cryptosporidium. The prevalence of *E.coli* in private group water schemes at levels almost eight times in excess of those in the public water supplies remains a significant concern.

In general, there remain significant challenges. The patchwork of different schemes which are stitched together to comprise the national supply of water contains elements which are entirely outdated. Some parts of the system date from the Victorian era; others come from the 1950s and 1960s when Ireland replaced sections of the network using asbestos cement. The network is not now of the required standard. The problem is compounded by breakages which result in leakage on a large scale. Indeed, water leakage, unauthorised usage and metering errors are major problems for county councils and in some areas mean that more than 50% of water is unaccounted for.

On top of the antiquity of the system, the failure of building inspection regimes and the

absence of contract sign-offs has meant that some housing estates built in the last ten years do not comply with the building regulations. This has resulted in increased pipe breakages (especially in cold weather). Further, a number of pumping stations and treatment plants were put in by developers as short-term measures and are now defunct, while others which were intended to be permanent plants have not been maintained and are no longer operating in compliance with planning conditions. Infrastructure for wastewater collection and treatment plants is of variable quality across the country. A lot has been done to develop treatment plants in compliance with the EU Urban Waste Water Treatment Directive. This is particularly the case in large towns and cities which have been addressed, and some advance has also been made with smaller towns and villages. The EPA's Remedial Action List (RAL) is driving the improvement of water treatment plants with good results.

A further difficulty with existing infrastructure is the amount of infiltration into the main sewers. In some areas, infiltration remediation projects have not been successful and some systems may need to be replaced as a consequence.

What does the future hold?

Certainty of water supply at reasonable cost gives Ireland a distinct competitive advantage in developing indigenous industries and in attracting foreign direct investment (FDI). The planned development of the national water network needs to be aligned with the alternative plan that replaces the national spatial strategy to support investment in new industries.

Currently, the basic cost to non-domestic customers of public water supply and waste water collection in Dublin is €1.99 per cubic metre (on average). Across Europe this can be almost €7 per cubic metre, because some countries seek to achieve full cost recovery. Furthermore, widespread infiltration of groundwater into the sewer network results in increased volumes of sewage being pumped unnecessarily. On top of that, there is a high volume of unaccounted for water (UFW) due to

leakage in the water supply system. This makes the cost of services more expensive than it needs to be.

Energy costs present a future risk. Ireland needs to manage water carefully so that the treatment and transportation costs do not become excessive.

Climate change will place Ireland's water supply system under significant pressure. Longer dry spells will dictate that more storage is required. Ireland needs to consider the design of water management systems to ensure that there is more storage capacity. Tighter standards for lead solvency in drinking water are being introduced from 2013, triggering the need to eradicate all lead supplies from both the public mains and the customer's service pipes.

What actions do we need to take?

The consolidation of water services from 34 local authorities to a single vertically-integrated publicly-owned water utility company should benefit the consumer. Irish Water must manage the drinking water and wastewater assets on a national basis to achieve efficient service delivery and capital investment; without jeopardising the skills and knowledge already in the local authorities and supply chain. The complementary introduction of a water regulator should guarantee sustainable water financing and professional consumer engagement. Ireland is currently working to the Water Services Investment Programme 2010-2012. Adequate funding for this programme, and its successors, is vital. Indeed, developing an appropriate funding model for water services by the water regulator in the longer term is central to the development of Ireland's water and wastewater infrastructure. Water charges need to be introduced in Ireland for all users, independently of progress on metering, and without costly universal allowances. This is not simply a matter of generating revenue, but is also about improving the management of the system. Steps must be taken to secure a long-term water supply for the Dublin region as the key economic driver of the country. The current

proposal by Dublin City Council to extract excess water from the Shannon, and store it in a worked-out peat bog in the Midlands, presents an appealing opportunity to secure a water supply for Dublin.

The future trend will be to reduce the mass transfer of water from remote reservoirs. More rainwater harvesting at homes and businesses will be required to limit the need for bulk transfers at high energy cost. Further, Ireland must reduce the carbon footprint of the water distribution system, through the use of wind power at pumping stations, for example. Renewal of water pipe infrastructure is vital. In many countries there is a strategic imperative to replace a certain percentage at least 1% of water infrastructure on an annual basis. It should be a national imperative that we upgrade at least 1%, or more, of water and wastewater infrastructure on an annual basis.

Water quality

This section deals with the quality of water in the natural environment – lakes, rivers, groundwater, and coastal bays and estuaries.

What is the current state of the infrastructure?

The money that has been invested in major wastewater treatment schemes has begun to have a positive impact on water quality. Of the almost 13,200km of rivers surveyed in Ireland between 2007-2009 the river quality monitoring showed 70% were unpolluted and 30% were impaired to a greater or lesser extent. Serious pollution was recorded at just 20 sites down from 39 in 2004-2006. In a recent European survey Ireland is ranked 10th out of 24 member states who submitted data for the quality of its groundwater.

The quality of Ireland's bathing waters is good, with 93% of designated bathing areas meeting EU standards. The quality of the water continues to improve. Until a few years ago, untreated raw sewage was discharged into Dublin Bay. The water quality of Dublin Bay has now improved dramatically with Dollymount Strand achieving Blue Flag status.

A major programme – the River Basin District Management Plans – is underway to meet the objectives of the EU’s Water Framework Directive, which is designed to protect all high status waters, prevent further deterioration of all waters, and restore degraded surface and ground waters to good status by 2015. The Directive was introduced in response to the increasing threat of pollution and the demand from the public for cleaner rivers, lakes and beaches. Now, for the first time, there is a framework for the protection of all waters including rivers, lakes, estuaries, coastal waters and groundwater, and their dependent wildlife habitats, under one piece of environmental legislation. The EPA Water Quality Report (Feb 2011) indicated that 52% of river and 47% of lake water bodies are at “good” or better ecological status.

In 2009 the European Court of Justice also reprimanded Ireland for not properly implementing EU rules on wastewater in rural areas, in the way septic tanks and other private wastewater treatment systems are installed and maintained throughout the countryside. The Court said that with the exception of Co. Cavan, which introduced water pollution bye-laws in 2004, Ireland had failed to implement properly an EU directive on wastewater. The Water Services (Amendment) Bill was passed in July 2012 to introduce registration and inspection of septic tanks; although the funding basis is questionable and this will impact on the effectiveness of the scheme. Significant investment in municipal wastewater treatment plants has ensured that huge progress has been made in the last decade and Ireland’s water is recovering, though much work remains to be done.

What does the future hold?

The future risks to water quality include those from increased development pressures, which bring more wastewater to be treated and assimilated back into the environment. There are risks also from climate change. In drought conditions there is not enough water to dilute treated sewage in Ireland’s rivers. In heavy rainfall, the storm overflows from sewers will

release untreated wastewater into the water environment. Cryptosporidium outbreaks have demonstrated the fragility of water supply and its importance to normal living. Many Irish water schemes are under threat from cryptosporidium because of inadequate barriers in treatment. Comprehensive water safety plans and catchment management plans are required to manage this risk.

What actions do we need to take?

The monitoring of water quality by the EPA is comprehensive, but sufficient resources are not always available to act on the recommendations which come from monitoring. It is important that this situation be resolved. Furthermore, in December 2011, the sixth review by the EU Commission of the Urban Wastewater Treatment Directive highlighted that while Ireland has 91% secondary treatment installed on urban wastewaters, the compliance outcomes are very low (22%). This may be indicative of operational difficulties and/or sampling failures, but must be addressed.

The key action in this area is to implement the River Basin Management Plans which have been adopted. The plans aim to increase the proportion of rivers and canals at good or high status from just over 50% to 68% by 2015, with further improvements up to 2027. With the implementation of the WFD split between a large number of local authorities progress is more challenging to co-ordinate. An implementation report and annual progress report should document this process. A properly-resourced programme of catchment risk management plans and of groundwater protection plans is vital for every water source and adequate funding must be provided if Ireland is to meet the targets set for it.

Flooding

Many parts of Ireland will remain in danger of flooding and risks in areas that are currently not associated with flooding will increase. This will continue to present considerable challenges for the Office of Public Works (OPW), which is the

lead agency for flood risk management in Ireland, the local authorities and other bodies with responsibilities for flood risk management. Flooding can derive from coastal/tidal, fluvial (rivers), pluvial (intense rainfall) and groundwater sources.

What is the current state of the infrastructure?

While Ireland in more recent years has not experienced widespread flooding on the scale witnessed at the end of 2009, disruptions, human suffering and financial losses from more localised floods of the type most recently experienced in Co. Cork and Galway City remain significant. The local authorities face a severe challenge in reducing or managing the risks related to intense rainfall and undercapacity of the urban drainage infrastructure.

The OPW continues to advance major capital flood relief schemes and minor flood works to protect against fluvial, coastal/tidal and groundwater flooding. However, there are significant challenges that remain. The poor state of river defences in some towns combined with poorly maintained river channels are an issue. While the OPW is responsible for maintenance programmes in river channels that are part of arterial drainage schemes, the maintenance in other channels is more ad-hoc. Of particular concern is the management of river channels within drainage districts and of river channels where maintenance is the responsibility of the riparian landowner. While maintenance programmes in many river channels that are not part of an arterial drainage scheme were never particularly well structured, the capacity of local authorities to maintain drainage districts and use their statutory powers to maintain other river channels is unlikely to be improved from cuts to local authority budgets and resources in future years.

Local authorities, under the Framework for Major Emergency Management, are required to develop Emergency Response Plans to provide co-ordinated responses to major emergencies including flood events resulting

from severe weather. The OPW provides advice and assistance to local authorities, when requested, in reviewing their Flood Emergency Response Plans. However, the responsibility lies with individual local authorities and progress in this regard is inconsistent across the country and can be improved.

During the “Celtic Tiger” years, Ireland witnessed the inappropriate development of residential, commercial and industrial properties in floodplains. A legacy from this is that flood risk in these developments will need careful management in future years, potentially imposing additional strains on the resources of local authorities. Inappropriate development should be eliminated through local authority implementation, by 2015, of The Planning System and Flood Risk Management guidance issued by DECLG and OPW in 2009. This should ensure that, when used in combination with the flood mapping being produced by the OPW and through strategic and local flood risk assessments, flood risk is a key consideration in preparing development plans and local area plans and in the assessment of planning applications. While evidence indicates that application of the guidance is gaining traction in the planning and development management decisions of local authorities, further work is required to ensure that the principles of the guidance are embedded and understood by both councils and planners in the decision making process.

What does the future hold?

In the context of the EU Floods Directive, the National Preliminary Flood Risk Assessment completed in 2011 identified 300 Areas for Further Assessment (AFAs) around Ireland. The OPW and its partners are now developing detailed flood maps through the Catchment Flood Risk Assessment and Management (CFRAM) studies, which focus on flood prevention, protection and preparedness. These maps will be delivered by the end of 2013. Potentially viable flood risk management options to reduce or manage the risks for the 300 AFAs will then be available for public consultation by early 2015

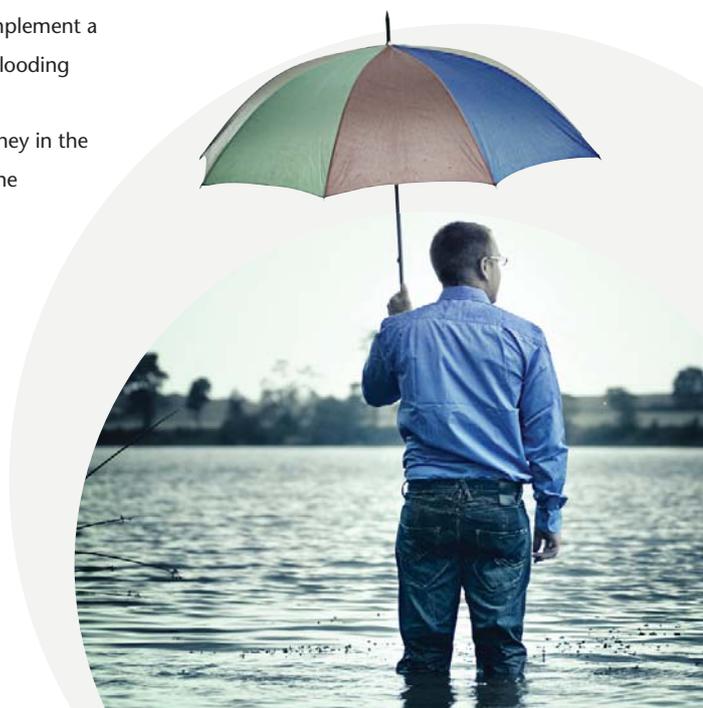
and based on this consultation, Flood Risk Management Plans will be issued for further consultation before the end of 2015. The Report of the Flood Policy Review Group in 2004 recognised that new or recalibrated digital flood estimation methodologies that reflect conditions and technologies in modern Irish hydrology could significantly improve the quality and facility of flood estimation for the purposes of flood risk management. A comprehensive research programme referred to as the Flood Studies Update (FSU) is now complete and OPW has recently awarded the contract for a web-based applications portal to implement extreme rainfall and flood estimation computations at river locations in Ireland, based on the methodologies developed through the FSU research. The portal will also provide a means of disseminating the FSU research documentation. Commissioning of the FSU system is expected to occur towards the end of 2013.

Non-structural flood risk management relies heavily on adequate flood forecasting and warning. A strategic review of options for flood forecasting and flood warning in Ireland has been completed. The final report is currently being considered by the relevant stakeholders with a view to proposals recommending preferred options, being submitted to Government in the near future. Ireland’s capability to plan and implement a maintenance regime to manage flooding remains poor. The curtailment of maintenance regimes to save money in the short term incurs larger costs in the longer term. The pluvial flooding through monster rain events is compounded because the amount of solid material going into gullies and drains increases, causing blockages and flooding. The probability of this occurring can be greatly reduced by the introduction of a proper monitoring, reporting and maintenance regime.

What actions do we need to take?

The CFRAM studies will be a major addition to the way Ireland manages flood protection and they are scheduled to be finished by 2015. Across the country, the Flood Risk Management Plans will be central to a pro-active approach for identifying and managing existing and potential flood risks. They must be used to develop an appropriate long-term strategy across the country for dealing with flooding. Ireland needs to move towards tailored flood warning systems across the country and towards an agreed approach to the maintenance of water courses.

Significant funding is required for the OPW and local authorities if they are to implement the measures (structural and non-structural) which are necessary to alleviate flooding. In this regard, the Government decision to ring fence the OPW capital budget (that includes provisions for major and minor flood relief schemes) is positive, but further funding to the local authorities is required to address the increasing urban storm water drainage problems. Despite the economic challenges facing the country, it is important that resources and funding be protected in future budget allocations. The difficulty is that failure to resolve the flooding issue will in turn create still more economic challenges.



RECOMMENDATIONS 2013

12-Month

Ensure that new regulation to strengthen the current waste collection permit system is brought into force.

Reorganise the configuration of the groupings of local authorities for waste management into three new regions and put into place planning frameworks for these regions through the preparation of new waste management plans.

Progress the development and construction of waste recovery treatment capacity options, such as the Dublin waste-to-energy facility.

Five-Year

Have in place the correct mix of waste capacity infrastructure to manage non-hazardous and hazardous wastes, which ensures that the State meets its statutory requirements.

Roll-out of the organic waste collection system to households and businesses in line with statutory thresholds to allow further development of biological treatment capacities including anaerobic digestion.

Work with third level institutes to develop waste and resource management modules as part of civil and environmental engineering courses to ensure this area is serviced with appropriately educated graduates.

Overall grade

B-

WASTE

Waste management infrastructure in Ireland is undergoing a transformation as the move away from landfill facilities continues. New treatment infrastructure is required if the State is to achieve its statutory diversion targets and ambitions of becoming self-sufficient with regards to particular wastes.

What is the current state of the infrastructure?

Waste management infrastructure is in a period of transition as historical treatment destinations are being replaced by more advanced and environmentally preferred solutions.

At the start of 2012 the number of landfills actively accepting municipal waste was 15 facilities which is a reduction of 46% from the number active in 2010. The drop in the number of landfills reflects the changes in the waste market with local authorities gradually exiting the collection and disposal markets. Landfill gate prices, excluding the levy, have dropped significantly since the economic downturn and local authorities have struggled to compete with privately operated facilities. The available tonnage of residual wastes has fallen significantly in this period also while the landfill levy has been increased substantially. The levy currently stands at €65 per tonne and is due to be increased to €75 per tonne by mid July 2013.

As landfills decline other waste destination treatment infrastructure has been constructed or is being developed. There are now 45 composting facilities with 386,100 tonnes of operating capacity. A total of five anaerobic digestion (AD) facilities are also active in Ireland. These biological facilities are treating food waste, green waste and certain agricultural sludges and wastes. Further growth in infrastructure in this area is predicted in the coming years. In 2011 Ireland's first waste-to-energy facility became active in Co. Meath and is accepting non-hazardous residual wastes which were previously buried at landfill

facilities. There are plans to expand this facility to accept some hazardous wastes in the future. The development of the Dublin waste-to-energy facility has been delayed substantially although construction is due to re-commence later in 2013. The development of the proposed waste-to-energy facility in Cork for the treatment of hazardous wastes is uncertain following a recent high court decision.

There are two active cement kilns which are accepting residual wastes in the form of solid recovered fuel and smaller quantities of other wastes such as chipped tyres, meat and bone meal from operators. These facilities are providing a treatment outlet although their primary function remains to manufacture cement and the calorific value of the feedstock restricts the type of wastes which can be accepted.

The largest quantity of waste treatment capacity in Ireland

is classed as pre-treatment infrastructure and is seen as a precursor to next step recovery or disposal operations. The mechanical treatment which falls into this category includes dismantling, sorting, crushing, compacting, pelletising, drying, shredding, repacking, separating and blending. The EPA are currently carrying out a study to quantify the extent of these mechanical capacities available in the State and a report is due to be available in 2013.

What does the future hold?

The recent trends show that municipal wastes and other major waste streams, such as construction and demolition wastes, have dropped in Ireland as a direct consequence of the economic downturn. The tonnage of future streams of waste is intricately linked to the performance of the economy and its ability to move out of recession. The EPA currently forecasts that an additional 825,000 tonnes of municipal waste will need to be managed in the State by 2025. The State has statutory obligations to meet specific targets in the coming years and failure to meet these will most likely result in financial penalties. The immediate targets are those adopted under the EU Landfill Directive which

requires the State to reduce the quantity of biodegradable municipal waste consigned to landfill. The indications are that the

first target in 2010 has been met. However, the threshold limits set for the future target years of 2013 and 2016 will be more difficult to achieve according to the EPA. The separate national target of diverting 50% of household waste from landfill by 2013 is also at risk. Infrastructural investment will be needed to ensure these targets are met. Other European targets adopted for the sound environmental management of waste batteries and end-of-life-vehicles will require investment to ensure these are achieved.

The new national waste policy statement has reinforced the State's commitment to ending the practice of disposal to landfill. The 10 year goal of the virtual elimination of landfill has been set and the path to achieving this objective, along with the State's ambition for self-sufficiency in terms of treatment capacity, will drive the infrastructure agenda.

What actions do we need to take?

The latest data shows the national disposal rate for municipal waste is 58% with landfill the primary treatment. The waste infrastructure market is changing as the State moves away from the practice of landfilling towards more advanced and sustainable solutions. Ireland has a considerable way to travel before we can stand shoulder to shoulder with the best environmental performing European member states who have corresponding disposal rates of less than 5%.

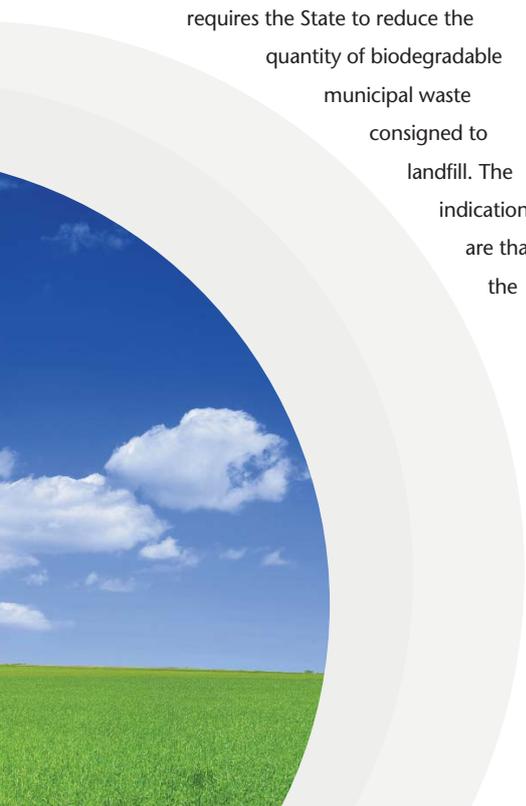
The current trend of exporting residual municipal (and hazardous) wastes for treatment to waste-to-energy, incineration and cement kilns in other European member states reflects the State's inability to date to adequately manage its own residual wastes. The export solution is providing short-term gains, in terms of diverting waste, but it is a reactive and market driven approach to a long-term environmental problem and is undermining national waste policy, planning and legislation.

Investment in infrastructure is needed if we are to close the capacity gap and become more self-reliant in terms of treating our own waste.

The State's existing capacities are unbalanced with high capacity levels of pre-treatment and mechanical treatment and below capacity levels of final destination facilities, e.g., biological treatment plants and waste-to-energy plants. Investment is needed in collection and treatment infrastructure, e.g., composting facilities, AD plants, if the State's desire to manage organic wastes in a more sustainable and resource focused manner is to be achieved. The national shortfall in capacity needs to be addressed if the State is serious about achieving European and national targets. The upcoming publication of the EPA's review of capacity will be a key publication in highlighting and quantifying the treatment capacity gaps and will point a way forward.

The preparation of new waste management plans will be important in the context of developing a planning framework which encourages the appropriate treatment capacities to be developed. These need to be put in place within the next 12 months so the management of wastes can be properly planned. The involvement of all public and industry stakeholders is needed to ensure the output of this process is effective and sustainable.

The State needs to continue to fund and support national programmes and campaigns which are helping to drive the better use of resources and the prevention of wastes. Programmes and projects such as RX3, the National Waste Prevention Programme, and reuse initiatives, such as freetradeireland.ie and SMILE, need continued investment if economic growth and waste arising are to be decoupled in a sustained manner. Lastly the imperative of finding new ways to manage waste demands a rethink on the education being taught to third-level graduates. Undergraduate courses must be geared to and mirror what the demands in the sector are. The changing landscape of waste management will have to be addressed in the future education of engineering and science undergraduates.



RECOMMENDATIONS 2013

12-Month

Clarify immediately the impact on Ireland of the EU budget cuts on the Connecting Europe Facility.

Continue the delivery of infrastructure necessary for advanced broadband nationwide and bring regional broadband costs down to match rates and speeds available in Dublin.

Support the delivery of a transatlantic submarine cable and connect Ireland's 'dark fibre' network.

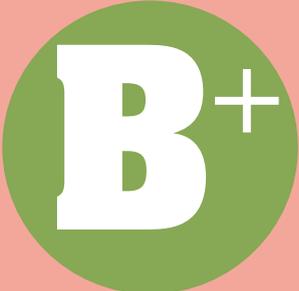
Five-Year

Continue to bring broadband costs down and achieve EU and UK norms within five years.

Achieve universal high-speed broadband to substantially all parts of the State by 2016 through the continued development of the next generation networks as well as satellite-based access services.

Ireland's national and regional broadband infrastructure should be in the top five of European league tables in terms of availability, uptake and speed by 2016.

Overall grade



B+

COMMUNICATIONS

Every time a phone call is made in Ireland, and every time a person in Ireland goes online, they depend on the smooth operation of Ireland's communications infrastructure.

What is the current state of the infrastructure?

The most significant development in mobile communications in 2012 was the switch-off of the analogue TV signal in October 2012 which freed up space for mobile broadband services, most notably on the 800Mhz band. In November ComReg announced the award of licences for the use of the 800Mhz, 900Mhz and 1,800Mhz frequency bands. The winning bidders will pay €854.64 million for the spectrum rights, which will facilitate the roll-out of next generation (4G) mobile communications in 2013.

Another important step in future proofing the network was reached when a survey of the duct system along the M4/M6 motorway was completed in 2012 to determine its suitability for laying high capacity 'dark fibre'. The same company that undertook the survey, PiPiper Infrastructure, signed a deal with the Apollo submarine cable system to connect New York and Belmullet with a direct transatlantic fibre cable system network delivering speeds of up to 10Gbps. Sea Fibre Networks is planning to enhance its current multi-fibre link from Ireland to the UK. At present, 94 towns in Ireland are circled with fibre in the form of Metropolitan Area Networks (MANs) with many connected nationally and internationally by fibre backhaul. With work due to commence in June 2013 and a programme of works lasting 18 months, it is planned that the submarine cable will connect to the 'dark fibre' network.

Smartphone ownership continued to grow in 2012 with almost half of the population owning a handset – up from 19% in 2010 – and it is expected to grow to some 71% of the population. Tablet use also doubled and with it the demand for broadband. The

number of WiFi hotspots increased by 169% in 12 months from Q3 2011 to Q3 2012.

Similarly WiFi minutes increased by 243%. Internet penetration is currently 70% of the population with broadband levels at 65% compared to the EU average of 68%. Ireland ranks 13th in the OECD for wireless broadband subscriptions, with 63.4 per 100 inhabitants, above the UK with 60 and the OECD average of 56.6. The first phase of the programme to extend 100Mbps broadband to all secondary schools in Ireland was completed in September 2012 with 200 schools across Ireland connected, and with ESB Telecoms providing backhaul from regional locations to Dublin.

Eircom has announced the roll-out of its Next Generation Access Fibre Network. The targeted completion date for the first 500,000 premises is mid-2013 with 1 million premises expected to be completed by December 2014. The network build is well underway with over 150,000 premises passed to date. Broadband speeds at launch are expected to be up to 70Mbps. UPC is investing €500 million in its cable network which should see 750,000 homes able to access services at data speeds of up to 150Mbps in the near future. In addition, Sky has announced that it is entering the broadband market and this should further stimulate competition. Prices both for wholesale and retail services have fallen while investment and quality levels have risen. This trend is evident across fixed and mobile markets both for telephony and data services but is especially noticeable in the enhanced value now on offer to purchasers of 'bundle' services. Ireland compares favourably with other European countries in mobile phone usage, with 5.5 million customers and a

penetration rate of 120.6%. Not surprisingly traffic from fixed lines has dropped in recent years, corresponding to a drop in the number of fixed line subscriptions.

The broadband infrastructure, across its current range, is capable of meeting normal and peak traffic demands, albeit sometimes at reduced speeds. Nonetheless, some areas of the country are not yet covered by the broadband network and development of the network is required to extend coverage across the entire State.

Since the 2012 report, progress has been made in making broadband more widely available to all parts of the State, though speed is still an issue. For phones and for broadband, the current economic recession has reduced the demand for service provision, thereby facilitating the existing network's capability to meet demand.

What does the future hold?

While mobile phone network infrastructure is capable of supporting projected economic developments, the broadband infrastructure will require considerable enhancement to extend network coverage and to improve broadband speeds. The announcement by the Department of Education and Skills to roll out 100Mb broadband to all second-level schools by 2014 is a step in the right direction and the Government's National Broadband Plan for Ireland, published in August of last year, which commits to a minimum speed of 30Mbps for every home

in the country, is certainly welcome.

The cost and quality of broadband access is fundamental to the economic success of enterprises that need such access for their business. In Ireland, the cost of broadband access is still high and needs to be reduced if small and medium enterprises are not to be disadvantaged by comparison with those in other countries. There is a need for increased development of wireless broadband media throughout the country (e.g., WiFi and WiMax) particularly in areas of the country which are not adequately served by existing landline infrastructure. Crucially, advanced broadband speeds must be delivered on a far greater scale across the country. Ownership of Ireland's telecoms infrastructure is in the hands of foreign investors and a key issue must be the ability of the overseas telecom owners to balance the demands of their shareholders with the needs of the Irish economy.

Cloud computing is also set to be a major cornerstone of Ireland's economic growth into the future with major multi-nationals Google, Amazon and Blacknight locating data centres here.

What actions do we need to take?

By providing voice and video conference facilities, the communications infrastructure has the potential to reduce the need for travel to attend meetings and to reduce carbon emissions. On the downside, hosting and hot-site facilities for network servers have high

energy requirements. Nonetheless, the temperate climate in Ireland reduces the requirements for cooling/air conditioning with reduced environmental impact compared to other countries. It will be vital to develop fibre access networks and satellite-based access services. These currently account for only a small percentage of total broadband subscriptions and this needs to be dramatically increased in the short to medium term. Changes in lifestyle with the advent of smartphones and tablets have implications for network usage including shopping, downloading music and accessing TV programmes from mobile devices. Investment is required in major network upgrade to cater for the higher speeds which will be required in the future.

The Government needs to clarify how the recent budget cut by European Union leaders to the Connecting Europe Facility from €9.2 billion to €1 billion will impact on its commitment to roll-out of broadband services in Ireland.

Cloud computing applications hosted in data centres are a key area of growing economic activity and rely on a high capacity, resilient communication service. The Government needs to prioritise connecting Ireland's network to international cities if we are to compete for and with global business. Ireland's intellectual property (IP) and data protection regimes need to keep abreast of international legislation in order to remain competitive in the global marketplace.

PRINCIPAL SOURCES

For a full list of reference documents used in the preparation of this report please see engineersireland.ie

ABBREVIATIONS

CCGT: Combined cycle gas turbine
CHP: Combined heat and power
DAA: Dublin Airport Authority
DECLG: Department of the Environment, Community and Local Government
DEHLG: Department of the Environment, Heritage and Local Government

DSL: Digital subscriber loop
EPA: Environmental Protection Agency
GDP: Gross domestic product
GHG: Greenhouse gases
IAA: Irish Aviation Authority
kV: KiloVolt
Mbps Megabits per second

MBT: Mechanical biological treatment
MVA: MegaVolt-Ampere
MW: Megawatts
OCGT: Open cycle gas turbine
OPW: Office of Public Works
RAL: Remedial action list
RX3: Rethink, recycle, remake
UFW: Unaccounted for water



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