

The State of Ireland

A review of infrastructure in Ireland

COMMUNICATIONS

WASTE

WATER AND FLOODING

ENERGY

TRANSPORT

Engineers Ireland is the voice of the engineering profession in Ireland, with over 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 2011.

Members of Engineers Ireland have assessed the existing quality and future infrastructural needs of the Republic of Ireland. This report is the product of their deliberations and I thank them for their time and commitment in producing this report. It is a commentary on the existing state of infrastructure in Ireland, 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 increasing competitiveness and improving the lives of the Irish people.

In preparing this report we are cognisant of our country's financial difficulties and the limited resources available but believe that every effort should be made to invest in productive infrastructure, which will always have a positive payback. Very clearly, given the constraints, a process of prioritisation needs to be undertaken with respect to the recommendations herein. Therefore, this report 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.

Finally, The State of Ireland is intended as the first in a series of reports which will create a framework to measure Ireland's success in improving its international competitiveness through productive infrastructure. Too often in Ireland, the best of plans are 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

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 productive 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

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.

Matters



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. Engineers Ireland recognises that, in these times of economic hardship in Ireland, not all infrastructure can be supported. We hope that this report will help to prioritise the productive infrastructure and projects that are most critical to our future.

Future reports in this series will review the progress made in meeting the recommendations set out in this report, through a revised marking system. This system will include the introduction of a 'Star' grade for aspects of infrastructure that are 'best in class' by international norms.



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

ENERGY

TRANSPORT

Overall score

B

Overall score

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 lives of 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

- Launch a scaled-up energy conservation programme aimed at reducing energy consumption by 20% in 2020.
- Initiate a review of the planning process to remove the high planning risk for energy infrastructure projects that are vital to security of energy availability.
- Invest in research and development of ocean and offshore wind, marine energy and smart grid technologies.

Five-year

- Achieve a 10% reduction in national energy consumption by 2016 through the energy conservation programme.
- Increase energy security by providing long-term strategic storage capacity of 20% of annual natural gas usage on the island in line with international norms.
- Strengthen the electricity transmission grid in accordance with the Eirgrid "Grid 25" targets.



Status: Ireland's transport system is something of a curate's egg, 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

- Produce the first annual inventory of the condition of national primary and secondary roads, and regional roads.
- Commit to a funding programme for integrated (public/private) transport plans in each of the Gateway Cities within 12 months.
- Commit funding to improve the speed and quality of mainline rail.

Five-year

- Decide on which one of the major transport projects in Dublin is to proceed and commence work on it.
- Develop a ports plan to access deeper water for quicker turnaround times and the accommodation of larger vessel sizes.
- Consider and decide on the advancement of the construction of the Atlantic Corridor.

WATER

Overall score



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 development 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

- Commence universal water charging and metering programme; close out the existing EPA Remedial Action List (RAL) in 2011.
- Publish and commit to a funded implementation plan for the River Basin Management Plans.
- Complete the National Flood Forecasting and Warning Study and provide resources to commence implementation of recommendations.

Five-year

- Reduce unaccounted for water (UFW) to 30% nationally and reduce the carbon footprint of water services by 20%.
- Complete the Catchment Flood Risk Assessment and Management (CFRAM) plans nationally by 2015, including the preliminary flood risk assessments in 2011 and the flood risk maps for 2013.
- Achieve the 2015 targets for “good” water quality status as adopted in the River Basin Management Plans.

WASTE

Overall score



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

- Vest the ownership of waste in local authorities and confirm their power to direct waste to higher order treatment tiers in the EU waste hierarchy.
- Regulate the collection of household waste by a fair, transparent and competitive tender process.
- Commence the construction of the Poolbeg energy-from-waste (EfW) facility.

Five-year

- Have revised and co-ordinated regional and county waste management plans in operation.
- Have the Poolbeg energy-from-waste (EfW) facility operational.
- Have dedicated expert waste management engineers available to the industry from university courses.

COMMUNICATIONS

Overall score



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

- Take immediate measures to bring regional broadband costs down to match rates available in Dublin.
- Implement a funded programme to make broadband available to all parts of the State, including islands, with high-speed broadband available to more than 95% of the population.
- Initiate a study to identify risks to national communications systems, e.g., reliance on one or two sub-sea cables, and commit to funding recommendations.

Five-year

- Bring broadband costs down to not more than 5% above EU and UK norms within five years.
- Achieve universal high-speed broadband to substantially all parts of the state by 2016.
- National and regional broadband infrastructure to be in the top quartile of European league tables in terms of availability, uptake and speed by 2016.

RECOMMENDATIONS

12-Month

Launch a scaled-up energy conservation programme aimed at reducing energy consumption by 20% in 2020.

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

Invest in research and development of ocean and offshore wind, marine energy and smart grid technologies.

Five-Year

Achieve a 10% reduction in national energy consumption by 2016 through the energy conservation programme.

Increase energy security by providing long-term strategic storage capacity of 20% of annual natural gas usage on the island in line with international norms.

Strengthen the electricity transmission grid in accordance with the Eirgrid "Grid 25" targets.

Sector	Overall grade
Electricity	B
Gas	B
Petroleum products	B

Overall score



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. Its importance is increasing with time, particularly due to the development of the knowledge economy and the communications infrastructure which underpins it. In the future electricity is also expected to play an increasing role in 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. In order to meet Ireland's obligations in 2020, however, the infrastructure that supports renewable energy will need to be significantly reinforced. Under the EU's 20:20:20 strategy (20% saving in final energy consumption, 20% improvement in energy efficiency and 20% saving in carbon emissions), 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. It must also reduce its greenhouse gas emissions to 80% of 2005 levels.

Electricity infrastructure in Ireland is, on the whole, well maintained and safe; it meets international standards in terms of reliability, safety and power quality. There has been very substantial investment in Ireland's power generation facilities in the past ten years. In that time over 4,500 megawatts (MW) of generation were added to a system with a peak demand of just 5,000MW. That included 2,570MW of combined cycle gas turbine (CCGT) and combined heat and power (CHP) plants, 1,180MW of wind-powered generation, 250MW of peat-fired generation and 320MW of open cycle gas turbine (OCGT) plants. The upshot is that the existing electricity generation capacity in Ireland is potentially sufficient to meet projected needs for the next decade. The need for decarbonisation of our generation portfolio and a transition to more indigenous sources of electricity must be considered in this context. 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 off the system to allow new, more efficient plants to operate on a cost-effective basis; this has been signalled by Eirgrid in its latest Generation Adequacy Report.

In addition, the ESB has spent in excess of €4 billion in upgrading Ireland's transmission and distribution networks in the past decade. This included the replacement of the rural 10kV distribution system with a new 20kV distribution system. This has greatly improved the continuity and quality of supply to rural areas.

By international standards, and correctly in light of the country's needs, Ireland's electricity transmission network was constructed to meet relatively low transmission requirements, with the exception of the Moneypoint 400kV lines to Dublin. The recent addition of a considerable amount of wind-powered generation located remote from population centres has changed the transmission requirements. Accordingly, a number of the low-capacity lines (both 110kV and 220kV) are now being upgraded.

There are, however, locations in the country, particularly in the north-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 generation demand and the network owner must be permitted to be proactive in this respect within regional planning policy.

Overall, the safety record in this area is excellent, particularly since the major investment in the distribution networks, which has dramatically reduced the number of conductor breaks during storms.

In general, Ireland's electricity infrastructure is capable of supporting current demand, but it will need to be reinforced to provide a more de-carbonised network.

What does the future hold?

There are significant challenges to develop Irish infrastructure in response to the need to meet low carbon and general environmental concerns. To meet Ireland's 2020 targets, full support must be given to the National Energy Retrofit Programme (Better Energy), the National Renewable Energy Action Plan, the Eirgrid 2025 plan and to the SEAI home energy efficiency grants. Population growth in Ireland during the 1990s and for much of the 2000s significantly contributed to the growth in energy demand in the country. 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 is a considerable ongoing debate on the implications of reaching the targets which have been set and this debate is an important process in the evolution of a pragmatic energy policy. 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 renewable resources and to integrate them into the existing infrastructure. With this in mind, the completion of current feasibility studies is essential to understanding and solving the technical, economic, environmental and regulatory challenges faced in optimising these resources.

What actions do we need to take?

In terms of investment requirements for Irish electricity infrastructure, the new North-South Interconnector should be fast-tracked. The development of the planned 400kV network would allow a very substantial increase in north-south transfers, from 200MVA at present to almost 1,500MVA.

The planning process in Ireland can be especially challenging and lengthy for the delivery of overhead transmission lines, wind farms and other network assets. However, of far greater concern, is that society allows those that do not accept a planning decision to continue to frustrate the delivery of such projects at great cost to the State. We must address these 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 Interconnector 2, the Pipeline to the West, the Galway-Mayo pipeline and the South-North pipeline there is a very considerable amount of spare capacity in the system. This 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.

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 energy emissions.

Nonetheless, in terms of supply, future planning needs to address the question of whether there is the demand to extend gas to every town in Ireland.

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 and from grass-based biomethane.

On the transport network, gas offers an alternative to diesel. 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.

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, for cars, trucks, public transport, aviation and marine transport. A secure supply of these products is essential for mobility and for economic activity. In addition, in Ireland 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 the infrastructure?

In respect of petroleum products, the facilities for importation are adequate. There is, however, an inadequate amount of petroleum products held in storage in Ireland, particularly in the Dublin area. While Whiddy Island in Cork provides some storage, at the moment almost half of Ireland's strategic petroleum stocks are held for Ireland in other countries. The National Oil Reserves Agency (NORA) has undertaken a process of increasing storage of stocks in Ireland, but if there were to be a serious crisis tomorrow there are question marks as to whether we would be able to access sufficient stocks. This is not so much an infrastructure problem as a management problem, but it is a potentially serious risk to energy supplies.

What does the future hold?

A further risk in this sector is the road tanker fleet. If, for any reason, the gas supply was restricted and the electricity sector was forced to transfer to the use of petroleum products, there are not enough road tankers capable of replenishing stocks in the power stations beyond the five days' stock each power plant is obliged to hold under current regulations. There is a move to convert the heavy 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 petroleum supply system. This process is in its early stages and will require a significant investment in both refurbishment and new infrastructure. A further risk is the danger of a sudden oil price rise. The Irish economy is particularly vulnerable to serious price shocks, which could have a dramatic impact on the country's GDP. 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 recent political events in North Africa and the Middle East.

What actions do we need to take?

To minimise risks to Ireland in respect of petroleum products, the state needs to diversify and to use sustainable sources for as much of its energy needs as it can particularly in the heating and transportation sectors. A clear and coherent plan needs to be pursued to meet this ambition, realising that there are risks of 'stranded assets' and cost penalties if a balanced approach is not taken to the transformation to a more sustainable energy sector.

Over one-third of all the energy imported into Ireland is used for heating homes and businesses. 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. Ireland's building stock has significant potential for improvement in terms of energy efficiency via the retrofit of insulation and renewable energy technologies. The National Retrofit Programme should be fully supported as it aims to retrofit up to one million homes by 2020.



RECOMMENDATIONS

12-Month

Produce the first annual inventory of the condition of national primary and secondary roads, and regional roads.

Commit to a funding programme for integrated (public/private) transport plans in each of the Gateway Cities within 12 months.

Commit funding to improve the speed and quality of mainline rail.

Five-Year

Decide on which one of the major transport projects is to proceed in Dublin and commence work on it.

Develop a ports plan to access deeper water for quicker turnaround times and the accommodation of larger vessel sizes.

Consider and decide on the advancement of the construction of the Atlantic Corridor.

Sector	Overall grade
Road: Motorways	B
Road: Other routes	D
Rail	D
Airports	B
Seaports	C

Overall score



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.

Roads

This section refers to the state's road network and its use for both private and public transport.

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.

Investment in roads has been targeted at upgrading roads where there is highest demand. There has been a clear strategy for this investment and 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 very 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.

There is a considerable difference between inter-urban motorways and other roads. Beyond the motorways, Ireland's remaining road network often consists of poorly maintained roads which are 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 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 little investment in maintenance over the last ten years. The recent severe winters have also damaged many of our roads. In addition to deficiencies in the road surfaces, there is also a need to implement an asset management system to maintain road markings and signage on both urban and rural roads.

In 2010, the National Roads Authority (NRA) rolled out a significant maintenance strengthening and rehabilitation programme, but this is only in its infancy.

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. The condition of these roads is poor and worsening. There are two issues here: the first is that the local authorities do not have the resources; and the second is related to systems. It is only recently that national standards developed for primary roads are being applied to secondary and regional roads. The NRA has commissioned a National Secondary Roads Needs Study and it is important that the recommendations of this study are implemented.

Currently, the NRA is rolling out the Eirspan bridge programme with local authorities to address concerns over the condition of road bridges on regional roads. This is an important programme that will identify the maintenance and repairs needed to keep the bridges in a safe condition. While the implementation has been delegated to local authorities with the oversight of the NRA, it is important that all local authorities do the inspection work speedily and uniformly, and without resource constraints.

What actions do we need to take?

It will be vital to continue to work on 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 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. In this respect, there is consideration being given to making Galway a cycling town. Bord Fáilte is also seeking to develop tourist cycle loops out of various tourist towns.

Rail

The introduction of the Luas in Dublin and the enhancement of suburban rail commuting services have increased the number of people travelling by train to work by at least two-thirds, according to the most recent survey figures.

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. A number of schemes to increase commuter capacity and electrify the existing lines are also at the planning stage, such as the Navan Railway Project, Kildare Railway Project Phase 2 and Maynooth Railway Project. Such schemes will increase capacity as far as both Heuston and Connolly Stations. 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 in relation to connectivity, for example the Luas Green Line finishes at St Stephen's Green where it has no connectivity to any other rail networks. The collapse of a 20-metre section of viaduct over the Malahide estuary on the main Dublin-Belfast rail line in 2009 was a particularly worrying development. Irish Rail is now overhauling its bridge management and asset management systems.

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.

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. Therefore, it is important that within resource constraints the Dart Interconnector, Metro North and Metro West Projects get serious consideration in order 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.

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.

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 such as a hub for Asian airlines en route to the US.

The regional airports will continue to face pressure as internal air transport competes with improved road transport travel times. 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 must be maintained because of their importance for the economic development of Ireland outside of Dublin.



Seaports

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.

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, there remain many small quay walls around the coast that are in need of repair and replacement.

In recent years the volume of traffic through ports has declined, although this is changing as exports begin to recover. 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?

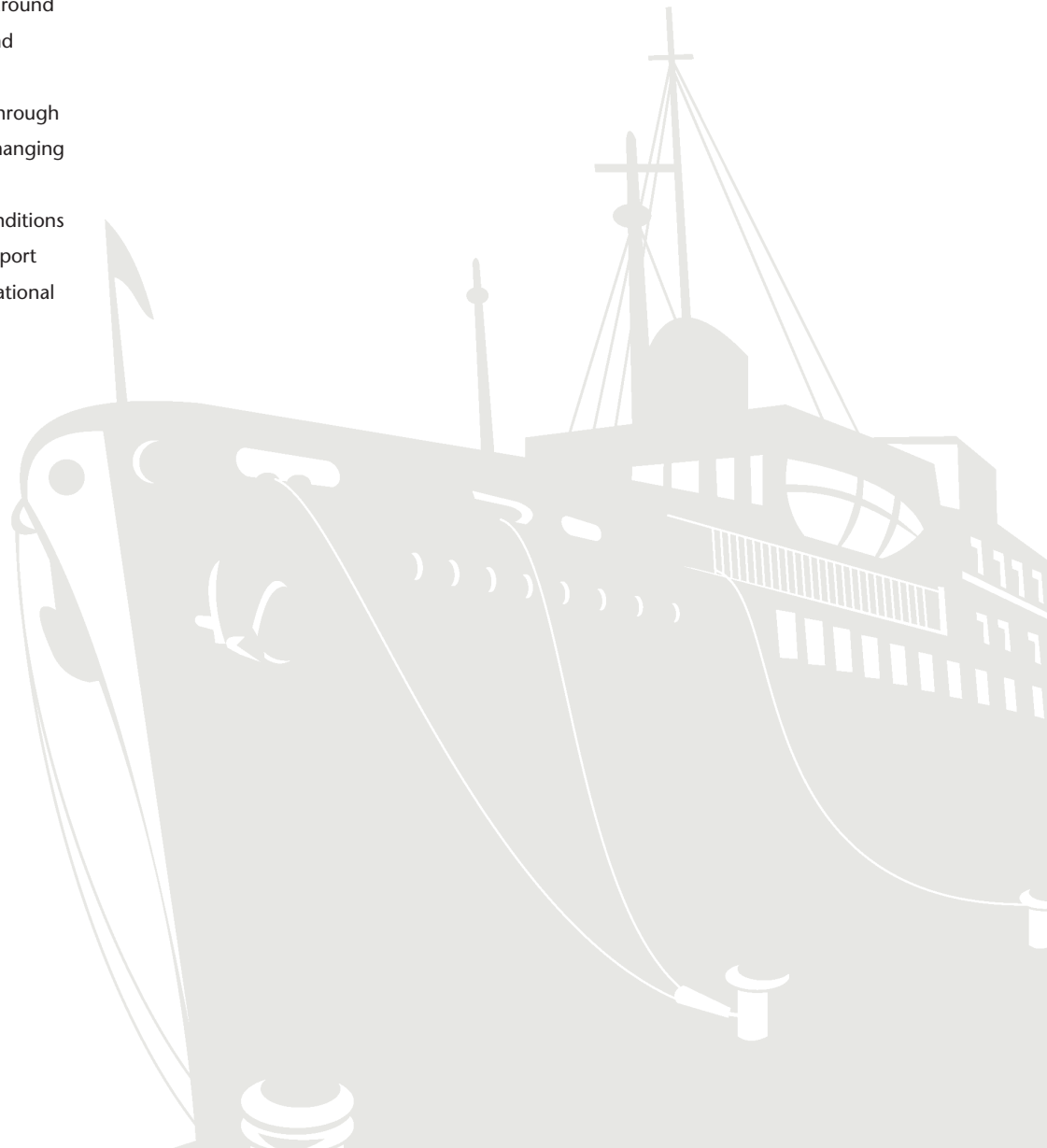
The changing market conditions and logistics will fuel the need for bigger berths and deeper water locations. Inner city renewal will also push more port activities out of city centres and release valuable land for development.

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.

What actions do we need to take?

Ireland needs to develop its commercial ports beyond city centres into deeper water where larger vessels can be accommodated with quicker turnaround times. It is imperative, also, to streamline the statutory planning process to ensure that this infrastructure can be delivered in a timely fashion.

The connectivity of our seaports with other transport modes needs to be improved, particularly for freight.



RECOMMENDATIONS

12-Month

Commence universal water charging and metering programme; close out the existing EPA Remedial Action List (RAL) in 2011.

Publish and commit to a funded implementation plan for the River Basin Management Plans.

Complete the National Flood Forecasting and Warning Study and provide resources to commence implementation of recommendations.

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, including the preliminary flood risk assessments in 2011 and the flood risk maps for 2013.

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

Sector	Overall grade
Water supply and wastewater	C
Water quality	C
Flooding	D

Overall score



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-in-pipe infrastructure

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?

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. 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. 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 currently 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 an updated national spatial strategy to support investment in new industries.

Currently, the basic cost to Irish non-domestic customers of public water supply and waste water collection is €2.30 per cubic metre (on average). In Germany and Denmark this can be more than €5 per cubic metre, because those 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.

There are 34 water service authorities and the consolidation of water service management functions would likely deliver a better service at a lower cost. The management of Ireland's water capture, treatment and distribution network may be better served by a single national water authority or company which could enforce standards for compliance by all water supply network operators or centralise operations and investment. Such standardisation would encourage and facilitate the development of the network in a manner which would meet the needs of the population.

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?

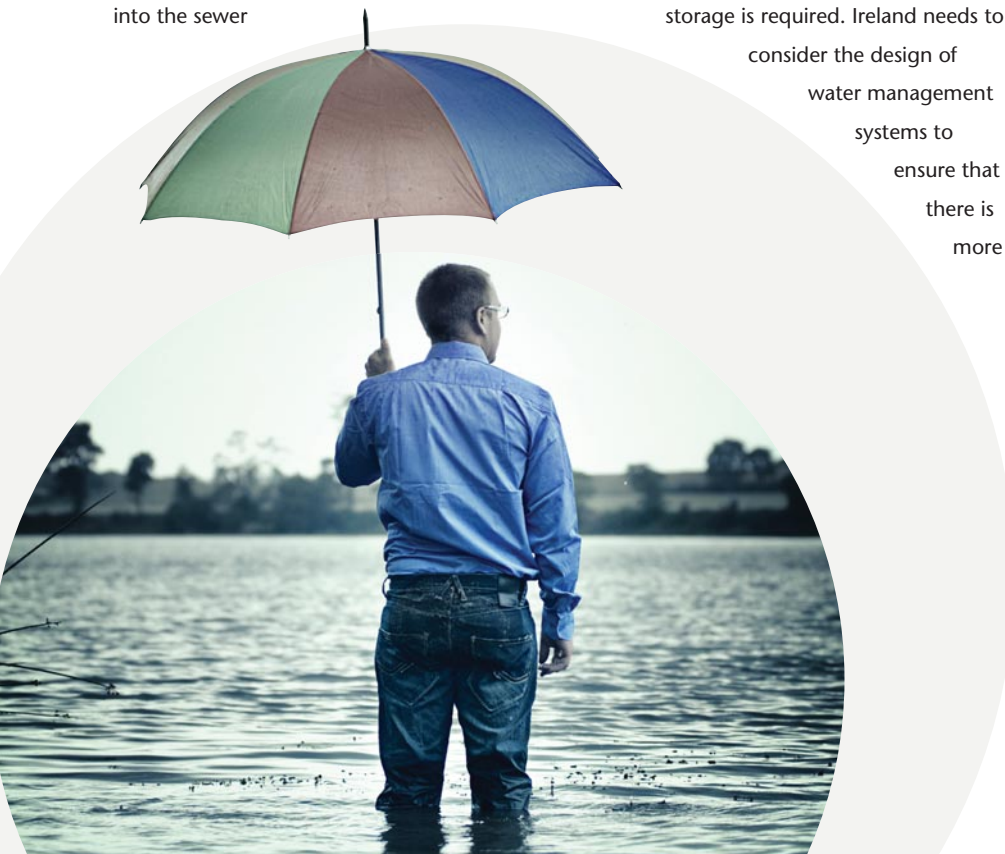
The future trend will be to reduce the mass transfer of water from remote reservoirs. More rainwater harvesting at homes and businesses will be required to limit the need for bulk transfers at high energy cost.

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.

Ireland is currently working to the Water Service Investment Programme 2010-2012. Adequate funding for this programme is vital. Indeed, developing an appropriate funding model for water services in the longer term is central to the development of Ireland's water and wastewater infrastructure.

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.

Water charges need to be introduced in Ireland for all users. This is not simply a matter of generating revenue, but is also about improving the management of the system.



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. Ireland's rivers, lakes, groundwater and coastal waters are in the top 10%, internationally, in terms of the quality of water. Of 13,200km of rivers surveyed in Ireland between 2006 and 2008, 70% were unpolluted, 19% slightly polluted, 10.5% moderately polluted and 0.5% seriously polluted.

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 awarded a Blue Flag.

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.

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. Ireland is currently developing a licensing system and this must be implemented quickly.

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.

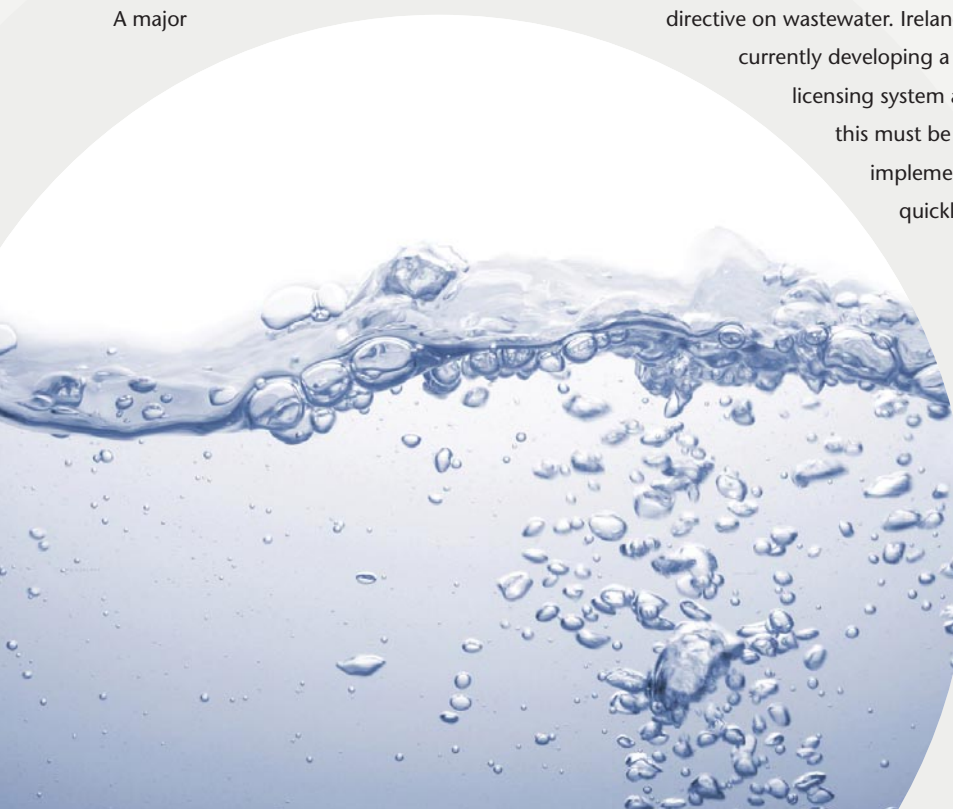
Problems in Galway around cryptosporidium demonstrated the fragility of water supply and its importance to normal living. Many Irish water schemes are under threat from cryptosporidium because of inadequate barriers in treatment. Comprehensive water safety plans and catchment management plans are required to manage this risk.

What actions do we need to take?

The monitoring of water quality by the EPA is comprehensive. While Ireland is now doing well on monitoring, sufficient resources are not always available to act on the recommendations which come from monitoring. It is important that this situation be resolved.

The key action in this area is to implement the River Basin Management Plans which have been adopted. 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

Flooding can come from a range of sources: coastal/tidal, fluvial (rivers), pluvial (heavy intense rainfall), and groundwater (turloughs). It is predicted that climate change will bring wetter winters and drier summers to Ireland. On top of that, sea levels are predicted to rise throughout the current century and, with more frequent and more severe storms also predicted, many parts of Ireland will be at an increased risk of flooding.

What is the current state of the infrastructure?

The Office of Public Works has done much work in protecting against flooding. Recent projects to provide flood warning and defences in Mallow and Clonmel are a positive development, and other projects are in progress. However, there are significant challenges to be overcome. The poor state of the river defences in the older parts of some towns (for example, the collapsed river walls in Cork City at the Mercy Hospital) is a cause for concern. There have been €140m of insured losses suffered in Cork alone from the floods of November 2009.

Irish cities and towns are invariably built on rivers; this was the logical location for their development. Accordingly, this will often present a difficulty when there are abnormal events. This is not simply a matter of history, however. Inappropriate building development took place on flood plains during the last ten years and this should never have happened. The Planning System and Flood Risk Management, Guidelines for Planning Authorities prepared by the Department of the Environment, Heritage and Local Government and the Office of Public Works in November 2009 should eliminate that problem in respect of new development, though the problem of managing existing developments remains. Local authorities are scheduled to have adopted the planning guidelines into all development plans by 2015, thus reducing zoned development land.

In respect of shock loads or peak events, there is a need for more infrastructure and management measures to be put in place for future flood risk scenarios. The OPW and the DEHLG have developed guidelines, templates and protocols for the preparation by local authorities of emergency response plans, and these must be adopted and maintained by local authorities. The maintenance of water courses is not solely the responsibility of the State authorities but also of landowners. The OPW maintains main arterial drainage scheme channels to a published programme, but the responsibilities of riparian landowners further up the catchment are not enforced.

What does the future hold?

Climate change is likely to bring greater risk of flooding through rising sea levels and more intense rain events. In accordance with the EU Floods Directive, Ireland is currently working to identify which parts of the country are most at risk from flooding through Catchment Flood Risk Assessment and Management (CFRAM) studies, which focus on prevention, protection and preparedness. This is done by first determining the extent of flood risk through flood hazard mapping and flood risk mapping. Consequently, objectives for flood risk reduction have to be established, as well as the measures that will be taken to reach these objectives. These are to be laid down in flood risk management plans. This is a national risk assessment exercise that is being used to identify how best to manage flood events and what measures to take to reduce flood risk. The CFRAM plans are scheduled to be completed by 2015, with preliminary flood risk assessments completed in 2011 and flood maps for areas of significant risk published in 2013. Equally, the capacity to respond to such events is often inadequate. Nonetheless, and allowing for the fact that there is much work to do, places like Mallow and Clonmel, which were inundated by flooding for many years, are now much better protected.

Ireland's capability to plan and implement a maintenance regime to manage flooding is poor, perhaps because of the perception that it is money spent unnecessarily. The curtailment of maintenance regimes to save money in the short term incurs larger costs in the longer term. In respect of the maintenance and management systems for flooding and for arterial drainage, landowners in general are not taking responsibility for water courses going through their property. 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, forecasting, 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. The year 2011 should see the adoption of the Lee CFRAM Study and a commitment to the works required under the plan. Across the country, these 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 if it is to implement the measures (structural and non-structural) which are necessary to alleviate flooding. The economic challenges facing the country suggest that this will prove difficult in the foreseeable future. The difficulty is that failure to resolve the flooding issue will, in turn, create still more economic challenges.

RECOMMENDATIONS

12-Month

Vest the ownership of waste in local authorities and confirm their power to direct waste to higher order treatment tiers in the EU waste hierarchy.

Regulate the collection of household waste by a fair, transparent and competitive tender process.

Commence the construction of the Poolbeg energy-from-waste (EfW) facility.

Five-Year

Have revised and co-ordinated regional and county waste management plans in operation.

Have the Poolbeg energy-from-waste (EfW) facility operational.

Have dedicated expert waste management engineers available to the industry from university courses.

Overall score



WASTE

The challenge for waste management in Ireland is to fully recognise waste as a resource for either material recycling or energy recovery. Current Government policy dates from the 1998 policy document, Changing our Ways. Current regional and county waste management plans chart a clear way forward to meet the EU Landfill Directive. This policy should be seen to be efficient in terms of both cost and practicality, while developing the ongoing philosophy of using waste as a resource. The essential challenge is to develop a policy which will maximise the benefits to Irish society and minimise the costs.

What is the current state of the infrastructure?

There has been stagnation in infrastructural development over the last number of years as the Government reconsidered the established policy of thermal treatment in favour of mechanical biological treatment (MBT). The ongoing debate over the most appropriate technologies for the management of residual waste in Ireland over recent years has created a huge degree of uncertainty in the area. Current difficulties are the falling levels of waste importation into established landfills, the requirement to reduce those volumes further in accordance with EU legislation, the debate on how waste will be managed relative to the EU requirement to reduce landfill intake, and the vacuum created by the stalled initiative to develop an energy-from-waste (EfW) facility in Dublin.

Although Ireland's waste management structure is really challenged to meet diversion from landfill targets, the fact that economic growth has slowed has alleviated some of the immediate pressure. Nevertheless, Ireland must continue to address waste primarily in terms of prevention, reuse and recycling, then treating further to generate energy and using landfill as a last resort. Ireland also has a substantial number of landfill legacy issues to resolve. EPA-monitored landfill sites are now endeavouring to apply proper environmental management and address low carbon concerns. The difficulty the industry recognises – and local authorities equally recognise – is that both are almost powerless to do anything about those historic landfills that were not subject to EPA scrutiny. In addition to that, there stands the challenge of dealing with those landfills which were in fact illegal landfill sites. Historic illegal landfills are an ongoing concern and the ability to address these problems has worsened with the decline in the

State's finances. Even during the boom Ireland was not fully addressing these issues. The cost of dealing with these sites is substantial, particularly given the state of the public finances.

A further complicating factor is that current EU legislation requires that the amount of material that goes to landfill actually shrinks. As a consequence some local authorities are endeavouring to sell their landfills to private enterprise. It remains to be seen if private enterprise is capable of generating the income from managing landfill to justify their involvement.

What does the future hold?

Irish waste management policy needs to be challenged to prevent waste and to move its treatment as far up the EU hierarchy as possible before the planning, design and construction of a new infrastructure to cope with future demands. The outcome of this debate will drive infrastructural development in a range of areas, which will probably be a mixture of incineration with energy recovery of residual waste and the introduction of MBT as a pre-treatment for landfill where incineration does not exist.

There has been a dramatic change of lifestyle in Ireland over the last decade in terms of people's commitment to recycling. The challenge now is to build on that momentum, driven by the regional and county waste management plans, to develop a recycling infrastructure in the workplace, in homes and in public spaces. There has been a definite shift away from people burning their own waste or fly-tipping and this should be commended. We now need to ensure that there is a consistent

approach to recycling all across Ireland and that every citizen is provided with the information and the means to recycle their waste. Ireland's commitment to recycling was initially seen as a way to reduce our 'throw-away' philosophy in favour of reusing materials. Latterly, however, waste is being seen as a resource which can lead to employment and investment opportunities. There is an increasing awareness that waste is not just rubbish. RX3 (rethink, recycle and remake) is a Department of the Environment, Heritage and Local Government initiative to promote the idea that waste is not something that simply must be disposed of. Instead, by a series of selective processes and with the proper incentives, whether it be commercial or financial, elements of waste input are taken and recycled into products. Additionally, the challenge is to retain these recycling activities in Ireland rather than having to export the raw material so that it is reprocessed outside Ireland. By retaining the raw material within Ireland we can generate opportunities for employment here.

The imperative of finding new ways to manage waste demands a rethink on the expertise being taught to third-level graduates, and the need to retrain people already working in the field is now clear. It is not that a wholesale change is necessary, more that undergraduate courses must actually be geared to and mirror what the demands outside are. The changing landscape of waste management with its emphasis on reuse and recovery and pre-processing before final despatch will have to be addressed in the future education of engineering and science undergraduates. A very positive development in re-use developed by engineers is the Freetrade (Freetrade Dublin and Freetrade Ireland) websites to encourage waste prevention and re-use.

What actions do we need to take?

The fact that 39% of Irish municipal waste is now being recovered is evidence of the trend towards greater recycling. It is a trend which must be maintained, based as far as possible on source-separated recycling in terms of green and brown bins for dry and wet recyclables, respectively. The medium-term challenge facing the waste management sector is to meet the challenges of the EU Landfill Directive. The aim of this Directive is to prevent or reduce as far as possible negative effects on the environment from the landfilling of waste, during the whole life-cycle of the landfill. The number of active landfills in Ireland has decreased from over 200 in the mid-1980s to 31 in 2009. This number will continue to decline. Part of the programme will be an obligation on householders and business owners to segregate their waste between black, brown and green bins. Increased charges will place a financial penalty on those who do not minimise the waste that goes into black bins. Nonetheless, the great likelihood is that no matter how much material is recycled, there will still be an element of waste which will not be suitable for that process. The key then is to decide how best to manage that waste and to invest money in developing an appropriate infrastructure.

To enable Waste Management Plans to be implemented will require the proper regulation of waste collection and local authorities to exercise the power to direct waste to higher order treatment facilities. The current unregulated collection of waste in Ireland which is unique in the EU cannot be allowed to continue as it is not in the national interest. The ownership of waste must be vested in the local authority and it is essential that the tender process for household waste collection is fair, transparent and competitive. In addition the provision of waste infrastructure needs to be led according to waste management plans.

RECOMMENDATIONS

12-Month

Take immediate measures to bring regional broadband costs down to match rates available in Dublin.

Implement a funded programme to make broadband available to all parts of the State, including islands, with high-speed broadband available to more than 95% of the population.

Initiate a study to identify risks to national communications systems, e.g., reliance on one or two sub-sea cables, and commit to funding recommendations.

Five-Year

Bring broadband costs down to not more than 5% above EU and UK norms within five years.

Achieve universal high-speed broadband to substantially all parts of the state by 2016.

National and regional broadband infrastructure to be in the top five of European league tables in terms of availability, uptake and speed by 2016.

Overall score



C

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?

In general, the fixed and mobile phone network infrastructure is capable of meeting the demands placed on it. The broadband infrastructure, across its current range, is capable of meeting normal and peak traffic demands, albeit sometimes at reduced speeds. Nonetheless, significant 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. 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. In general, Ireland compares favourably with other European countries in mobile phone usage, with 5.3 million customers and a penetration rate of 119%. However, there have been high termination rates reported recently, which could indicate a fall off in usage. In general, Ireland also compares favourably with other European countries for fixed-line infrastructure, with a high percentage of the network digitised. While there has been increased broadband penetration in recent years, Ireland compares poorly with other European countries on the extent of its internet and broadband penetrations.

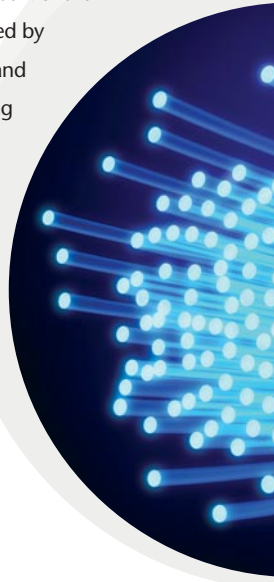
What does the future hold?

While mobile phone network infrastructures are capable of supporting projected economic developments, the broadband infrastructure will require considerable enhancement to extend network coverage and to improve broadband speeds. The cost and quality of broadband access is fundamental to the economic success of enterprises which need such access for their business. In Ireland, the cost of broadband access is high and needs to be reduced if small and medium enterprises are not to be disadvantaged by comparison with

those in other countries. The bulk of the broadband network is provided by digital subscriber loop (DSL) and mobile broadband, accounting for 48% and 34%, respectively. 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.

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. Disposal of old and faulty network equipment is covered by the Electrical Waste Directive, ensuring that environmental concerns are addressed. 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 (e.g., 'fibre to the kerb' and 'fibre to the home') and satellite-based access services. These currently account for only 0.5% of total broadband subscriptions and this percentage needs to be dramatically increased in the short to medium term. Changes in lifestyle which have implications for network usage include shopping on the internet, downloading music and accessing TV programmes. Investment is required in major network upgrade to cater for the higher speeds which will be required in the future.



PRINCIPAL SOURCES

- Central Statistics Office**, Measuring Ireland's Progress (2009).
- Cómhar**, Creating Green Infrastructure for Ireland: Enhancing Natural Capital for Human Wellbeing (2010).
- Comreg**, 10/47 Strategy Statement 2010-2012: Snapshot of key statistics and developments.
- Construction Industry Council**, Building a better Ireland: Investing in infrastructure and the built environment to support Ireland's Smart Economy (2010).
- Department of the Environment, Heritage and Local Government**, Changing our ways (1998).
- Department of Finance**, Infrastructure Investment Priorities, 2010-2016 (2010).
- Department of Transport**, National Cycle Network – Scoping Study (2010).
- Environmental Protection Agency**, National Waste Report 2009 (2011).
- Environmental Protection Agency**, Provision and quality of drinking water in Ireland: a report for the years 2008-2009 (2011).
- Environmental Protection Agency**, Drinking water report 2008-2009: Remedial action list (2011).
- Environmental Protection Agency**, Water Quality in Ireland Report 2007-2009 (2011).
- European Commission**, 15th Progress Report on the Single European Electronic Communications Market (2009).
- Eurostat**, Telecommunication Services: Access to Networks per 100 inhabitants (2010).
- Fitzpatrick Associates (for Regional Assemblies)**, Preparation of a Gateway Development Index: Report on Stages 1 & 2 (2009).
- Forfás**, Adaptation to Climate Change: Issues for Business (2010).
- Forfás and National Competitiveness Council**, Costs of Doing Business in Ireland Vol. 1 (2010).
- Institution of Civil Engineers**, The State of the Nation: Infrastructure 2010 (2010).
- Institution of Civil Engineers**, Low Carbon Infrastructure (Northern Ireland): State of the Nation Briefing Sheet (2010).
- Institution of Civil Engineers**, The State of the Nation: Low Carbon Infrastructure (2010).
- Institution of Civil Engineers**, The State of the Nation: Capacity & Skills (2010).
- KPMG**, Competitive Alternatives: Guide to International Business Location (2010).
- Irish Academy of Engineering**, Critical Infrastructure: Adaptation for Climate Change (2009).
- Irish Academy of Engineering**, Review of Ireland's Energy Policy in the context of the changing economy (2009).
- Local Government Management Services Board**, Service Indicators in Local Authorities (2008).
- Mary Moloney, Karsten Menzel, Eamon McKeogh**, Quantifying Ireland's Infrastructural Deficit (Paper presented at BCRI 2010).
- SEAI**, Ireland: Your Smart Grid Opportunity (2010).
- Siemens**, The Economic Impacts for Ireland of High Oil and Gas Prices (2010).
- Urban Land Institute and Ernst & Young**, Infrastructure 2010: Investment Imperative (2010).

ABBREVIATIONS

CCGT: Combined cycle gas turbine	EPA: Environmental Protection Agency	MVA: MegaVolt-Ampere
CHP: Combined heat and power	GDP: Gross domestic product	MW: Megawatts
DAA: Dublin Airport Authority	GHG: Greenhouse gases	CCGT: Open cycle gas turbine
DEHLG: Department of the Environment, Heritage and Local Government	IAA: Irish Aviation Authority	OPW: Office of Public Works
DSL: Digital subscriber loop	kV: KiloVolt	RAL: Remedial action list
	MBT: Mechanical biological treatment	RX3: Rethink, recycle, remake
		UFW: Unaccounted for water



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