ENGINEERING THE WEST TO 2020

- Reinventing Our Region

ENGINEERS IRELAND
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EXECUTIVE SUMMARY

We recommend the adoption of a sustainability framework for development to achieve our vision, and put forward the 10 One Planet Living principles as an example of such a framework.

In the Zero Carbon section we recommend the adoption of energy efficiency as the first priority, and the generation of electricity from renewable sources within the region.

We recommend that waste be viewed as a resource in the Zero Waste section, and call for a rational, informed public debate about waste management.

In Sustainable Transport we recommend a high quality road network in the West Region to improve connectivity both within the region and to other regions and cities. We want more bus and rail use by commuters to and from Galway City and we want our city and rural towns to be more cycling and walking friendly.

We advocate for the use of Sustainable Materials, focusing on the design of goods, taking account of efficient use of resources, and the longevity, reparability and recyclability of products. We want more use to be made of timber, which can be grown sustainably in the region.

In relation to Local and Sustainable Food, we want more locally, organically produced foods that keep us healthy and well and meet the increasing consumer interest in the provenance of the food they eat.

In the Sustainable Water section, we make recommendations about what needs to be done in relation to water supply, public sewerage schemes, septic tanks in un-sewered areas and flooding, and call for the West Region to become an exemplar in relation to River Basin District Management.

In Land Use and Wildlife we advocate for the adoption of new land use strategies for the West Region that support our vision of an agile and sustainable region and encourage positive stakeholder engagement.

We want to enhance the contribution of Culture and Heritage to our well-being, to innovation and creativity and to economic development and thus provide a 'Quality of Life' that is second to none.

The primary focus of the Equity and Local Economy section is employment, on the basis that the largest contribution that can be made to social equity is to ensure employment opportunities are available to all.

In Health and Happiness we want the West Region to be a leader in addressing the various elements of a proactive approach to health, including healthy eating, healthy lifestyles through exercise and sport.

"Ní neart go cur le chéile!"


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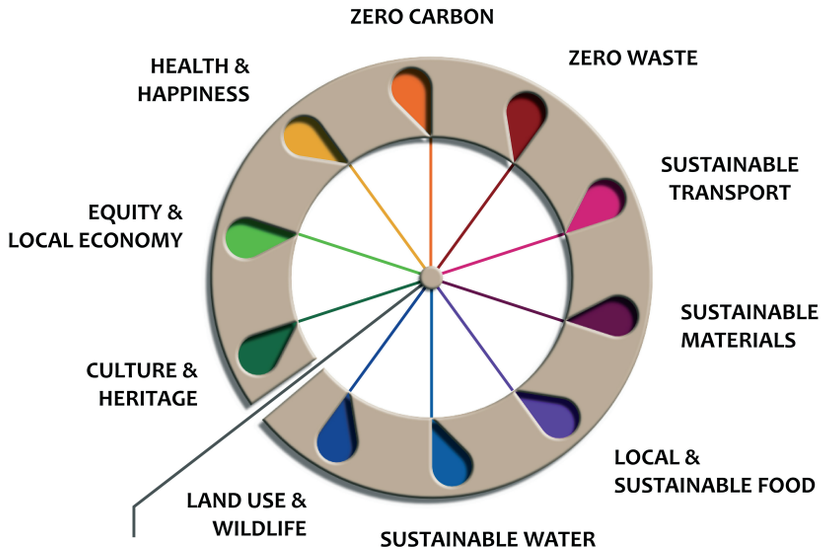

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INTRODUCTION

VISION AND OBJECTIVES

Our vision is to foster the growth of

An agile and sustainable West Region, benefiting from world class industrial clusters, a vibrant economy and our rich natural and cultural heritage.

For a considerable period of time, the Engineers Ireland West Region has had a strong focus on its contribution to the development and sustained growth of the West of Ireland. Motivated by this ambition, a body of work was commissioned in which there was a critical assessment of the Region in terms of its resources and the enormous potential that exists. This work has led to the above vision for the Region and, through a series of key recommendations, it spells out how this vision can be achieved.

In this initiative, there was particular attention given to engineering related activities, the roles that engineers are now playing and the role that engineering can play in the future to drive this growth. In pursuit of the vision, engineers must work with other professionals and stakeholders to deliver the infrastructure to support our economic prosperity while at the same time reducing our ecological footprint. This will be achieved through the use of new technologies, enhanced design and integrated planning, thereby ensuring a sustainable future for the Region.

It is opportune that this report was launched in the same month in which the new programme for government was initiated. The recommendations contained in this report are in keeping with key objectives of the government programme. Over the coming years, Engineers Ireland West Region will work with relevant government departments, local authorities and agencies and other stakeholders to contribute to the detail of the government programme such that the vision for economic recovery is achieved.

The recommendations outlined in this report clearly will have national implications and are consistent with national objectives. However, there is a very strong emphasis on the development of a Region: in this case the West Region. Thus, the report looks at opportunities that are particular or unique to this Region. This is a clear example of how a Region can look at itself in a critical manner and then outline the approach that best suits the local needs. Essentially, it is an example of a Region taking ownership of its own destiny and reinventing itself.

While this report provides the recommendations that will help to secure the future, in some respects this only represents the start of the next journey which must see the achievement of the vision by 2020. Thus, considerable effort is required to ensure that the recommendations herein are carried out. Engineers Ireland West Region remains committed to this objective over the next decade.

Engineers Ireland and the West Region

Engineers Ireland is the professional body for engineers in Ireland. It has in excess of 24,000 members drawn from across all disciplines in engineering. Engineers Ireland has been representing the engineering profession since 1835, making it one of the oldest and largest professional bodies in Ireland.

Engineers Ireland is organised on a regional basis with a total of 10 regions in the country. The West Region comprises the counties Galway, Mayo and Roscommon.

Regional Overview and Key Industries

The total area of the West Region is 14,287 square kilometres, and it has a population of 414,277. According to CSO figures, the population of the Region is expected to increase to 552,000 by 2026. Between 2002 and 2006, the population of the West Region grew by almost 9%, which was just above the national average. However, since 2006 the level of population increase has reduced to just over 4%, which is one of the lowest rates of increase in the country. Growth in population is seen as a key indicator of how a region is performing. The Region is predominantly rural with a low population density although urban centres have developed throughout the Region. The main urban centres in the Region include Galway City, Tuam, Ballina, Castlebar and Roscommon Town. There are four local authorities in the Region: Galway City Council, Galway County Council, Mayo County Council and Roscommon County Council.

Galway City is the only city in the Region and acts as the main driver of economic development for the Region. According to CSO figures for 2002-2006 Galway City experienced growth in population at a higher rate than the rest of the Region. The growth rates of the other towns have not been as significant. This highlights the importance of Galway City and the way in which it acts as a driver for economic growth in the Region. Galway City has a large industrial base, third level education institutions and it is generally seen as having a high quality of life.

The Region is also serviced by two large third level institutions, NUI Galway and GMIT. GMIT has campuses in Galway City and Castlebar. The presence of these third level institutions is important for the development of industry in the Region, as a secure supply of suitably qualified graduates is an important consideration for multi-national companies, and also startup companies, considering locating in the Region. The Region has seven hospitals (four in Galway City, one in Roscommon town, one in Ballinasloe and one in Castlebar). This is also an important consideration for industry. From a quality of life perspective, having good healthcare facilities within the Region is important to companies looking to attract high calibre people to the Region, particularly the multi-national companies.

Sustainable and globally competitive industries will be critical to the future development of the Region. The West Region is fortunate that it is the home to a very large biomedical cluster. This has had an enormous impact on the Region over

the last twenty years and it is vitally important that this sector continues to expand. The ICT industry, going back to the arrival of Digital in 1971, has also been very significant for the Region also. This is a rapidly changing global industry and it must continue to evolve at the forefront of new technology to maintain its position. The exciting new opportunities for growth are in the energy sector with particular opportunities in wind and ocean. Given its resources in these areas, the Region has the opportunity to expand significantly in these areas. Infrastructure development must also continue to grow as this very much underpins these and other industries that are highly relevant to the Region, such as tourism.

METHODOLOGY

In 2008, the West Region Committee of Engineers Ireland adopted a plan to develop a comprehensive report on the growth of the West Region to 2020. Accordingly a sub-committee was put in place to carry out this work. Funding was obtained from the Irish Research Council for Science, Engineering and Technology to support a graduate student at NUI Galway. Co-funding for this student came from Engineers Ireland West Region. The brief for the student was to carry out the necessary background research to ensure that the report could be prepared.

A key feature of the research work was that it was highly consultative. This was to ensure that the views of all possible stakeholders were included in the outcomes and that they influenced the recommendations. There was also considerable interaction between the student, the academic supervisors and the sub-committee to adjust the direction as appropriate and to provide other inputs.

There is no doubt that Ireland is a much changed nation since this report was commissioned. This has certainly resulted in a change to the focus of some of the report to reflect the current economic difficulties. It is clear that the recommendations also reflect the new reality that now exists in this country. Many of these recommendations will be key to ensuring that national competitiveness continues to improve and that economic recovery will take place sooner rather than later.

The project consisted of the following tasks:

- Assess the principles of sustainability

  Sustainability is a key theme running through this report and it is necessary to ensure that conclusions from the report are in line with principles of sustainability.
- Review of Policy Documents

  A comprehensive review was conducted of all European, National, Regional and County policy documents, strategies, directives and plans that were relevant to the growth of the West Region. The most relevant points in the documents were identified based on the aims of this report. The documents were also assessed to identify the level of fit between them and how they influenced other reports, particularly from E.U. level down to regional level.
- Consultation Process

  An extensive consultation process was undertaken with stakeholders representing

a range of organisations in the West Region. The consultation process was carried out with representatives of the region's Local Authorities, industry, academics and state agencies.

- Assessment of key existing industries and identification of growth opportunities

  There was a significant emphasis on the industries that had a particular relevance to engineering. These included ICT, biomedical and energy. Growth opportunities were clearly identified and the importance of this growth to the Region was very much emphasised.

- Analysis of Infrastructural Needs in West Region

  The analysis of the infrastructural needs of the West Region involved consideration of broad and diverse issues affecting the development of infrastructure. Central to this analysis was the role that infrastructural development plays in acting as a driver for economic development. All plans and strategies that highlight infrastructure as a core requirement for development were considered. The consultation process also formed a major role in the analysis and identification of key infrastructure as it highlighted, in a qualitative way, the importance of physical infrastructure to the development of industry.

SUSTAINABLE DEVELOPMENT AND ONE PLANET LIVING

SUSTAINABILITY

The West Region is characterised by a uniquely rugged, scenic and sensitive environment that presents both opportunities and constraints for development. This underlines the need for coherent and integrated policies in areas such as planning. It is essential to work with and not against the environment, to ensure that development is in keeping with our location, and to create the proper foundation on which to build a vibrant economy. The current economic crisis must be viewed as an opportunity to take stock of our existing situation and ensure that things will be done in a more constructive manner in the future. Working from a sustainability framework, it will be possible to unlock the full and vast potential of our Region, in terms of natural and human resources.

It is important to understand that sustainability is about much more than the environment, and that the social and economic pillars are integral to development and growth. Economic plans must be based on the strengths and resources of our Region and based on world class economic clusters as the key to economic recovery. We must grow our existing clusters in ICT and Medical Devices and develop new clusters in Renewable Energy and Smart Ocean. Other sectors will benefit also and in particular tourism, arts and culture - areas where there are already notable international successes such as the Galway Arts Festival and the Volvo Ocean Race.

There are a number of locations around the world where sustainability is being adopted as the key driver and framework for development. Vancouver, which is often named as the most livable city in the world, published a report in 2009, which sets out its plan to becoming the "greenest city in the world"[1]. Vancouver is not alone in its quest to be the greenest city and

faces competition from other cities including London, Sydney, Copenhagen, New York, Portland, Seattle, San Francisco, Chicago, Toronto, Berlin, Paris, and Stockholm.

One Planet Living®

One Planet Living is a sustainability framework that was developed by BioRegional and World Wildlife Fund (WWF) to enable people and organisations to live and work within a fair share of our planet's resources.

The basic concept behind One Planet Living is to encourage people to live within an ecological footprint that can be supported by the planet. At present if everybody in the world had the same ecological footprint as the inhabitants of Europe, three planets would be needed to support the global population.

The core of the framework is the use of ten guiding principles to help individuals and organisations to examine the sustainability challenges that they face, and to develop appropriate solutions. The ten guiding principles which One Planet Living uses are outlined and briefly explained below:

- Zero Carbon: Making buildings more energy efficient and delivering all energy with renewable technologies.
- Zero Waste: Reducing waste, reusing where possible, and ultimately sending zero waste to landfill.
- Sustainable Transport: Encouraging low carbon modes of transport to reduce emissions, reducing the need to travel.
- Sustainable Materials: Using sustainable healthy products, with low embodied energy, sourced locally, made from renewable or waste resources.
- Local and Sustainable Food: Choosing low impact, local, seasonal and organic diets and reducing food waste.
- Sustainable Water: Using water more efficiently in buildings and in the products we buy; tackling local flooding and water course pollution.
- Land Use and Wildlife: Protecting and restoring biodiversity and natural habitats through appropriate land use and integration into the built environment.
- Culture and Heritage: Reviving local identity and wisdom; supporting and participating in the arts.
- Equity and Local Economy: Creating bioregional economies that support fair employment, inclusive communities and international fair trade.
- Health and Happiness: Encouraging active, sociable, meaningful lives to promote good health and well-being.

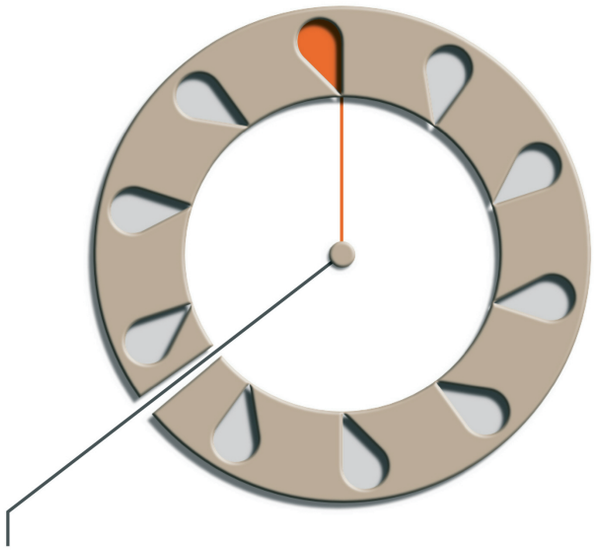
Structure of Report

This report follows the One Planet Living concept and it is structured according to the ten guiding principles. Given the nature and the scope of this project with an emphasis on technology driven activities, there is more discussion on some of the principles than on others. Key recommendations have also been highlighted under each section.

The report concludes with the next steps associated with implementing the vision that has been articulated here.

BIBLIOGRAPHY

1 a. http://vancouver.ca/greenestcity/



"making buildings more energy efficient and delivering all energy with renewable technologies"

Section Contents

KEY RECOMMENDATIONS

01 Develop a Regional Energy Efficiency Action Plan by mid 2012 incorporating ambitious targets for energy efficiency in buildings, public lighting and water services.

02 Setup a Regional resource to share experience and knowledge, provide advice on design for energy efficiency in buildings and promote responsible energy use.

03 Explore option of EU funding for the up-front costs of energy retrofit measures, in the light of the current scarcity of credit.

EXECUTIVE SUMMARY

There has been a major drive to the change the way in which we produce and consume energy due to issues of security of supply, climate change and economics. The West Region has the potential to lead the way in responding to this challenge by reducing the energy demand through the introduction of energy efficiency measures and by decarbonising the regional energy supply through the development of renewable energy resources.

In 2009, the primary energy requirement in Ireland was 15.1 mtoe and the associated energy related CO_2 emissions were 42.6 mt. Fossil fuels account for 95% of the energy used and about 89% of this energy was imported, which indicates clearly how vulnerable the country is from an energy perspective. In the West Region, the domestic energy consumption per household is 22% higher than the national average. With the increasing price of fuel, this higher consumption will place increased financial burdens on homeowners in the Region unless measures can be taken to reduce consumption.

The National Energy Efficiency Action Plan (NEEAP) sets out actions to be implemented in the period to 2020 to achieve 20% energy efficiency across the public, business, residential, transport and energy supply sectors. Under the NEEAP, the vision is that "All new Irish housing will be carbon neutral. Efficiency standards in older homes will be significantly improved through retrofitting actions". An aggressive approach to the upgrade of residential buildings in the West Region should be pursued.

In order to achieve the Government's target of 10% electric vehicles by 2020, the installation of charging stations will be required across the region. These should ideally be powered by renewable energy. The development of rail freight has the potential to significantly reduce CO_2 emissions relative to road transport. The diversion of freight from road to rail should be actively explored. In order to reduce overall consumption, it will be important to align land use and transport planning.

The Public Sector is required to achieve energy savings of 33% by 2020. As over 80% of the energy used by Local Authorities relates to public lighting and water services, these areas need to be targeted. Local authorities in the region should work together to share experience and knowledge on the implementation of energy efficiency technologies. New approaches to funding these initiatives should be investigated.

A regional resource should be developed to share experience and knowledge, provide advice on design for energy efficiency and promote responsible energy use.

ZERO CARBON

04 Develop an overall national vision for Renewable Energy in Ireland and communicate this to the general public with a view to developing a "Team Ireland" approach.

05 Adopt a national, integrated and coordinated approach to the planning and development of Renewable Energy including all stakeholders.

06 Develop Regional Plans for Renewable Energy development taking the particular characteristics and natural resources of each region into account.

Engineers Ireland West Region is of the view that the West Region should aim to become a "low carbon" Region and nett exporter of renewable energy by 2020.

Ireland has achieved its 2010 target of 15% of electrical energy to be derived from renewable sources. The West Region has contributed to achieving that with 16 wind farms with an installed capacity of 140 MW representing 7.77% of Ireland's installed onshore wind capacity.

To achieve Ireland's National Renewable Energy Action Plan target of 42.5% of electricity from renewable sources will require a greatly increased roll out of developments. The Gate 3 process includes applications for a total installed capacity in the West Region of 1,077MW. This represents 33.72% of the total installed onshore wind energy included in Gate 3 for the 26 counties.

Significant grid reinforcement and new grid installation will have to be undertaken to enable the connection of the developments included in Gate 3. We are concerned about the lead times associated with the development of new high voltage overhead lines which could seriously impact on the achievement of the connection of significant renewable energy developments between now and 2020.

We would like to see significant developments in Bioenergy and in particular in Biomass High Efficiency CHP, in Anaerobic Digestion plants to digest biodegradable municipal waste, agricultural wastes and grass and in biomass boilers for domestic heating particularly for houses in rural areas. District heating, with heat energy from biomass boilers/biomass CHP plants or from energy-from-waste plants, should be considered for all new housing developments.

An overall, integrated, national strategy for renewables is needed with a streamlined consent system including foreshore licensing. A balance needs to be struck between environmental protection, the energy needs of the economy and society's needs. Strategic development zones for both onshore and offshore wind, wave and tidal energy should be identified taking account of environmental factors, the wind resource and the feasibility of a grid connection. In this way developers and investors will have a reasonable level of certainty as to where developments will be permitted and can be assured of a connection to the grid. In will also enable EirGrid to plan the optimum routes for the main bulk power transmission cables to connect the consented developments into the grid.

INTRODUCTION

Both nationally and internationally, there has been a major drive to change the way in which we produce and consume energy. The main reasons for this are security of supply, climate change and economics. In Ireland, about 90% of the current energy supply is imported and is based on the use of fossil fuels. The scientific opinion that human activity is contributing to climate change is accepted and it is also accepted that measures must be taken to reduce the concentration of Green House Gases (GHGs) in the atmosphere. The burning of fossil fuels is a significant contributor to GHG concentrations. As a member of the EU, Ireland is required to reduce CO2 emissions by 20% from 2005 levels in 2020 in order to mitigate climate change.

ENERGY EFFICIENCY

CURRENT SITUATION

NATIONAL ENERGY CONSUMPTION

In 2009, the primary energy requirement in Ireland was 15.1 million tonnes of oil equivalent (mtoe), which represents an increase of 57% from the 1990 value[1]. The associated energy related CO2 emissions increased by 39% to 42.6 million tonnes during the same period. The energy related emissions represent 68.4% of the total CO2 emissions for 2009[2]. (The agricultural sector accounts for most of the non-energy related emissions.) The breakdown of the energy requirement and emissions by sector is shown in Table 1 and Figure 1. Sixty percent of the primary energy requirement is in the transport and residential sectors.

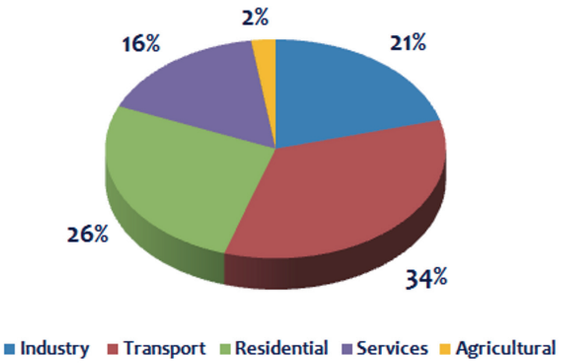


Figure 1 Primary Energy Requirement by Sector 2009

The breakdown of primary energy by fuel type is shown in Figure 2[1]. This shows the extent of our dependency on fossil fuels, particularly oil. With the advent of 'peak oil', the continued escalation of oil prices and the political instability in many oil-producing countries, this is not sustainable into the future. Between 1990 and 2008, Ireland's imported energy more than doubled from 6.9 mtoe to 15.0 mtoe. While the imported energy fell by 10% in 2009 to 13.5 mtoe mainly due to the decline in economic activity, this still represented 89% of our total energy

	Industry	Transport	Residential	Services	Agricultural	Total
Primary Energy Requirement(kto	3,136	5,151	4,001	2,465	349	15,102
Energy related CO_2 emissions($ktCO_2$)	8,379	15,043	11,557	6,651	1,019	42,648

Table 1 Energy Requirement and Emissions by Sector in 2009 - Ireland

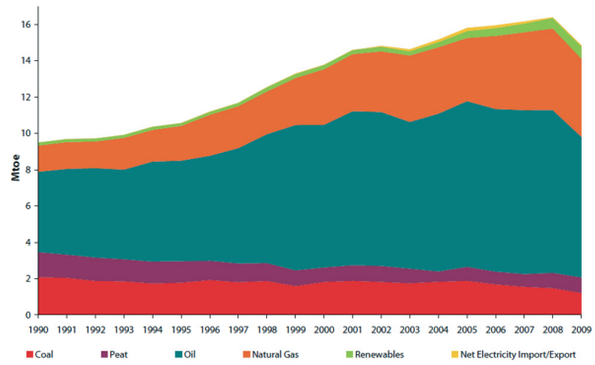


Figure 2 Total Primary Energy Requirement by Fuel Type 1990-2009 - Ireland

requirement, which indicates clearly how vulnerable the country is from an energy perspective.

The breakdown of energy use between thermal and non-thermal use for each sector is shown in Figure 3[3]. Within the domestic sector, over 80% of energy use is thermal. The thermal performance of many dwellings is poor so much of this energy is wasteful. The Industrial sector also has a very high thermal energy demand, a significant proportion of which relates to heating of buildings.

Energy Consumption in the West Region

The energy consumption figures for the West Region are only available for the domestic sector

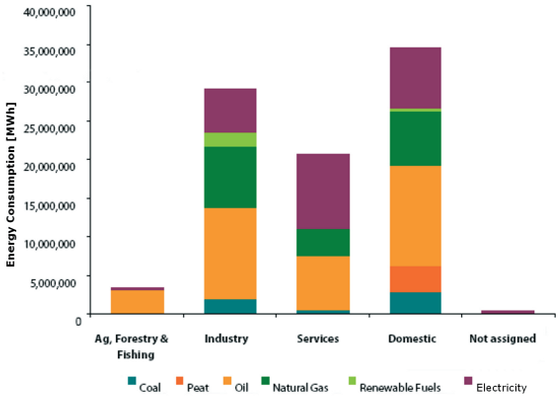


Figure 3 End use split in each sector in 2009 - Ireland

and these are broken down by fuel type in Table 2[3, 4]. The domestic fuel consumption per person in the region is 15% higher than the national average and consumption per household is 22% higher than the national average. This probably reflects the fact that most of the housing stock is widely distributed and has poor thermal efficiency. With the increasing price of fuel, this higher consumption will place increased financial burdens on homeowners in the Region unless measures can be taken to reduce consumption.

Current Energy Policy

It is imperative that we change our current level of dependency on carbon-based energy supplies. This can be achieved by reducing the amount of energy consumed through the introduction of energy efficiency measures and by changing to renewable energy sources. A number of national energy policy initiatives have been put in place to implement these measures.

To a large extent, the energy policy at national level is driven by EU directives. These dictate minimum requirements that each member state must meet within a specified timeframe. In March 2007, the EU's leaders endorsed an integrated approach to climate and energy policy that aims to combat climate change and increase the EU's energy security while strengthening its competitiveness. They committed Europe to transforming itself into a highly energy-efficient, low carbon economy. As

County	Galway	Mayo	Roscommon	West Region	West (% of Country Total)	Ireland
Coal	198,339	172,106	76,538	446,983	15.6	2,859,302
Peat	412,771	332,871	129,276	874,918	25.7	3,401,245
Oil	1,078,213	608,341	292,021	1,974,575	15.3	12,972,782
Natural Gas	24,824	0	0	24,824	0.3	7,172,714
Renewables	13,996	11,909	3,667	29,572	15.2	195,114
Electricity	447,743	259,932	126,184	833,859	11.1	7,975,601
Total	2,175,887	1,385,159	627,686	4,188,731	12.1	34,556,758
Population[3]	213,670	123,839	58,768	414,277	10.6	3,917,203
Energy use /Person	9.4	11.19	10.68	10.11	-	8.82
Households[3]	78,661	43,431	20,480	145,572	9.9	1,469,521
Energy use /Household	27.3	31.9	30.6	28.8	-	23.5

Table 2 Regional domestic fuel split (MWh) in 2009

part of this process, the '20-20-20' targets were put in place. These targets are:

- 20% reduction in EU greenhouse gas (GHG) emissions below 1990 levels
- 20% of EU energy consumption from renewable resources
- 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency

The National Climate Change Strategy 2007-2012[5] sets out a series of measures to ensure that the 20-20-20 targets are met in Ireland.

Energy Efficiency

The EU Energy 2020 Strategy[6] sets out priorities for achieving an energy-efficient Europe. The European Commission[7] estimates that Europe wastes at least 20% of the energy it uses. They point out that by not addressing the area of energy efficiency, "the direct cost of our energy consumption could be reduced by more than €100 billion annually by 2020; around 780 million tonnes of CO_2 will also be avoided yearly". The Energy Services Directive (ESD)[8] is the main legal instrument governing energy efficiency in the EU. Under this Directive, each member state is required to draw up a National Energy Efficiency Action Plan.

Ireland's first National Energy Efficiency Action Plan (NEEAP)[9] was published in May 2009. The plan sets out 90 actions to be implemented in the period to 2020 to achieve 20% energy efficiency across the public, business, residential, transport and energy supply sectors. The savings identified amount to about €1.6 bn in annual energy cost reductions and a reduction in annual CO_2 emissions of 5.7 mtonne in 2020. The plan sets a target of 33% reduction in public sector energy use. The energy efficiency measures reduce our dependency on fossil fuels and contribute 'to security of supply, sustainable transport, affordable energy, competitiveness and environmental sustainability'. The ESD requires Ireland to submit a second NEEAP by June 2011.

Energy Efficiency in Buildings

Because of its large share of total energy consumption, the residential and commercial buildings sector has been identified as having the greatest potential for energy savings. Buildings account for 40% of the EU's energy requirements and 36% of EU CO_2 emissions. It is estimated that 28% of the energy used in the buildings sector could be saved resulting in an 11% reduction on the EU's total energy consumption. Focusing on this sector will go a long way towards meeting the '20-20-20' energy efficiency targets and will have the added benefit of creating employment in the construction sector.

Directive 2010/31/EU of the EU Parliament and Council[10] is a recasting of the 2002 Directive on energy performance of buildings to bring it into line with the '20-20-20' targets. It must be transposed into member state law by July 2012. It requires that: "Member States shall ensure that: (a) by 31 December 2020, all new buildings are nearly zero- energy buildings; and (b) after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings". Member States are required to "develop policies and take measures such as the setting of targets in order to stimulate the transformation of buildings that are refurbished into nearly zero-energy buildings". A near zero-energy building is a building with a very high energy performance. The nearly zero or very low energy requirement for appliances such as ovens and washing machines should come from renewable sources.

Under the 2009 NEEAP, the 2020 vision for the residential sector is that "All new Irish housing will be carbon neutral. Efficiency standards in older homes will be significantly improved through retrofitting actions". Actions to achieve this vision include: Amendments to the Building Regulations, grants for energy efficiency upgrades, Building Energy Rating requirements for all new homes sold or rented from 2009 and the introduction of smart meters. The Building Regulations, Part L (2008)[11] came into effect in July 2009 and they require an increase of 40% in the minimum energy performance requirements for dwellings compared to 2005. New regulations to be introduced in 2011 require energy performance 60% higher than 2005 levels. With the current low level of new home construction, the impact of these measures on the overall energy use in buildings will be small and the key focus will have to be on the retrofit of existing buildings.

Under the Sustainable Energy Act 2002, the Sustainable Energy Authority of Ireland (SEAI) is mandated to promote and assist energy efficiency. The authority has a role in implementing many of the actions identified in the NEEAP. SEAI have put in place a number of measures to promote energy efficiency including the Home Energy saving scheme. SEAI will introduce the National Energy Retrofit Programme in 2011, which will have the effect of rationalising a number of current grant programmes and escalating the rate of retrofit across all sectors. The programme for government for the new Fine Gael-Labour

coalition government, announced in March 2011, gives a commitment to double the funding for home energy efficiency and renewable energy programmes up to the end of 2013.

The SEAI Residential Energy Roadmap to 2050[12] sets out a number of possible scenarios for energy consumption and CO2 emissions for Ireland's existing and future housing stock. It concluded that "residential CO2 emissions can be reduced by 90% through a sustained programme of dwelling retrofits and regulation improvements". To achieve this level of decarbonisation in the sector by 2050, "very high levels of energy efficiency retrofit, deployment of renewable energy technologies and low and zero carbon technologies, high levels of electrification and decarbonisation of the grid" will be required. The energy demand per household will reduce from 22,500 kWh in 2010 to 8,000-9,000 kWh in 2050. The reduction in CO2 emissions is higher due to the decarbonisation of the electricity grid and the switch to cleaner fuels. In addition to the environmental benefits, there will be other significant gains. It is estimated that 10,000 jobs per annum could be created between now and 2020 in retrofitting the existing housing stock; the reduced reliance on imported fossil fuels will improve security of supply; the warmer building stock will provide a healthier environment.

Energy Efficiency in Transport

Transport accounted for 34.1% of primary energy use in Ireland in 2009. There have been significant improvements in the efficiency of cars in recent years.

Cars with conventional diesel/petrol engines.

The Irish Government introduced a new Vehicle Registration Tax (VRT) in the middle of 2008. The VRT favoured cars with lower emissions. The Road Tax regime was also changed to favour cars with low emissions. This has had a marked effect on the purchasing decisions of car buyers leading to the selection of more efficient vehicles. The proportion of cars with diesel engines being purchased is now approaching European levels due to their lower emissions and consequently lower VRT. In 2010, 45% of new cars purchased were in the emissions Band B and 80% were in the A and B bands.[13]

The EU introduced regulations in April 2009 requiring manufacturers to reduce the CO2 emissions of their fleets to less than 130g/km (subject to an adjustment for the vehicle weight). The range of emissions for VRT Band B in Ireland is 121g/km to 140g/km. The following are the specific emissions targets;

"For the calendar year commencing 1 January 2012 and each subsequent calendar year, each manufacturer of passenger cars shall ensure that its average specific emissions of CO2 do not exceed its specific emissions target determined in accordance with Annex I. "

"For the purposes of determining each manufacturer's average specific emissions of CO2, the following percentages of each manufacturer's new passenger cars registered in the relevant year shall be taken into account:

Figure 4 Volvo V60 plug-in diesel hybrid

- 65 % in 2012, -
- 75 % in 2013, -
- 80 % in 2014, -

100 % from 2015 onwards."

This means that virtually all (some very limited derogations) vehicles produced in Europe from 2015 onwards would qualify for the VRT Band B rate or better in Ireland.

Cars with hybrid engines

At the Geneva Motor show in March 2011 many manufacturers showed hybrid and electric vehicles. Volvo and their partner energy company Vattenfall, showed a Volvo V60 plug-in diesel hybrid, (see to Figure 4), a mid-sized family car, with a claimed fuel consumption of 150 miles per gallon or just 1.9l/100km and CO_2 emissions of 49g/km.[14] The first models are due on the streets in 2012. From studies conducted by Volvo and Vattenfall, it appears that just one wind generator could charge 3,000 cars of this type.

This is evidence of the progress that is being made in hybrid technology. Peugeot will launch a model with a diesel hybrid engine this year.

BMW Group and PSA Peugeot Citroën have set up a 50-50 equity joint venture called BMW Peugeot Citroën Electrification to focus on developing and producing hybrid components for the electrification of their vehicle ranges from 2014 and to help the European industry to structure itself in the hybridisation field.

Electric Vehicles (EV)

In November 2008 The Minister for Communications, Energy and Natural Resources and the Minister for Transport announced a plan for the mass deployment of electric vehicles in Ireland. The Government set a target of 10% of all vehicles in the transport fleet to be powered by electricity by 2020 - 230,000 vehicles[9]. The two Departments were to work with Sustainable Energy Ireland, ESB, the IDA and Enterprise Ireland to ensure co-ordination across the state sector and to deliver the cleaner transport future for Ireland.

In April 2009 the government signed an agreement with the ESB and carmaker Renault-Nissan to increase radically the usage of electric vehicles by providing infrastructure to support the Government target of making one-tenth of all road vehicles electrically powered by 2020.

In April 2010 the Irish Government, the ESB and the Renault-Nissan Alliance announced a comprehensive partnership to position Ireland as a European leader in electric transport.

In December 2010 PSA Peugeot Citroën introduced two new electric cars to Ireland, as part of a Memorandum of Understanding (MOU) with the Irish Government and ESB. Viewing Ireland as an ideal market for electric cars PSA Peugeot Citroën will supply the Irish market with the Peugeot iOn and Citroën C-Zero. ESB committed to installing 1,500 publicly

accessible charging stations, 2,000 domestic charging points and 30 fast charging units on a nationwide basis throughout Ireland by the end of 2011. ESB's Chief Executive, Padraig McManus said: "Ireland is one of the first countries in the world to build a nationwide electric vehicle charging infrastructure and to put in place other necessary conditions to facilitate the widespread adoption of ecars. This agreement with PSA Peugeot Citroën further supports the expansion of ecar use among the public and demonstrates that car manufacturers view Ireland as an ideal location to develop carbon-neutral driving". The Minister for Communications, Energy and Natural Resources has announced the opening of a â‚¬5m Electric Vehicle grant scheme whereby grants of up to â‚¬5,000 are available for all cars with CO2 emissions of less than 75g/km sold after the 1st January 2011.

Electric cars really only make sense if powered by renewable energy. There is a lot of interest being shown by governments, utility companies and car makers in electric vehicles, as evidenced above. Using Smart Grids there is the potential to charge batteries in cars at off peak times at cheap rates. Drivers could opt to charge their cars at any time if necessary to make a journey but in that case would have to pay the appropriate rate at that time. Car batteries could be used to store electricity being generated from wind at a time of low demand and feed it back into the grid at a peak demand time if not needed for a car journey. A smart grid and smart metering would facilitate this. There is a study being carried out on the Aran Islands at the moment to look at the feasibility of this. The Sustainable Energy Authority of Ireland (SEAI) came up with the idea for the electric vehicle (EV) project and has developed it with the EV supplier Green Machines and the fleet management provider Merrion Fleet Management. Klockner Moeller Ireland (a subsidiary of Eaton) will supply its smart-metering expertise. The eight Green Machine's electric Mega e-City cars were delivered to the Aran Islands in January 2011. The EVs will be used as everyday transport by participants. In addition, their charging patterns and electricity usage will be monitored and managed through a smart-metering system. It is hoped that when the vehicles are charging, primarily at night, they will be using energy from renewable sources. The project will run for three years.

The Future for cars 2020+

The main gains in efficiency and CO2 emissions reductions are likely to come through the reduction of vehicle weight by the adoption of new light-weight materials.

Bus and Train

The Smarter Travel policy[15], in encouraging a modal shift from cars to bus or rail, can contribute significantly to achieving the EU target of a reduction of 20% in greenhouse gases by 2020.

A factsheet[16] produced by the UK Department for Transport sets out the following DEFRA

emission factors to estimate the total GHG emissions associated with an average journey;

- Average petrol car: 207.81g CO_2e per vehicle km (129.9g CO_2e per passenger km)
- Average diesel car: 198.35g CO_2e per vehicle km (124.0g CO_2e per passenger km)
- Average bus/coach: 69.11g CO_2e per passenger km

(Note: The factors for cars are estimated values for the average petrol and diesel car in the UK car fleet. This has been divided by an average car occupancy rate of 1.6 passengers to derive average emissions per passenger kilometre.)

Source: Guidelines to DEFRA / DECC's greenhouse gas conversion factors for company reporting, 2009

Freight Transport

The vast bulk of freight in Ireland is now carried on the roads as Iarnród Éireann has largely withdrawn from the freight business since 2005. At present 95% of all goods are moved by road and over 30% of transport greenhouse gas emissions are from the freight sector [16]. The development of rail freight has the potential to significantly reduce CO_2 emissions relative to road transport.

Land-use Planning

In order to reduce overall consumption, it will be important to align land use and transport planning. In addition to shortening journeys, it will facilitate the development of an efficient public transport network.

Energy Efficiency in the Public Sector

Under the NEEAP, the Public Sector is required to achieve energy savings of 33% by 2020 and to be an exemplar of energy efficiency. The Public Sector is considered to include the Civil Service, state bodies, the Defence Forces, An Garda Síochána, public hospitals, Local and Regional Authorities, and educational establishments. In this document, the focus is on the Local Authority sector.

The Local Authorities have taken a number of steps in the promotion of energy awareness and sustainable energy management, energy efficiency upgrades and baseline studies to monitor progress. Many local authorities have signed up to the SEAI Energy MAP, an online tool which provides a step-by-step guide to creating a best practice energy management action plan. For this sector, over 80% of their energy use relates to public lighting and water services so these key areas need to be targeted if the 33% target is to be achieved.

The water services sector is the highest consumer of energy for local authorities and represents between 40% and 60% of the total consumption[17]. The average annual energy consumption is over 105 kWh per person on water and waste water. Some pilot projects have demonstrated that increases of the order of 20-40% in pumping efficiency can be achieved. Most water pumping stations and treatment plants do not currently have energy management systems in place and there is a general lack of knowledge in the sector about

these systems. SEAI have brought together a Water Services group to address this issue by developing pump efficiency assessment tools and energy performance indicators. Each local authority will then have to implement these new procedures. The other main constraint to energy efficiency upgrades in this area is the lack of funding.

Between 30% and 40% of the total energy consumed is used in public lighting[18]. There are an estimated 420,000 street lights in Ireland or about 1 light for every 10 people. The associated energy consumption is estimated at 205 GWh per annum and the CO_2 emissions are about 110 ktonne annually. In Co Mayo, the current cost of public lighting is about €1.2m/annum[19]. There are several energy efficiency strategies that can be implemented to reduce these figures including changing to LED bulbs, dimming the lights and shortening the lighting time. These measures in conjunction with a central management system for communication to smart lights can result in significant savings in energy use and maintenance costs. A number of small projects have been rolled out across the region where LED lights have been installed. Their performance will be monitored over a period of time to assess the energy savings and the public response. Significant savings can be made by rolling out these new technologies. The main barriers to change in the public lighting strategy are technical expertise in the local authorities and financial constraints. Currently, the energy charges to local authorities are based on a fixed tariff system rather than on the actual energy usage so there is no payback for energy efficiency. This needs to be renegotiated so that the proper return on the energy retrofits can be delivered. Another major issue for local authorities is the lack of capital to implement energy efficiency measures. SEAI have some grant schemes in place but they are also working to a limited budget. Other solutions should be investigated including the development of innovative procurement models or using the public lighting network to generate income by acting as a host to other technologies such as GSM, broadband etc.[20]

The European Commission has developed a new Energy Efficiency Plan[21] in which they address the issue of funding for energy efficiency measures, particularly in the public sector. They support the use of Energy Service Companies (ESCOs) as catalysts for renovation. ESCOs deliver energy efficiency improvements, cover upfront investment costs and refinance this through the savings achieved. Innovative financing of ESCOs at national and European levels will be required.

RENEWABLE ENERGY

CURRENT STATUS

PLANNING

The Regional Planning Guidelines[22], the individual development plans for Counties Mayo[23], Galway[24] and Roscommon[25] and Galway City[26] all support the development of renewable energy within their functional areas. Mayo County Council published a wind energy

strategy[27] in 2008 and a draft Renewable Energy Strategy for County Mayo[28] in December 2010 for public consultation. Roscommon County Council has since published a Wind Energy Strategy[29] for public consultation. Roscommon's strategy designates 3 different types of areas within the county - "Most Favoured Areas", "Less Favoured Areas" and "Areas Not Favoured" for wind farm developments. This is a step in the right direction as it gives potential wind farm developers a reasonable certainty as to the likely outcome of an application for permission for development in any particular area.

The Transmission Grid

The Commission for Energy Regulation (CER) put in place a Gate process for grid connection for renewable generation. To date there have been 3 'Gates'. Under Gate 1 and Gate 2, 1,755 MW of connection offers were made to renewable generators and accepted. Under Gate 3 3,990 MW of offers are currently in the process of being issued to prospective onshore and offshore wind generators. Delivery on all of the connection approvals granted under the Gate 3 process would be sufficient for the achievement of electricity from renewable energy sources (RES-E) target of the NREAP[30].

Onshore Wind

Onshore wind has been developed in a random fashion thus far, led by wind farm developers, rather than to any strategic plan. The installed capacity on 152 wind farms in the 26 counties is approximately 1,803.79 MW as of the 31/05/2010[31]. Table 3 includes the currently installed capacities in counties Galway, Mayo and Roscommon.

The onshore wind resource in Ireland is best in the West where the electrical grid is weakest. This partly explains the relatively low percentage of installed wind power in the West Region. The high proportion of areas within the Region designated as SACs, SPA's and NHA's is also a significant factor. Significant further development of renewables is dependent on upgrading of the grid.

According to EirGrid[32] "at the end of Q2 2010, there was 1,459 MW of installed wind capacity in Ireland, 242 MW of hydro and 30 MW of other small renewables - giving a combined renewable energy total of 1,731 MW. Estimates of new wind connections in the pipeline indicate that 244 MW (41 MW at transmission and 203 MW at distribution) will connect between now at the end of 2010. If all of this is connected on time,

County	Galway	Mayo	Roscommon	West Region	26 Counties
No. of Farms	4	8	4	16	152
Installed Capacity (MW)	72.64	47.69	19.79	140.12	1,803.79
% of Total Installed Capacity	4.03	2.64	1.10	7.77	100

Table 3 Installed Onshore Wind Capacity in the West Region (from IWEA data May 2010)

Year	2003	2004	2005	2006	2007	2008	2009 (Provisional)	2010 (Target)
% Renewable Electricity	4	5	6.8	8.6	9.4	11.9	14.4	15

Table 4 Renewable Electricity as a percentage of all electricity consumption in Ireland (from Draft OREDP)

Ireland will have a combined total of 1,975 MW of installed renewable energy by the end of the year."

The Government's Renewable Energy Policy[33], reflecting Directive 2001/77/EC[34] on the Promotion of Electricity produced from Renewable Energy Sources, set a target for Ireland of 15% electricity consumption from renewable sources by 2010 and it would appear that that target will be achieved, see Table 4[35].

A report[36] prepared by SEAI and EirGrid in February 2011 found that "in general, while capital costs of wind energy plants are higher than conventional generation, wind energy can act as a hedge against high fuel costs by depressing the wholesale cost of electricity." The report concludes that "wind generation lowers wholesale prices by €74 million, which almost exactly offsets the costs of the Public Service Obligation (PSO) levy and other costs associated with the generation of wind energy. The study clearly demonstrates that wind energy is not contributing to higher wholesale electricity prices on the Irish electricity system."

A report prepared by Redpoint Energy Ltd for the IWEA published in February 2011 found that "consumers are shown to pay less through the support mechanisms than the savings they make from lower wholesale power prices." The report, in looking forward to 2020, concluded that "the general trend observed in the modelling was of renewable support costs being more than offset by lower wholesale prices."

Offshore Wind

Currently there is only one offshore wind farm in Ireland, the Arklow Bank Offshore Wind Farm in the Irish Sea, which has been partially developed. Only 7 turbines totalling 25.2 MW have been installed of a total permitted installed capacity of 520 MW. There is no grid connection for the balance. Another offshore wind farm at Codling Bank which will have 220 Turbines and 1,100 MW has a foreshore licence but no grid connection. Both developments have foreshore leases (since 2002 and 2005 respectively) but there is no grid connection available for the balance of the Arklow Bank or the Codling Bank

Approximately 800 MW of offshore wind projects in Gate 3 are due to receive an offer of a grid connection. Offshore wind projects included in Gate 3, but which do not have foreshore licences, are the Dublin Array 10 - 364MW, Oriel - 330MW, both in the Irish Sea and Fuinneamh Sceirde Teo -100.8MW, in outer Galway Bay, Atlantic Coast. The sum of the installed capacities of developments for which there are Foreshore Licences but no connection and those which have been given a connection offer in Gate 3 is 2,389.6 MW.

A draft Offshore Renewable Energy Development Plan and Strategic Environmental Assessment was published in October 2010 for public consultation. A Natura Impact Statement to inform the Appropriate Assessment of the OREDP was published in April 2011 as part of the consultation process. The total amount of offshore fixed wind development (MW) that could potentially occur within the West Coast area (from Slea Head to Erris Head) without likely significant adverse effects on the environment is only 500 MW. This compares to a figure of 7,000 MW for offshore floating wind.

Fuinneamh Sceirde Teo has applied for a Foreshore Licence for their development in outer Galway Bay and that application is currently under consideration. There is however a backlog of some 700 applications for Foreshore Licences.

Ocean Energy

It has taken 30 years for onshore wind energy to reach its current state of development. The development of technologies to harness wave and tidal energy is at an early stage. The investment in research and development in this area is much more extensive than was the case in the early stages of wind energy development so that may mean a shorter time frame for the development of viable technologies. On the other hand, the challenges faced in developing technologies to harness wave and tidal energy are arguably much greater than that which the developers of technically and economically viable systems to harness wind energy had to face. Some very promising devices, such as those developed by Wavebob Ltd, Ocean Energy Ltd and OpenHydro Group Ltd, are now at the stage of undergoing full scale trials in the ocean. Getting the power to the grid onshore is another significant challenge requiring development of new underwater transmission systems. Given all of that it is likely to be the next decade before we can expect to see a significant contribution to our energy needs from ocean energy.

SEAI, in association with the Marine Institute, established an Ocean Energy test site for scaled prototypes of wave energy devices in Galway Bay. A Foreshore Licence for this site was granted in 2006. Wavebob Ltd was the first company to test a prototype device at this site and Ocean Energy Ltd have subsequently tested a prototype there. Testing of devices is continuing at this site with Ocean Energy Ltd deploying a wave energy test buoy there in early March 2011.

A site has been identified off Béal an Mhuirtead (Belmullet) as a test site for full scale, grid connected, wave energy devices;

"The Sustainable Energy Authority of Ireland plans to develop a National Wave Energy Test Site, which is proposed to be located off Annagh Head, west of Belmullet in County Mayo.

The purpose of the wave energy test site at Belmullet is to provide a location for the temporary mooring and deployment of wave energy machines so that their performance in generating electricity and their survivability can be tested and demonstrated in open ocean conditions. It is proposed for the site to operate

for up to 20 years with devices on site intermittently throughout the year."

An Environmental Screening and Scoping Report has been prepared and currently various surveys on land and at sea are being conducted to inform an Environmental Impact Assessment.

The draft Offshore Renewable Energy Development Plan (OREDP) indicates that the total amount of wave energy development that could potentially occur within the West Coast area (from Slea Head to Erris Head) without likely significant adverse effects on the environment is 5,000MW in water depths from 10m to 100m and a further 6,000 to 7,000 MW in water depths from 100m to 200m. The potential is enormous. SEAI's Roadmap[37] predicts that there is the potential to generate 29 GW of ocean energy by 2050 which could create an opportunity for 70,000 jobs and a cumulative economic benefit of €120 billion.

At the Public Consultation on the OREDP in Galway in November 2010 it was stated that the Department of the Environment, Heritage and Local Government would be preparing a Marine Spatial Plan over the next 18 months which will provide a framework within which offshore wind and ocean energy projects can be planned.

Bioenergy

There are a number of Biomass boilers installed which are using wood for heating commercial and industrial premises. SEAI's ReHeat programme[38] supported Biomass Boiler Installations with capital investment grants. There were 6 projects completed in Co. Galway, 3 in Co. Mayo and 2 in Co. Roscommon with total boiler capacities of 968 kW, 2,985 kW and 345 kW respectively in each county. The largest installation was 2,800 kW at M & B Quinn Ltd. Under the Pilot Bioheat Programme there were a further 4 Projects supported in the 3 counties with total boiler capacities of 600kW There are also some woodchip and wood pellet boilers installed for domestic heating.

SEAI's CHP programme[39] supported 9 projects in Co. Galway and 1 in Co. Mayo. The largest had output capacities of 999 kW of electricity and 1,005 kW of heat at Boston Scientific Ireland Ltd. In NUIG there were two CHP plants supported, one with output capacities of 400 kW of electricity and 500 kW of heat and the second with output capacities of 350 kW of electricity and 422 kW of heat. Another CHP plant was supported at the Galway Clinic with output capacities of 400 kW of electricity and 509 kW of heat. Some energy supply companies (ESCOs) will supply and install a biomass CHP plant on site for an industrial or commercial client and sell the energy to the client at rates that represent a saving in energy costs. The client avoids having to make a capital investment. The energy supply company will typically contract with farmers to supply the feedstock of woodchip from willow or the like.

There are a few Anaerobic Digestion (AD) plants associated with effluent treatment plants for the treatment of excess sludge. There are two case studies on the SEAI website for AD plants at Ballyshannon Farms, Co. Wexford and The

Camphill Community in Ballytobin, Co. Kilkenny which commenced operation in 1995 and 1999 respectively. The Ballyshannon AD plant runs on cow slurry in winter, pig slurry in summer and whey from cheese production throughout the year. The biogas is used in an engine to generate 100 kW of electrical power and heat is recovered from the cooling watter and exhaust gas. In the Camphill Community AD plant slurry from local farms is co-digested with kitchen refuse and food industry waste. The biogas produced fuels a small district heating scheme.

WHAT DO WE NEED?

Ireland needs a secure, sustainable, competitively priced energy supply that will not harm the environment, that will support economic growth and meet the needs of society. Delivering this will create a new indigenous industry which will create jobs and has the potential to become an export industry. Development of renewable energy sources such as wind, wave, tidal and bioenergy will significantly reduce our dependence on imported fossil fuels

EU Directive 2009/28/EC[40] on the promotion of the use of energy from renewable sources established the basis for the achievement of the EU's 20% renewable energy target (across the electricity, transport and heat sectors) by 2020. Under the terms of the Directive, each Member State is set an individually binding renewable energy target, which will contribute to the achievement of the overall EU goal.

Ireland's target set out in Annex 1 of the Directive is that 16% of all energy consumed across the 3 sectors is to be from renewable sources by 2020, up from 3.1% in 2005. Achieving this scale of increase will be challenging in the time period.

Ireland's National Renewable Energy Action Plan (NREAP), published in July 2010, provides for the overall 16% target to be achieved from 12% heat from renewable energy sources (RES-H), 10% transport from renewable energy sources (RES-T) and 42.5% electricity from renewable energy sources (RES-E).

The European Council of March 2007 made a firm commitment to reduce the overall greenhouse gas emissions of the Community by at least 20% below 1990 levels by 2020, and by 30% provided that other developed countries commit themselves to comparable emission reductions and economically more advanced developing countries contribute adequately according to their responsibilities and respective capabilities. By 2050, global greenhouse gas emissions should be reduced by at least 50% below their 1990 levels.[41]

The West Region should harness as much of the wind energy that is included in Gate 3 as possible, consistent with proper planning and sustainable development, by 2020.

The West Region should be delivering at least 50% of the 500 MW target for ocean energy by 2020.

County	Galway	Mayo	Roscommon	Total for West Region	Total for 26 Counties
Installed Capacity (MW)	248.79	732.40	96.25	1,077.44	3,195.51
% of Total Installed Capacity	7.79	22.92	3.01	33.72	100

Table 5 Gate 3 ITC Programme 2010-2023 Firm Access Quantities

The West Region should be sourcing a significant amount of its electricity and energy needs from bioenergy by 2020.

How are we going to get there?

Onshore Wind in Gate 3

In January 2010 EirGrid published their assessment[42] of the capability of the transmission grid to accommodate Gate 3 applications on a firm basis. This included following significant onshore wind generation within the West Region by the end of 2023 - see Table 5.

The West Region can become a net exporter of renewable energy by 2020, reducing its dependence on energy generated elsewhere in the island.

Engineers Ireland West Region are concerned about the Gate 3 process, which was developer led rather than plan led, because it is aware that offers of grid connection have been made to applicants who don't have fully developed plans, don't have finance in place, in some cases don't either own the sites or have leases in place for the sites or have not applied for planning permission for the wind farms. There is then the matter of obtaining planning permission and way leaves for the connections from the wind farms to the appropriate nodes on the electricity grid. Many of the developments which have been included in the Gate 3 process are proposed to be located on sites in areas where there are environmental constraints, such as Natura 2000 sites. The routes from the sites to the appropriate connection nodes on the grid may run through areas which will also be subject to environmental constraints. Some of the developments included in Gate 3 may have difficulty in obtaining planning permission as a result. There are major question marks over the achievability of connecting the total 3,196MW of onshore wind generated electricity in Gate 3 to the grid by 2023.

An overall, integrated, national strategy for renewables is needed with a streamlined consent system. A balance needs to be struck between environmental protection, the energy needs of the economy and society's needs. Strategic development zones for both onshore and offshore wind, wave and tidal energy should be identified taking account of environmental factors, the wind resource and the feasibility of a grid connection. In this way developers and investors will have a reasonable level of certainty as to where developments will be permitted and can be assured of a connection to the grid. In will also enable EirGrid to plan the

optimum routes for the main bulk power transmission cables to connect the consented developments into the grid. The commitment in the new government's National Recovery document to a "new 'plan led' Gate 4 process, as opposed to existing 'developer led' system" will be a significant step in the right direction.

Offshore Wind

We need to enable the connection of the Fuinneamh Sceirde Teo 100.8 MW offshore wind farm to the grid. The development by ESB Networks of the Conamara 110 KV Reinforcement Project from the 110 kV substation at Salthill to the upgraded 110 kV/38 kV substation at Screebe will facilitate that. It should proceed as soon as possible

Given that the there is another 2,314 MW planned for the Irish Sea, where water depths are relatively shallow and there is the prospect of a Grid Connection, it would seem that, other than the Fuinneamh Sceirde Teo development, the opportunities for fixed offshore wind energy in the West Region will be limited in the short term to 2020. The main potential for offshore wind energy off the West coast is for floating wind turbines in deep water. This technology has not been developed to any great extent yet but given the potential energy available investment must continue to be made in research and development of appropriate technologies.

Ocean Energy

There is an enormous energy resource in the ocean around our shores. Energy from this source would not suffer from the same level of intermittency as wind energy. We need to develop technologies that can harness that resource. Doing so will enable the development of an ocean energy industrial cluster in the West Region which would have the potential to generate thousands of jobs in design, manufacturing and services.

The 2007 Government White Paper on energy policy[43] set out a number of strategic goals, including a specific ocean (wave and tidal) energy target of 500 MW by 2020. This is a very ambitious target. In addition, there is no specific provision in GRID25 for the connection of this capacity to the grid.

The significant investment in research by SEAI, NUIG, GMIT and the Marine Institute should be continued as the ultimate prize is so valuable. MCS Kenny is a company established in Galway for the past 30 years who have engineering design expertise in the offshore energy industry. There is an opportunity to develop a centre of excellence in ocean energy in the west and based on that a significant industrial cluster.

The National Wave Energy Test Site needs to be delivered as soon as possible to allow the testing of full scale grid connected, wave energy devices. Planning permission and a Foreshore Licence will have to be obtained. There are already full scale wave and tidal energy device test sites off Portugal, Cornwall and Scotland. Wavebob Ltd

is carrying out full scale tests off Portugal, the OpenHydro Group Ltd is doing so off Scotland and in Canada.

To enable Ireland to get the maximum benefit from the development of ocean energy devices we need to have our own test facilities for devices developed in Ireland and to attract other international developers to do their development work in Ireland. This will enable the development of an internationally recognised centre of excellence in ocean energy. For example, it was announced in January of this year that SEAI is co-funding a €150,000 research project with an Australian company, Carnegie Wave Energy Ltd. Carnegie has developed a device called CETO which can generate electricity and desalinated water from wave action. The project will evaluate potential CETO wave sites in Ireland and develop a site specific conceptual design. The West Region is well placed to take advantage of such opportunities given the significant research capacity in NUIG itself and that available to it through its collaboration with other Universities, GMIT and the Marine Institute.

The new coalition government's decision to merge marine responsibilities under one Department, included in the Government for National Recovery[44] document, and the commitment to "develop an integrated marine and coastal planning process in order to maximise the potential of Ireland's coastline" is particularly important in respect of Ocean Energy. Equally important and very urgently required is the commitment to "provide efficient foreshore licensing and leasing process for marine energy."

BIOENERGY

The West Region should aim to source a significant amount of its electricity and energy needs from bioenergy. Businesses with a large heat demand could use Biomass CHP plants to meet that demand and export surplus electricity to the grid. Rural towns could look to become self-sufficient in electrical energy and heating via district heating schemes using regionally available renewable feedstock. The town of Güssing[45] in Austria is one such successful example which is now a carbon neutral town using wood to generate electricity and heat for district heating. This would have the potential to generate significant jobs locally in growing, processing and distributing the energy. It would allow farmers an opportunity to diversify their farm activities which are largely focused on raising cattle. As the rate of bovinity in Ireland as a whole is very high this is a significant contributor to methane gas production. Methane is 20 times more harmful to the atmosphere that carbon dioxide. Enabling farmers to diversify away to some extent from the heavy reliance on beef production to the production of energy crops would help Ireland meets its target for reduction in green-house gases.

The Western Development Commission (WDC) published a strategy[46] in 2008 that forecast that, with 41% of the afforested land in the state, the

West Region could generate an additional 477MW of renewable heat energy (11% of the Region's heat market) by 2020. This could create up to 900 jobs based mainly in rural areas and achieve savings of 69,000 tonnes per annum of CO2 emissions. The WDC are now leading an international partnership, Regional Approaches to Stimulating Local Renewable Energy Solutions (RASLRES) Project, to stimulate interest in the Region in renewable heat from wood.

The climate in the West Region is suitable for the growing of energy crops and therefore biomass from energy crops is one of the potential technologies that have particular relevance to Ireland. Short Rotation Coppice (SRC) willow is one such energy crop. Best practice guidelines[47] were published in 2010. In those guidelines it is stated that one hectare of willow has the same energy content as 4,500 litres of home heating oil. It is also stated that "total carbon budgets have been calculated for the generation of electricity from biomass, gas and coal and these show carbon dioxide (CO2) emissions of 60g, 400g and 1,000g per kWh electricity respectively." According to the guidelines research has shown that at a minimum SRC willow delivers between 14 and 30 times more energy than is needed to produce and deliver the crop. SRC willow may be harvested 6 to 8 times on a three year cycle giving an overall plantation life of up to 25 years.

Miscanthus is another potential energy crop. A Miscanthus Pilot Demonstration Programme[48] was launched on 30th April 2010 to provide assistance for the deployment of renewable heating systems fuelled by miscanthus in commercial, industrial, services and public sectors and also community organisations and Energy Supply Companies (ESCOs), in Ireland.

Funded under the Renewable Energy Research Development and Demonstration Programme, and administered by the SEAI, this programme is intended to support the establishment of a number of exemplar boiler sites (between 5 and 15 depending on the mix of size ranges and costs submitted). These exemplar sites will serve to provide important information on the supply chain logistics and suitability of miscanthus as a boiler fuel in an Irish context, as well as providing a solid basis for creating market confidence.

Ireland's most successful crop is grass which has the potential as a feedstock for Anaerobic Digesters (AD) plants. Given that AD plants can also handle agricultural slurry and the biodegradable fraction of municipal waste they would have the double benefit of generating heat and electricity while at the same time putting agricultural slurry and biodegradable waste to beneficial use as a resource. The digestate from the process is an effective fertiliser which can be land spread and would have a much lower impact on ground and surface waters than the undigested slurry. An Bord Gáis published a report[49] which predicts that 7.5% of Ireland's natural gas demand can be

met by renewable gas generated from grass and waste.

A Joint Oireachtas Committee concluded in its report published in January 2011 that "the European experience has taught us that AD is a viable industry, but only if substantial and adequate returns are achievable for investors. Our REFIT must be at least in line with, if not higher than those being offered by our European counterparts. The increase in the REFIT will require no start-up cost, yet will reap immeasurable benefits in relation to employment, security of energy supply, exchequer returns, greenhouse emissions, EU environmental targets, budget spending and energy efficiency." The report envisages that 1,000 380 kW AD Plants would contribute 12% of Ireland's electricity and that coupled with 30% from wind would meet our 2020 target for renewable energy of 42%. It is considered unlikely that anything like 1,000 AD plants could be in operation in Ireland by 2020.

As the rate of bovinity in Ireland as a whole is very high this is a significant contributor to methane gas production. Methane is 23 times more harmful to the atmosphere that carbon dioxide. Enabling farmers to diversify away to some extent from the heavy reliance on beef production to the production of energy crops would help Ireland meets its target from reduction in green-house gases as well as providing more secure income for farmers. The commitment in the Government for National Recovery 2011-2016 document to "facilitate the development of energy co-operatives to make it easier for small-scale renewable energy providers to contribute to our renewable energy target" is likely to be particularly important to the development of AD plants in rural areas.

The Department of Communications Energy and Natural Resources (DCENR) introduced a range of additional categories of renewable energy technologies that are eligible for financial support under a further tranche of the Renewable Energy Feed-In Tariff (REFIT) scheme. The 2009 REFIT builds on the existing technologies and now provides support for Anaerobic Digestion, and biomass-based High Efficiency-Combined Heat and Power (HE-CHP). The Joint Oireachtas Committee on Communications, Energy and Natural Resources found that the REFIT on offer in Ireland in relation to energy from AD is significantly less than that available elsewhere in Europe and must be brought into line with that available elsewhere in Europe if the industry is to develop.

The Government for National Recovery 2011 - 2016 document commits to "accelerate the development of Ireland's forestry and bio-energies." It proposes to "create a new State company called BioEnergy Ireland to become a global leader in the commercialisation of next generation bio-energy technologies." This is most welcome and we look forward to seeing the details of the proposal.

Energy from Waste (EfW)

Incinerator plants in Ireland have proven to be particularly controversial and have encountered long delays in the planning process. There is one

plant under construction by Indaver in Co. Louth which is due for completion later this year. A development by Covanta for Poolbeg in Dublin is ready to commence construction but uncertainties about proposed levies have delayed its commencement. Another plant in Ringaskiddy in Cork is on appeal to An Bord Pleanála.

The CBI issued a briefing document[50] on Waste to Energy in October 2010. It noted that Germany has a recycling rate of around 66% with approximately 32% being put through energy recovery treatments and the remaining 1% being landfilled. Flanders (Belgium), which has the highest household recycling rate in the EU at 72% send the residual waste for energy recovery. These examples show that sustainable waste strategies can include recycling and a significant proportion of waste to energy.

The public have concerns about AD (EfW) plants which can handle wet waste such as sewage sludges and agricultural wastes as well as the biodegradable fraction of municipal waste. It will be necessary to allay public concerns about AD and encourage their acceptance as an integral part of sustainable energy development.

AD and Incineration plants are well established technologies in Europe.

Coping with the Intermittency of Wind Energy

Early in 2009, EirGrid and SONI (System Operator Northern Ireland) initiated a suite of studies - entitled the Facilitation of Renewables - designed to examine the technical challenges with integrating significant volumes of wind farms onto the power system of Ireland and Northern Ireland.

The coming into production of the Corrib Gas field would facilitate the construction of a Combined Cycle Gas Turbine power plant at the site of the former peat fired power station at Bellacorrick, if necessary, to compensate for the intermittency of wind energy in the short term.

The introduction of other renewable energy sources such as ocean energy, bioenergy, solar energy, etc. will mitigate the intermittency effects of wind energy on the grid. The completion of the 500MW East-West interconnector will also help to mitigate the effects of intermittency.

The electrification of domestic heating systems and the introduction of electric cars if sufficiently extensive may enable the storage of electricity produced at off-peak times. With smart meters it should be possible to feed electricity from car batteries back into the grid if required.

The Spirit of Ireland proposal offers an imaginative technical solution to harnessing the energy of the wind by deploying large scale wind farms in conjunction with hydro storage reservoirs to store the energy from the wind until it is needed. The proposal will have to overcome significant environmental challenges if it is to succeed.

The European Commission has tabled a new initiative[51] to develop an integrated European energy network for today's challenges. One of

the objectives is to enable the European Union to achieve its 20-20-20 targets for renewable sources to contribute 20% to its final energy consumption, reduce greenhouse gases by 20% and achieve energy efficiency gains of 20% by 2020. It will be necessary to be able to connect more renewables into the grid. The future development of a transnational European Supergrid would facilitate the connection of a higher proportion of wind generated electricity to the grid. It is essential that Ireland is fully connected into that Supergrid so that it can maximise the harnessing of its renewable resources and have the capability to export the energy produced to the European Supergrid. This will mean more East-West interconnectors to Britain and also to continental Europe. Eddie O'Connor, CEO, Mainstream Renewable Power, is an enthusiastic promoter of a European Supergrid and Ireland's integration with it. The Prime Minister of the UK has pledged his support for the proposed supergrid.

The Electricity Grid

In October 2008 EirGrid published its GRID25[52] strategy for the long-term development of the Transmission System. The strategy envisages building mainly at 400 kV voltage where new high capacity infrastructure is required. The following is an extract in relation to what it refers to as the North-West Region which includes counties Donegal, Sligo and Leitrim as well as Galway, Mayo and Roscommon;

"Key developments

Figure 5 West Region

It is expected that demand in the region will grow by up to 60% by 2025. Area A (Donegal) is expected to have up to 691 MW of wind generation, with Areas B (Mayo/Galway) and C (Leitrim/Roscommon) having 880 MW and 269 MW respectively. Area B is also expected to have up to 240 MW of wave generation and 31 MW of offshore wind. If ocean technologies, for whatever reason, do not develop sufficiently for such large scale deployment by 2025, the network capacity that might have been attributed to it could be utilised by other more established renewable technologies such as wind generation."

GRID25 provides for "major infrastructural development from Mayo to the main bulk transmission system in the eastern part of the region" to enable the harnessing of the considerable renewable resources in County Mayo.

GRID25 predated the Gate 3 process. As can be seen from Table 5 above firm access offers for a

further 1,077.44 MW of onshore wind generation in counties Galway and Mayo have been made in addition to the existing installed capacity of 140.12 MW (Table 3) giving a total onshore wind generation capacity of almost than 1,217.56 MW. This is almost 40% more than the 880 MW anticipated in the GRID25 strategy in 2008. There are however significant challenges to be overcome in obtaining consent for all of the wind generation capacity included in Gate 3.

EirGrid published a transmission development plan[53] for public consultation in late 2010. The draft plan sets out developments proposed during the period 2010-2015. The following is an extract from the section on Regional Benefits[54] that will arise from the plan;

Looping the Dalton-Galway circuit into Galway will provide an extra circuit into Galway and help avoid post fault overloads on the Cashla-Galway circuits that supply the high demand in Galway.

Uprating the Cashla-Cloon 110 kV line will avoid unacceptable overloading of the line during certain contingencies.

Athlone-Shannonbridge 110 kV no 2 will provide greater reliability for customers supplied by Athlone 110 kV station. The installation of the new circuit and the uprating of the existing Athlone-Shannonbridge 110 kV no 1 line will improve the ability of the network to move power from generation sources in the south to the north west.

The new Castlebar-Tonroe 110 kV will alleviate unacceptable overloads on the Cunghill-Sligo 110 kV line during certain contingencies. The line also forms part of a long term development to introduce 220 kV to support future load growth or to accommodate large amounts of wind generation expected to connect in County Mayo. This project is under review as EirGrid is assessing network options to evacuate large quantities of renewable generation from north Mayo.

For County Galway, the construction of the proposed Conamara 110 kV Reinforcement Project from the Salthill 110 kV substation to an upgraded Screebe 110 kV/38 kV substation will facilitate the connection to the grid of both onshore and offshore wind energy developments included in Gate 3. Planning permission for this was granted in early 2010 by An Bord Pleanála under the Strategic Infrastructure Act."

The draft transmission development plan also includes for the reinforcement of the grid in the West Region[55] to provide for the long-term strategic development of the electricity transmission infrastructure in the West Region. The grid will be required to facilitate the connection of significant amounts of generation particularly from renewable sources such as wind farms biomass plants and ocean energy generation. There will also be significant conventional gas and distillate fired power stations. The power produced in the Region will have to be transported to areas where the demand is and this will result in the requirement to build new high voltage electricity

transmission infrastructure in the region. New transmission infrastructure will be required from North Mayo towards either the east or the south of the Region and onwards to other regions and from west County Galway towards Galway city.

The connection of the increased generation will require the upgrade of many parts of the existing transmission network in order for it to be able to carry more electricity. General demand growth in the area will also result in the requirement to both upgrade the existing network and build new 110 kV transmission lines. For example, EirGrid recognise the need to reinforce the network in the Mayo area to secure demand.

In the draft Transmission Development Plan it is stated that "EirGrid will analyse the requirement to provide infrastructure for transporting the excess generation out of the area, while at the same time looking at the requirement to secure local demand, and propose optimised solutions for both". The draft plan gives indicative lead times for the development of high voltage transmission lines which range from over 5 years for 110 kV to over 8 years for 400 kV. It is clear from these indicative lead times that it is essential to start the planning process now if the significant wind energy projects in the West Region are to be connected by the dates scheduled. The development of the Grid must be seen to be progressing otherwise uncertainty around the availability of a connection will be a deterrent to potential investors in renewable energy generation projects.

Irish-Scottish Links on Energy Study (ISLES)

ISLES is a collaborative project between the Scottish Government, the Northern Ireland Executive and the Irish Government. Funded mainly by the EU's INTERREG IVA Programme it is assessing the feasibility of creating an offshore interconnected transmission network and subsea electricity grid based on renewable energy sources off the coast of western Scotland and the Irish Sea. It may also extend across the north coast of the island of Ireland.

The target area has huge potential for capturing wind, wave and tidal energy. However, each region's electricity network has not been developed as an offshore grid to exploit this major marine renewable resource and grid infrastructure is poor. As a result, the capacity to generate electricity is not matched by the ability to collect and transport that energy to market. As well as identifying the challenges in creating, storing and transporting the electricity created from these renewable sources, ISLES can help pave the way for renewable energy and carbon reduction targets to be met and assist in the economic development of the relatively peripheral coastal areas in each of the three partner countries.

A feasibility study is being carried out by RPS Group which will be completed by the end of 2011.

It is not yet clear if the particular subsea grid which is the subject of this study will directly benefit the West Region but the knowledge gained will inform any decisions as to as similar

study off the West Coast to harness the huge offshore wind and wave energy potential.

North Seas Offshore Grid Initiative

On the 3 December, 2010 Ireland signed a Memorandum of Understanding with nine other European countries (Denmark, Norway, Sweden France, Germany, the Benelux countries and the UK) on the North Seas Grid initiative, one of the most ambitious transnational renewable energy projects in the world.

This initiative will make it possible to transmit high volumes of electricity generated from wind and wave energy in the coastal regions of Northern Europe across great distances to populous centres of demand in the heart of Europe and would constitute the first building-block of the European Supergrid.

Smart Grid

A Smart Grid will facilitate the intelligent integration of all generation and enable the efficient consumption of electricity. Consumers will be able to participate in optimising the operation of the system by choosing to schedule some of their demand to avail of cheaper rates and sell electricity into the grid from micro-generators if in excess of their requirements.

We welcome the commitment in the Government for National Recovery 2011-2016 document to "create a 'Smart Grid' company with ultimate full ownership and responsibility for the development of Ireland's electricity and gas networks."

Carbon Reduction Initiatives from around the World

The West Region has much to learn from sustainable energy initiatives that have been taken around the world and from the research and development work currently underway in the region.

A number of cities and towns have devised and are successfully implementing sustainability plans. Among these are Vancouver in Canada, Växjö in Sweden and Dundalk in Ireland.

Vancouver is aiming to become the greenest city in the world by 2020[56]. It has developed a range of initiatives in order to achieve its target:

- Green Buildings. All new commercial and multifamily buildings are required to meet the strictest energy efficiency requirements in Canada.
- Green Municipal Facilities. New government facilities are built to the highest environmental performance of any municipality in North America.
- City Building Renovations. Civic buildings are being upgraded to reduce energy consumption by 20%.
- Green Power. An energy system is being constructed in one of the municipalities that will reduce greenhouse gases by 60%.
- Solid Waste. Methane gas from landfill is being used to generate electricity.
- Street Lighting. All of the traffic lights have been converted to LEDs with a saving of almost $400,000 per year.
- Community Engagement. Residents are actively encouraged to reduce their own energy usage.
- Greening Fleets. The city's vehicles have been converted to biodiesel.
- Alternative Transport. By developing alternatives to private car use there has

been a 44% increase in people walking, and a 180% in people cycling.

- Idling Bylaw. Idling of parked vehicles is prohibited by law.

Växjö in Sweden is a town of approximately 80,000 inhabitants. In 1996, the city council of Växjö decided that the emission of greenhouse gases should be reduced by a half by 2010 from 1993 levels, and that the municipality should become fossil fuel free[57]. Among the initiatives they have introduced are:

- Local demonstration of fossil fuel applications, such as small bio-based heating plants and CHPs.
- Subsidies for conversion of oil burners to pellets, and for 200 installations of solar energy applications with financial support from national policy programmes
- Ethanol mix in gasoline and free parking for environment friendly cars
- 200 environment friendly cars by 2010
- Free local energy advice
- All new public buildings are based on timber construction; a number passive multi-storey timber apartment buildings has been constructed.

In Ireland, the Dundalk 2020 initiative[58] was established under the SEAI Sustainable Energy Community initiative in partnership with Louth County Council. A 4 km2 sustainable energy zone (SEZ) was identified. Within the SEZ, the aim is to achieve:

- 20% renewable heat
- 20% renewable electricity, and
- 40% energy efficiency in selected buildings

It was estimated that these targets, once reached, would reduce carbon-dioxide emissions by 10,000 tonnes each year.

Irish Examples in 2020?

Tuam, Co. Galway, in conjunction with Galway County Council, has applied to SEAI to become a Sustainable Energy Community.

All of the established sustainable energy initiatives have been based in urban centres and to our knowledge no sustainability models been implemented on a regional basis incorporating both rural and urban communities. The West Region has the potential to become the first sustainable region in the world.

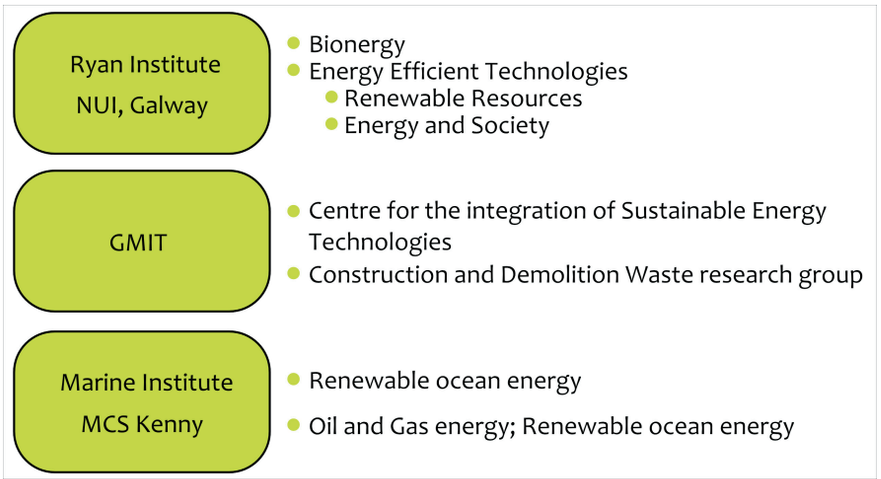


Figure 6 Energy related R&D in West Region

Energy related Research and Development in West Region

In order to achieve high standards of energy efficiency in our buildings and to be able to harness the wind, ocean and biomass energy resources available in the West Region, a significant amount of research work needs to be done to develop new materials, technologies and design tools. A significant amount of work is currently underway in NUI Galway, GMIT, the Marine Institute and in engineering consultancy companies such as MCS Kenny, (see Figure 6). It is essential that this work be supported and further developed in order for the Region to reach its goal of energy self-sufficiency.

Links between the research groups and industry should be fostered to promote the development of a sustainable energy industrial cluster in the region.

Recommendations

The West Region should:

Develop a regional Energy Efficiency Plan by mid 2012. In implementing this plan, the West Region should aim to take a lead role in the move to energy saving and become a model for similar initiatives in other regions of the country and internationally.

Define efficiency targets and developing support mechanisms to ensure that they are achieved. The following ambitious regional targets are proposed:

- all new residential and commercial buildings from 2011 on to have BER rating of A3 or higher;
- all new buildings should be of 'near passive' standard by 2020
- 25% of existing building stock to be retrofitted to BER rating of A3 or higher by 2020.

Support from SEAI for this initiative should be targeted.

Engage with the wider community with the process. It will be essential to have 'buy-in' from public bodies, private companies and the general public. It will be necessary to tap into the West of Ireland drive, commitment and energy so clearly demonstrated by the 'Let's do it Galway' campaign.

Develop a regional resource in conjunction with SEAI, the local energy agencies, local authorities and sustainability advocacy groups to share experience and knowledge and to provide advice on design for energy efficiency in buildings. Actions to increase energy awareness in the public at large and in schools should to be put in place by Jan 2012.

Encourage Local authorities in the region to share knowledge in relation to energy efficiency measures for public lighting and water services.

Explore opportunities for EU funding for the up-front costs of energy retrofit measures in the light of the current scarcity of credit in the country.

Strongly support research initiatives at NUI Galway and GMIT in the fields of energy efficiency. Expertise in the 3rd level institutions should also be tapped to ensure that the latest research findings are translated into usable technology for the benefit of the Region. Links

between the research groups and industry should be fostered to promote the development of a sustainable energy industrial cluster in the region. All 3rd level engineering undergraduate programmes should include energy efficiency in their curricula.

Support the creation of a significant number of jobs in upgrading the existing building stock in the region. A co-operative approach should be used to enable public and private bodies and individuals get value-for-money energy efficiency products and services.

Put in place a promotional campaign to market the West as a low-carbon region to investors and tourists.

Develop an overall national vision for Renewable Energy in Ireland and communicate this to the general public with a view to developing a "Team Ireland" approach. The goals are the achievement of a "low carbon" society ultimately, the securing of energy supplies by reducing dependence on imported fossil fuels, reducing Ireland's energy costs and enhancing its competitiveness, the creation of an indigenous energy industry with capacity to export surplus energy and create significant, sustainable employment in rural areas and the enhancement of Ireland's unique environment.

Adopt a national, integrated and coordinated approach to the planning and development of Renewable Energy including all stakeholders. There should be an overall "Project Manager" with project team members drawn from the various Government Departments, Utility Companies, Development Agencies, Industry Organisations, NPWS, EPA , An Bord Pleanála, Regional Authorities and Environmental NGOs to break down the silos within which members of these bodies currently operate.

Develop Regional Plans for Renewable Energy development taking the particular characteristics and natural resources of each region into account.

Develop Regional Plans for Energy Infrastructure development involving Regional and Local Authorities, the infrastructure developers Eirgrid, ESB Networks and An Bord Gáis and the residents of the regions.

Determine the viability of projects included in Gate 3 as soon as possible with a view to excluding non-viable projects and including viable projects not included in the Gate 3 process.

Introduce new legislation for Foreshore Licensing and ensure that the Department responsible has a specific division, adequately and appropriately resourced with appropriate engineering, environmental and legal expertise to process applications for foreshore licences for offshore wind, wave and tidal energy devices and associated infrastructure in an expeditious manner.

Prepare a Marine Spatial Plan as soon as possible and identify specific areas where wave and tidal energy devices and offshore wind turbines would be particularly favoured.

Encourage the development of bioenergy projects throughout the West Region.

EIRGRID should proceed with determining the best way to connect the significant wind energy resources in Co. Mayo to the grid as soon as possible taking account of the potential for ocean energy and bioenergy in the Region.

ESB Networks Ltd should proceed with the Conamara 110 kV Reinforcement Project as soon as possible to facilitate the connection of onshore wind and offshore wind projects included in Gate 3.

SEAI should proceed with seeking the necessary consents for the National Wave Energy Test Site off Béal an Mhuirthead as soon as possible so as have the facility available to carry out full scale testing of devices as soon as possible.

Develop key harbour facilities to service an offshore wind, wave and tidal energy industry.

Encourage and facilitate the development of indigenous service industries to support the renewable energy industry. For instance, develop training programmes to provide the specialist engineering skills necessary to service wind generators.

Ireland must continue to be an active participant in the international efforts to develop offshore grids and the new European Supergrid so as to ensure that Ireland achieves full connectivity to any such grids.

BIBLIOGRAPHY

1 SEAI, 'Energy in Ireland. 1990-2009', 2010

2 EPA, 2010, 'Ireland's Greenhouse Gas Emissions in 2009'

3 SEI, 'Energy End-Use in Ireland Study Summary Report, Nov 2008

4 CSO, 2006 Census, Central Statistics Office, Apr 2007

5 Department of Environment, Heritage and Local Government, 2007, 'National Climate Change Strategy 2007-2012'

6 Energy 2020, A strategy for competitive, sustainable and secure energy, European Commission Directorate-General for Energy, Nov. 2010

7 2020 vision: Saving our energy, European Commission, 2007

8 Energy Services Directive 2006/32/EC

9 The National Energy Efficiency Action Plan 2009-2020 (NEEAP), 'Maximising Ireland's Energy Efficiency', Dept. of Communications, Energy and Natural Resources.

10 Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings

11 Building Regulations, 2008,' Technical Guidance Document Part L - Conservation of fuel and Energy-Dwellings'

12 SEAI, Residential energy roadmap 2010-2050.

13 Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO2 emissions from light-duty vehicles

14 The Sunday Business Tribune 6th March 2011.

15 Smarter Travel: A Sustainable Transport Future, A New Transport Policy for Ireland 2009 - 2020

16 Facstsheet 2 - ROAD TRANSPORT: Greenhouse Gas Emissions, Department for Transport, UK

17 SEAI, 2011, http://www.seai.ie/Your_Business/Public_Sector/Water_Services_Working_Group.html

18 SEAI, 2011, http://www.seai.ie/Your_Business/Public_Sector/Public_Lighting_Working_Group.html

19 Iarla Moran, 'Energy Management in public lighting', Engineers Ireland, West Region seminar, 22 Feb 2011.

20 Irish Times, 2011, http://www.irishtimes.com/newspaper/finance/2011/02011/122428952143.html

21 European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Energy Efficiency Plan 2011, Brussels, 8 Mar 2011.

22 Regional Planning Guidelines for the West Region 2010-2022

[23] Mayo County Development Plan 2008-2014

[24] Galway County Development Plan 2009-2015

[25] Roscommon County Development Plan 2008-2014

[26] Galway City Development Plan 2011-2017

[27] Mayo Wind Energy Strategy 2008

[28] Draft Renewable Energy Strategy for County Mayo 2010-2020

[29] Roscommon Wind Energy Strategy - Draft January 2011

[30] National Renewable Energy Action Plan, Ireland, submitted under Article 4 of Directive 2009/28/EC

[31] Irish Wind Energy Association, www.iwea.com

[32] EirGrid Group - Inaugural Annual Renewable Energy Report 2010

[33] Government White Paper -Delivering a Sustainable Energy Future for Ireland, The Energy Policy Framework 2007-2020

[34] Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market

[35] Draft Offshore Renewable Energy Development Plan (OREDP), Version 1.3, November 2010 published for consultation by the Department of Communications, Energy and Natural Resources

[36] Impact of Wind Generation on Wholesale Electricity Costs in 2011 published by SEAI and EirGrid

[37] Ocean Energy Roadmap to 2050 by SEAI

[38] SEAI Renewable Heat (ReHeat) Deployment Programme - Capital Investment Grants, Completed Projects at the end of April 2010, http://www.seai.ie/grants/renewable_heat_deployment_programme/

[39] SEAI Combined Heat and Power (CHP) Deployment Programme - Capital Investment Grants, Completed Projects at the end of April 2010, http://www.seai.ie/Grants/CHP/

[40] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

[41] Directive 2009/29/EC DIRECTIVE of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community

[42] EirGrid - Gate 3 ITC Programme Final Results - Firm Access Quantities

[43] Delivering a sustainable energy future for Ireland - The Energy Policy Framework 2007-2020

[44] Government for National Recovery 2011-2016, published 06/03/2011

[45] FORSCHUNGSFORUM 1/2007- Model Region Güssing self-sufficient energy supply based on regionally available renewable resources and Sustainable Regional Development

[46] Wood Energy Strategy for the Western Region by the Western Development Commission

[47] Short Rotation Coppice Willow Best Practice Guidelines published by Teagasc and the Agri-Food and Biosciences Institute in September 2010

[48] http://www.dcenr.gov.ie/Press+Releases/Minister+Ryan+announces+new+Government+support+price+for+bio-energy.htm

[49] The Future of Renewable Gas in Ireland by An Bord Gáis

[50] CBI Brief October 2010, Going to waste: Making the case for energy to waste

[51] Energy infrastructure priorities for 2020 and beyond - A Blueprint for an integrated European energy network

[52] EirGrid - GRID25, A Strategy for the Development of Ireland's Electricity Grid for a Sustainable and Competitive Future

[53] EirGrid Transmission Development Plan 2010 - Draft for Public Consultation

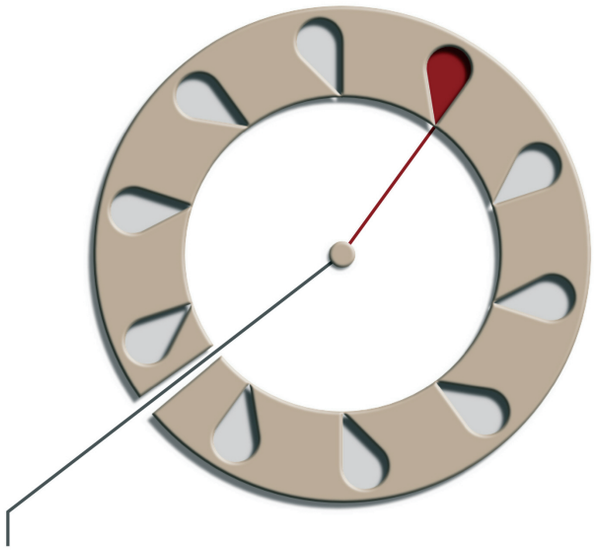
[54] Section 4.6, EirGrid Transmission Development Plan 2010 - Draft for Public Consultation

[55] Section 5.1.2, EirGrid Transmission Development Plan 2010 - Draft for Public Consultation

[56] Greenest City Action Team, 'Vancouver 2020 A Bright Green Future An Action Plan for Becoming The World's Greenest City by 2020', http://vancouver.ca/greenestcity/PDF/Vancouver2020-ABrightGreenFuture.pdf

[57] 'Fossil Fuel Free Växjö', www.resourcesmart.vic.gov.au/.../SEZ_Case_Study_Vaxjo.pdf

[58] Dundalk 2020 Initiative, http://www.galway.ie/en/Services/CommunityEnterpriseEconomicDevelopment/FormsDownloads/SEI%20Dundalk%20Presenation%20June%20081.pdf



"reducing waste, reusing where possible, and ultimately sending zero waste to landfill"

Section Contents

KEY RECOMMENDATIONS

01 Bring forward a strategy as a matter of urgency to meet the 2013 and 2016 targets for diversion of Biodegradable Municipal Waste from landfill.

02 Expand the availability of 3 bin collections to as many households as economically possible taking advantage of the public willingness to segregate waste at source.

03 Have an informed, rational public debate, about the most suitable waste management technologies for the West Region.

EXECUTIVE SUMMARY

Waste management has been one of the most challenging issues facing Ireland in terms of environmental and competitiveness issues. Traditionally Ireland was heavily dependent on landfill and still is. Ireland sent 62% of its municipal waste to landfill in 2009. Landfill is the least favoured waste management strategy because of its potential environmental effects. It can cause environmental damage to ground water and surface water through the leakage of leachate and to the atmosphere by the release of greenhouse gases as the biodegradable fraction decays. There is a legacy of old landfills in Ireland that are going to have to be managed for decades.

Ireland applied for a derogation from the initial target dates set out in the Landfill Directive. A four year derogation was granted to Ireland by Europe on 3 milestones in the Landfill Directive which are now 2010, 2013 and 2016. It looks like Ireland will achieve its 2010 target of reducing the quantity of its Biodegradable Municipal Waste (BMW) going to landfill to 75% of the total quantity (by weight) of BMW produced in 1995. A major question mark hangs over Ireland's ability to achieve the 2013 and 2016 targets of 50% and 35% respectively due to a lack of investment in waste management infrastructure.

Irish citizens have risen to the challenge and there has been a high participation rate in domestic refuse collection where those services have been available. They have been eager participants in segregation of waste at source where the 3 bin service has been available and have made extensive use of bottle banks and civic amenity sites. Galway City, where the 3 bin system was rolled out for the first time in Ireland in 2001, is a good example of that. Recycling rates of household and commercial waste in Ireland have grown from a rate of 7.8% in 1995 to almost 35% in 2009. Ireland is among the leaders in Europe in the recycling of packaging waste, WEEE and C&D waste.

Regretfully, waste management policy has stalled over the last three years. Potential investors in MBT did not commit to investing due to uncertainty as to whether waste would be available to them or whether they would face competition for waste from incinerators. The development of the Covanta Incinerator in Poolbeg has been significantly delayed in obtaining the necessary consents.

We need a rational, informed debate about the relative merits of the various waste management technologies including composting, anaerobic digestion, the various Mechanical Biological Treatment (MBT) technologies and incineration.

04 Provide for co-ordination of the activities of the various Waste Management Regions at National Level.

05 Adopt 'community-based social marketing' to bring about behavioural change in the community in relation to waste prevention and recycling.

06 Encourage sustainable manufacturing ensuring resource use efficiency and incorporation of recycled materials into manufacturing.

The Dublin Local Authorities intended to direct waste to the Covanta Waste to Energy plant but this was challenged in the High Court by both Panda Waste and Greenstar. The High Court found in favour of the waste companies. If competition is to be introduced for the waste market, as recommended by the ESRI and the Competition Authority, the issue of "who owns the waste" will have to be resolved. The current situation that prevails where a number of waste collectors traverse the same areas competing in the waste market is unsustainable.

We have to put greater emphasis on considering waste as a resource from which we must extract economic value. There is merit in the old adage "waste not, want not". The bulk of recyclables recovered are sent abroad for processing. We must develop an indigenous industry to process the recovered material in this country which would create significant employment. This would maximise the value for Ireland of the recovered materials rather than exporting the material to other countries.

MBT technologies will be needed to separate out the biodegradable fraction of the grey bin waste. Two treatment options are Composting and Anaerobic Digestion (AD). There is significant composting capacity available at Carrowbrowne, outside Galway City, where facilities are operated by Galway City Council (9,500 tonnes p.a.) and Barna Waste (20,000 tonnes p.a.). Additional composting facilities should also be provided in other parts of the West Region.

We believe that AD offers significant opportunities throughout the West Region for the treatment of biodegradable waste and the recovery of energy from it. AD has the advantage that it can handle high water content material such as sludges from waste water treatment plants and agricultural slurry. We believe that AD may be an appropriate technology for biodegradable waste treatment, with energy recovery for district heating, at towns in the West Region where there is significant agricultural activity in their hinterlands.

We believe that residents of the Region have shown that they will make good use of civic amenity sites and bring banks. Civic amenity sites should be located strategically in areas where a waste collection service is not viable so that users can access these sites while visiting other facilities such as shops, schools and post offices, thus avoiding unnecessary extra journeys.

Drivers of Waste Policy

There are several drivers of waste management policy including European Directives on waste and environmental protection, climate change and national policies.

Under the Landfill Directive[1], Ireland is committed to reducing the volume of Biodegradable Municipal Waste (BMW) going to landfill to 75% of its 1995 level by 16th July 2010, to 50% of the 1995 level by the 16th July 2013 and to 35% of the 1995 level by 16th July 2016. While Ireland was on track in 2009 to reach the BMW diversion target for 2010, the targets for 2013 and 2016 will be much more difficult to achieve[2].

There was an obligation on Member states to transpose the new EU Waste Framework Directive[3] into national legislation by the 12th December 2010. Ireland has still (March 2011) to transpose the directive into Irish law. This directive makes the waste hierarchy (see Figure 1) a legal requirement.

The Directive includes the following Article;

"Article 11

Re-use and recycling

1. Member States shall take measures, as appropriate, to promote the re-use of products and preparing for re-use activities, notably by encouraging the establishment and support of re-use and repair networks, the use of economic instruments, procurement criteria, quantitative objectives or other measures.

   Member States shall take measures to promote high quality recycling and, to this end, shall set up separate collections of waste where technically, environmentally and economically practicable and appropriate to meet the necessary quality standards for the relevant recycling sectors. Subject to Article 10(2), by 2015 separate collection shall be set up for at least the following: paper, metal, plastic and glass.

Figure 1 Waste Hierarchy

2. In order to comply with the objectives of this Directive, and move towards a European recycling society with a high level of resource efficiency, Member States shall take the necessary measures designed to achieve the following targets:

   c) by 2020, the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be increased to a minimum of overall 50 % by weight;

   d) by 2020, the preparing for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the list of waste shall be increased to a minimum of 70% by weight.

Article 40 of this directive requires that "Member States shall bring into force the laws, regulations

and administrative provisions necessary to comply with this Directive by 12 December 2010."

Waste Management Policy - National Context

The International Review of Waste Management Policy.

An International Review of Waste Management Policy[4] was published in 2009. It was launched by the Minister for the Environment Heritage and Local Government in November 2009. It favoured the use of MBT over incineration as a technology for waste management. It proposed the application of levies that would have given MBT an advantage over incineration. At this time Indaver were in the process of building incinerators at Carranstown, Co. Louth and Ringaskiddy, Co. Cork. Covanta was about to commence construction of an incinerator at Poolbeg in Dublin.

The ESRI Report for Dublin City Council

The ESRI were commissioned by Dublin City Council to prepare a report[5] which was published in March 2010. This report was critical of a number of aspects of the International Review and recommendations namely;

- The review fails to explain how the proposed residual waste levy structure for landfill, incineration and MBT were derived from the underlying research.
- The recommendation that the level of residual household waste per capita is to be halved over a 13 year period from 300kg to 150kg. While England and Wales have set similar targets they are taking 20 and 16/17 years respectively to achieve them. The target is not credible.
- The review fails to address how the targets will be achieved for the diversion of BMW from landfill by 2013 and 2016 to conform to the Landfill Directive.
- The review failed to address the merits of MBT over incineration and failed to set out guidance as to an appropriate mix of technologies.

The ESRI's report's findings were criticised by the Minister for the Environment and the Irish Waste Management Association. While the ESRI acknowledged that they had indeed made an error in their report in assuming that emissions from the Poolbeg incinerator would be covered by the EU Emissions Trading Scheme (ETS) they mounted a strenuous defence of the findings of their report and issued an amended report[6] correcting the incorrect assumption.

ESRI's submission[7] to Reopening of Consultation on Proposed Section 60 Policy Direction[8] on a proposed cap to incineration

In its submission dated 1st October 2010 on the reopened consultation the ESRI stated that "we have grave concerns about the cost and feasibility of the Draft Waste Statement's aim to move away from landfill and incineration as waste disposal methods towards MBT and higher levels of recycling."

The ESRI found that "the landfill price is too high and MBT is too low, while if there is a regional cap of 30% on the share of incineration in accounting for municipal waste, then the implied price for incinerators above the cap will be too high - in effect infinity since the plant would breach the cap and hence not be built and/or closed down." It was evident to the ESRI that a clear policy preference for MBT over landfill and incineration, particularly large incinerators, was driving the cap on incineration

and the structure of waste levies. There were other policy measures included also aimed at disadvantaging incineration but no justification was given for doing so. The uncertainty caused by all this has delayed the development of both incinerators and MBT facilities as investors in either have no certainty as to the availability of waste for their facilities. This may well result in inadequate alternative facilities to landfill and consequently Ireland may not achieve its targets under the Landfill Directive for 2013 and 2016. This may mean Ireland having to pay fines and reputational damage. Ireland was already given a four year derogation in relation to the timelines under the landfill directive

The ESRI were very critical of the consultation process over the previous three years. The proposed policy seemed to have a bias against incineration with no coherent economic or environmental rationale. The ESRI concluded that "waste policy development in Ireland is essentially on hold" and "there is no sign that this paralysis will come to an end shortly." The ESRI submission expressed concern that "the reputational damage to Ireland , which is likely to spread to sectors of the economy beyond waste, as well as the likely failure to reach landfill targets in 2013 and 2016, is something that should not be contemplated lightly."

Forfás Report

Forfás published a report[9] on waste management in Ireland. One of the key messages in that report is that "Ireland continues to perform poorly relative to a selection of competitor countries/regions in the provision and cost of waste management treatment options to enterprise."

Among the report's key findings were the following;

- "Future volumes of municipal waste are expected to increase within the coming decade, necessitating investment in waste management infrastructure."
- "Ireland continues to remain highly dependent on landfill with 62% of municipal waste being land filled in 2008. 75% of industrial waste was landfilled in 2008."
- "A material recycling rate of 32 per cent in 2008 place Ireland joint fourth of ten benchmarked countries/regions for recycling performance."
- "Composting as a waste treatment option is growing but remains at a very low level in Ireland (3 per cent of municipal waste was composted in 2008)."
- "Ireland remains the only country of the benchmarked countries/regions not to have a commercial waste to energy (WtE) market. The 3% of municipal Irish waste that was treated through WtE in 2008 was collected, transported and treated overseas."
- "Advertised landfill costs are the highest of the benchmarked countries/regions."
- "Levies do not feature in the cost of thermal treatment in the majority of the benchmarked countries/regions. Where levies apply, they are applied either at a very low level or in a way that incentivises heat and energy recovery. The proposed waste-to-energy levy stands to inhibit the development of waste-to-energy as a waste management option for Irish enterprise."
- "Although gate fees for food waste have decreased in Ireland over Recent years, they still remain amongst the highest of the benchmarked countries/regions."

The report goes on to state that "given the unprecedented challenges facing the Irish

economy, a key challenge for waste policy in Ireland is to balance economic and environmental goals in a way which will minimise business costs and avoid putting jobs at risk."

CURRENT SITUATION - NATIONAL CONTEXT

NATIONAL WASTE REPORT 2009

The Environmental Protection Agency's (EPA) National Waste Report 2009 published early in February 2011 concludes as follows;

"Ireland is well advanced with achievement of its EU recovery/recycling obligations in relation to a range of EU waste directives, as set out in Table 1A. Ireland is failing by a small margin however to meet the End of Life Vehicle Directive reuse and recovery/recycling targets. There is also still some risk that Ireland will fail to meet the July 2013 and 2016 Landfill Directive targets for diversion of biodegradable municipal waste from landfill."

However, the report warns that there are risks ahead that certain targets may not be achieved - see Table 1

It is necessary to continue the efforts to prevent waste arising from all sectors of society, to increase the penetration of source separated waste collection services (further roll out of 3 bin collections) and to divert biodegradable waste from landfill. To some extent the low hanging fruit has been addressed, it will be more difficult to attain the next targets.

The decline in economic activity has undoubtedly contributed to the reduction in municipal waste

Issue	Target	Source	Current Progress (2009) %	Indicator
Household Waste	50% diversion from landfill of managed household waste by end of 2013	Waste Management: Changing our Ways (DEHLG, 1998)	29.5	Risk
Biodegradable Waste	Recycling of municipal paper and card	National Strategy on Biodegradable Waste (DEHLG, 2006) (selected targets)		
	(i) 55% of that managed by end 2010		50	Risk
	(ii) 65% of that managed by end 2013		(50)	Risk
	(iii) 67% of that managed by end 2016		(50)	Risk
	Recovery of source separated municipal derived organic wastes (including home composting), as a proportion of biowaste content of MSW managed			
	(i) 35% of that managed by end 2010		18	Risk
	(ii) 43% of that managed by end 2013		(18)	Risk
	(ii) 50% of that managed by end 2016		(18)	Risk

Table 1 Progress towards national waste management targets - Extracted from Table 1B in the EPA National Waste Report 2009

generation of 8.4% nationally compared to 2008 noted in the EPA National Waste Report 2009. This is in addition to a 5.1% reduction in 2008 relative to 2007. Household waste generation declined by 3%, commercial waste by 12% and Construction & Demolition waste by 62% in 2009. It has helped Ireland to achieve its targets and to make substantial progress towards those targets still to be achieved. It is also to be seen in relation to Packaging Waste where a recovery rate of 70% was achieved in 2009 compared to the target for 2011 of 60%. Similarly the target of preparing for reuse, recycling and other material recovery of 70% by weight for Construction & Demolition (C&D) waste by 2020 has already been exceeded. Municipal waste recycling (excluding energy recovery) achieved a rate of 35% in 2009, close to the EU27 norm of 40%.

The total MSW disposed to landfill in 2009 reduced by 11% relative to 2008. By the end of 2009 Ireland was within 149,000 tonnes of meeting its EU Landfill Directive target for diversion of biodegradable municipal waste from landfill in 2010. The targets for 2013 and 2016 will be much more difficult to achieve[2]. The introduction of the Food Waste Regulations[10] in 2010 will go some way towards achieving those targets by requiring major producers to segregate food waste at source, thus enabling its diversion to food waste recycling facilities, such as composting plants.

According to the EPA National Waste Report 2009 "at the end of 2009, the remaining capacity of fully consented MSW landfill capacity (i.e. with waste licence and planning permission in place) was approximately 28 million tonnes nationally". This estimate includes two consented facilities that have yet to commence construction (Bottlehill Landfill in Cork County Council area and Fingal Landfill, Nevitt). These two landfills represent just over 50% of the total remaining national capacity of 28 million tonnes. If MSW landfill disposal were to continue at the same rate as 2009, that is 1.9 million tonnes per annum, the remaining capacity would be exhausted by 2025.

Mechanical Biological Treatment (MBT)

Juniper Consultancy Services Ltd produced a guide for decision makers[11] in relation to MBT in 2005. Juniper was commissioned by the Irish arm of the Confederation of European Waste-to-Energy Plants (CEWEP) in 2007 to produce a briefing note[12] in which 10 key questions about MBT were addressed. The briefing note explained that "MBT is not a single concept or type of technology - instead the term is applicable to a wide range of technologies with very varying capabilities." It also explained that "all MBT processes will produce a non-biodegradable plastic rich fraction usually referred to as Refuse Derived Fuel (RDF) which requires an outlet. In some EU member states, this is sent for incineration or for utilisation in cement kilns." MBT has a part to play in sustainable waste management but Juniper states that "MBT used on its own will not maximise the sustainability of Irish waste management."

The EPA published a critical analysis of the potential of MBT[13] for Irish waste management in 2007. The following is an extract from that report;

"A recent report on MBT defined it a process that 'partially processes mixed household waste by mechanically removing some parts of the waste and biologically treating others, so that the residual fraction is smaller and more suitable for a number of possible uses'.

This concise definition sums up the process of MBT as comprising both mechanical and biological treatment process elements.

An important point to note in this definition is the use of the word 'partially'. MBT in itself does not result in the final treatment of residual waste. Whatever outputs are generated from an MBT process are typically in a form that may require further treatment to make them suitable for their end use. Alternatively, they are treated to a required standard that makes them suitable for disposal. For this reason, MBT can be considered a 'pre-treatment' process."

The report found that;

"MBT is a flexible treatment option and can play a role in Irish Waste Management"

and concluded that;

"The best quality of recyclables and the least expense for generating such recyclables are achieved by source separation - that is, the operation of a three-bin collection system rather than the sorting of mixed waste.

Any integrated waste-management system will consist of several mutually complimentary waste- treatment technologies.

Both MBT and EfW [Energy from Waste] facilities have strengths and weaknesses"

The National Waste Report 2009 noted that there were only two integrated (as in on the same site) MBT facilities in Ireland.

The past 3 years or so featured a public stand-off between the Minister for the Environment, Heritage and Local Government and Covanta, the developer of the proposed Poolbeg Waste to Energy (WtE) plant. Regretfully, the public debate around that generated much more heat than light. While the public are now familiar with the term MBT it is unlikely that the public have any understanding of the technologies that can be considered to be MBT technologies or the relative advantages of MBT and WtE. The debate has only contributed to a polarising of positions.

WASTE TO ENERGY (WTE) FACILITIES

In February 2010 a report[14] was published by a Taskforce organised by the Irish Academy of Engineering and Engineers Ireland, representing the engineering profession on the island of Ireland. It was commissioned by InterTradeIreland. The report recommended that "appropriately sized waste to energy (WTE) plants should be established and strategically located to cater for residual waste from the City Regions. Regional transfer of waste by rail

should be permitted to give economies of scale." The report went on to recommend that "DH [District Heating] should be a requirement in all new high-density residential and commercial developments." The report noted that "in 27 European countries District Heating is distributed to 100 million people, this is 23% of the population of these countries. DH offers advantages in terms of higher efficiency, significantly reduced CO_2 emissions and reduced consumption of energy resources." In many cases the source for the district heating are municipal incinerators. Incinerators are at their most efficient when generating electricity and heat together.

There are no municipal waste incinerators operating In Ireland in early 2011. The EPA granted licences to Indaver Ireland in November 2005 for two municipal Waste to Energy (WtE) facilities. The one at Carrannstown, Co. Louth, was for a capacity of 150,000 tonnes per annum. It will commence operation in mid 2011 subject to determination of their waste licence review application to increase its capacity from 150,000 to 200,000 tonnes per annum. It will be Ireland's first municipal WtE plant. The second Indaver Ireland proposal is for two WtE facilities within one building, plus a waste transfer station at Ringaskiddy in Co. Cork. The industrial WtE plant will treat 100,000 tonnes per annum of solid and liquid, hazardous and non-hazardous wastes such as contaminated packaging/products, and solvents/liquids from the pharmaceutical and chemical industry. The municipal WtE plant will treat 140,000 tonnes per annum of residual household and commercial waste and other similar types of waste. The two WtE facilities will operate independently. Both facilities will generate 22 MW of electricity, enough to power 30,000 homes. The project is currently awaiting a decision from An Bord Pleanála.

In December 2008 the EPA granted a licence to Covanta for a municipal WtE facility at Poolbeg with a capacity of 600,000 tonnes per annum. Development of this facility is at an early stage and has been hampered by delays in processing a foreshore licence and uncertainty about the levies that will apply.

Incineration is well established in Europe for the treatment of municipal waste. According to Eurostat statistics for municipal waste incinerated[15], almost 51 million tonnes of municipal waste was incinerated in the EU 27 countries in 2009. This quantity has increased steadily from circa 31 million tonnes in 1995. Of that total Germany, accounted for 15.5 m tonnes, France for 11.7m tonnes, the UK 3.6m tonnes and Belgium 1.8m tonnes. The International Solid Waste Association produced a report on the thermal treatment of waste in 2006[16]. The report covers MSW incineration plants with a capacity of more than 15 tonnes/day or 10,000 tonnes/year, which means that special plants for hazardous waste, sludge, agricultural and hospital wastes are not included. The report found that there were 431 waste to energy plants in 16 European countries in 2005 - Germany had 68 , France had 127, the UK had 22 and Belgium had 18.

There are new generation thermal treatment technologies being developed which may become viable. Gasification involves heating of the waste to produce lower calorific gas containing hydrogen, carbon monoxide and methane which can be used in combustion engines to produce electricity. A second technology is pyrolysis, which is similar to gasification but involves heating biomass in the absence of oxygen to produce a fuel.

One of the key findings of a Forfás report[17] was that "Ireland remains the only country of the benchmarked countries/regions not to have a commercial waste-to-energy (WtE) market. The 3% of municipal waste that was treated through WtE in 2008 was collected, transported and treated overseas."

The CBI issued a briefing document[18] on WtE in October 2010. It noted that Germany has a recycling rate of around 66% with approximately 32% being put through energy recovery treatments and the remaining 1% being landfilled. Flanders (Belgium), which has the highest household recycling rate in the EU at 72%, send the residual waste for energy recovery. These examples show that sustainable waste strategies can include both high recycling rates and a significant proportion of waste to energy.

Anaerobic Digestion (AD) is another form of waste to energy technology. AD plants produce methane gas which can be burnt on site to produce electricity or heat or, when purified, can be injected into the national gas grid. There are no municipal waste anaerobic digesters in Ireland although there are some in use for treatment of sludges arising from waste water treatment plants. There are, however, two plants, one in Limerick and one in Wexford in the Department of Agriculture, Fisheries and Food approval process for treatment of catering and food waste[19].

Composting

One of the key findings of the Forfás report was that "composting as a waste treatment option is growing but remains at a very low level in Ireland (3 per cent of municipal waste in 2008 was composted). According to the EPA[2] 7% of collected and 'brought' household waste was composted in 2009 (brown bin collected and home composted) compared to 5% equivalent in 2008.

A recent Eurostat news release[20] states that in 2009 "the Member States with the highest composting rates for municipal waste were Austria (40%), Italy (32%), the Netherlands (28%), Spain and Belgium (both 24%) and Luxembourg (20%)." It quotes an average rate for composting of municipal waste of 18% for the EU27 and a rate for composting of municipal waste in Ireland of only 4%.

Current Situation - Regional Context

The Connacht Waste Management (CWM) Region includes Counties Sligo and Leitrim as well as Mayo, Galway and Roscommon, see Figure 2.

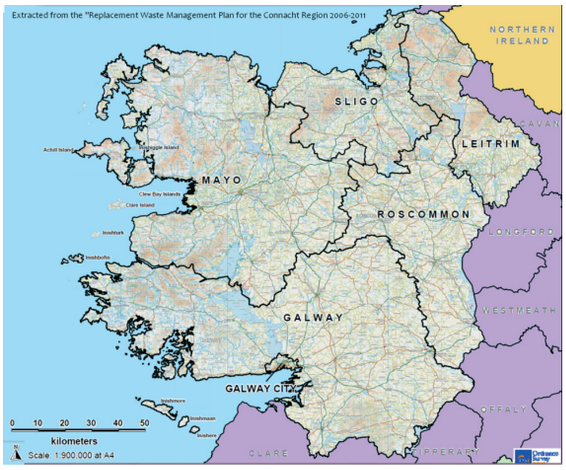


Figure 2 Waste Management Region

The CWM Region has the second largest population after the Dublin Region, is the largest Region by land area and has the lowest population density. The topography of the Region is mountainous to the North, West and South East. While there is a significant urban centre in Galway City and the towns of Sligo, Castlebar and Ballina have significant populations, there is still a high rural based population. All these factors combine to contribute to the fact that the Region is difficult to service with waste collection.

While the total household waste per head of population in the CWM Region is in or about the national norm, the figure for 2008 of 312kg/head represented a 7% increase over the 2007 figure. This contrasts with a reduction of 5.4% nationally. The 2009 EPA report does not include an estimated figure for uncollected waste for the CWM Region. If the same figure is added as in the 2008 report, 32,551 tonnes, to the total collected and brought household waste figure for 2009 of 162,902 tonnes it would give a total of 195,453 tonnes for total household waste generated. This would represent a reduction in household waste generation of 7.18% on the figure for 2008 of 210,578. This compares to a reduction of 3% in household waste generation nationally.

In 2008 the overall recycling rate for municipal waste was 38.1% which was slightly better that the national norm. The current Connacht Waste Management (CWM) Plan[21] set a target for 2013

Waste Management Region	% of Land Area of the State	Population Density Pop/km²	Household Waste Collected in 2008 (t)	Household Waste Collected in 2009 (t)	Change (%)
Connacht	25.4	28	178,027	162,902	-8.50
Mid-West	15.3	41	139,908	135,622	-3.06
South East	13.5	49	161,988	165,482	+2.15
Midlands	12.3	37	110,392	114,454	+3.68
Cork	10.8	64	156,367	159,582	+2.06
North East	9.2	42	149,336	138,318	-7.38
Donegal	7.0	30	32,960	29,093	-11.73
Wicklow	2.9	62	48,465	39,668	-18.15
Kildare	2.4	110	84,622	72,046	-14.86
Dublin	1.3	1,290	476,058	462,641	-2.82

Table 2 Connacht Waste Management Region compared to other Regions in terms of Area, Population Density and Household Waste Collected (from Connacht Waste Annual Report 2008 and EPA Waste Reports 2008 and 2009)

of 48%. Significant progress in waste recycling will be required by 2013.

Waste Infrastructure in the Connacht Region

Municipal Landfill

The following table details the 4 Landfills that operated in the CWM Region in 2009 and the types and quantities of waste disposed of. The Carrowbrowne Landfill only accepted restoration material comprising composted municipal organics for capping purposes. While there are five counties in the CWM Region the landfills operating in 2009 are located in three counties, Galway (2), Mayo (1) and Roscommon (1). There were no landfills in operation in Counties Leitrim or Sligo in 2009, (see Table 3).

It is clear from Table 4 [Approximate remaining life expectancy in years[22, 23]] that at the 2009 filling rates the landfill capacity in the CWM Region would be exhausted by 2017 or thereabouts. Once exhausted, waste from the CWM Region will have to be exported to other MSW landfills outside the Region unless additional facilities are developed. This would result in additional transport costs and may put the CWM Region at a competitive disadvantage relative to other Regions.

Achievement of the diversion of BMW from Landfill targets for 2013 and 2016 will significantly extend the remaining life expectancy of the landfills in the CWM Region. The infrastructure to treat very large quantities of organic (particularly food) waste that must be collected separately and diverted from landfill to enable the achievement of those targets needs to be developed urgently.

The further roll out of the 3rd bin for biodegradable waste collection from households will be necessary.

Waste to Energy (WtE) Facilities

There are currently no "mass burn" incinerator facilities for MSW in the CWM Region. The current CWM Plan includes a target for Energy Recovery of 33% from municipal waste.

Mechanical Biological Treatment (MBT)

The National Waste Report 2009 noted that there were only two integrated (as in on the same site) MBT facilities in Ireland. There are currently no MBT facilities, as described above, for MSW in the CWM Region.

EPA Licence reg. no.	Landfill	Household Waste disposed (t)	Cleansing Waste disposed (t)	Commercial Waste disposed (t)	Total MSW disposal to Landfill (t)	Municipal Organic Waste (stabilised and woodchip) (t)
W0013-01	Carrowbrowne, Co. Galway	0	0	0	0	7,267
W0059-02	Ballaghaderreen, Co. Roscommon	23,780	58	5,857	29,695	0
W0067-01l	Rathroeen, Co. Mayo	20,800	3,942	5,671	30,413	1,143
W0178-01	Connacht Regional, Co.	55,155	984	41,768	97,907	1,030
	All of Connacht Waste Region	99,735	4,984	53,296	158,015	9,440

Table 3 Municipal waste landfills operating in Connacht Waste Region in 2009 - Extracted from Table 39 in the EPA National Waste Report 2009

EPA licence reg. no.	Licensee	Landfill	Approximate remaining disposal	Approximate remaining life expectancy in years	
				Site	Region
W0021-01	Mayo Co. Co.	Derrinumera	56,000	3	7.5
W0059-02	Roscommon Co. Co.	Ballaghaderreen	48,000	1	
W0067-01	Mayo Co. Co.	Rathroeen	162,000	5	
W00178-01	Greenstar Holdings	Connacht Regional	900,000	8.5	
	Total Remaining Disposal Capacity (t)		1,166,00	7.5	

Table 4 CWM Region MSW landfill disposal capacity (at end of 2009) - Extracted from Table 40 in the EPA National Waste Report 2009

Composting

Galway City Council operates a composting facility at Carrowbrowne with a capacity to process 9,500 tonnes per annum. Barna Waste have developed a facility at Carrowbrowne with a capacity to process 25,000 tonnes per annum. Athchursáil Árann Teo on Inis Mór in the Aran Islands has Department of Agriculture, Fisheries & Food (DAF&F) approval for treating catering and food waste. There is a small, community operated, composting facility at Ballisodare in Sligo for processing green waste only.

Civic Amenity Sites and Bring Bank

Set out in Table 5[24], and Table 6[25], is a breakdown of the quantities of waste collected at Civic amenity sites in the CWM Region in 2009. The headings chosen represent what might be expected to be collected in the 3 bin collection system operating in Galway City which is why the quantity under these headings for Galway City are zero as these wastes are collected at the kerbside.

WHAT DO WE NEED?

We need urgently a national waste policy that initially focuses on meeting the 2013 and 2016 EU Landfill Directive targets for the diversion of BMW from landfill by 2013 and 2016 to avoid the imposition of fines and reputational damage.

We need a sustainable national waste policy that is compatible with the EU Waste Management Framework Directive and the Waste Hierarchy therein.

The old adage "waste not, want not!" is very appropriate in this context. At present we are consuming the earth's resources at an unsustainable level. The One Planet Living website includes the following statements;

> *"If everyone in the world lived like an average European we would need three planets to live on. If everyone in the world lived like an average North American we would need five planets to live on."*

It would do us well to consider the Native American proverb;

> *"We do not inherit the Earth from our ancestors, we borrow it from our children."*

To ensure a good quality of life for ourselves, and more particularly for future generations, we must learn how to do more with less resources. We need a waste management system that;

Local Authority	Mixed Residual Waste (t)	Organic Waste (food & garden) (t)	Mixed Dry Recyclables (t)	Paper, Card & Magazines (t)	Plastic (t)	Other (t)	Total (t)
County Galway	266	1,278	225	322	6	1,243	**3,340**
Galway City	0	0	0	0	0	889	**899**
Leitrim	101	0	0	118	19	253	**491**
Mayo	2515	0	0	884	101	2,057	**5,557**
Roscommon	649	0	23	925	142	1,360	**3,099**
Sligo	0	690	0	451	28	1,138	**2,307**
Total	3,531	1,968	248	2,700	296	6,940	15,683

Table 5 Waste Types collected at Civic Amenity Sites

- encourages the efficient use of resources and the prevention of waste in the first place
- that treats materials discarded as a "resource" rather than "waste", with segregation at source to isolate the biodegradable fraction
- uses technologies that enable the maximising of reuse and recycling of the non-biodegradable fraction
- involves the treatment of the biodegradable fraction to extract beneficial use from it either as compost or feedstock for waste to energy plants
- improves the competitiveness of Irish business to enable it to compete with its European counterparts

Local Authority	Bring Banks	Civic Amenity Sites
County Galway	12	1
Galway City	88	6
Leitrim	38	2
Mayo	97	2
Roscommon	39	4
Sligo	50	3

Table 6 Bring banks and civic amenity sites in operation in 2009

- creates a sustainable resource recovery from waste industry that creates significant employment
- protects public health
- protects Ireland's unique environment
- enhances the quality of life of those residing in the West Region
- meets EU Directive targets for diversion of waste from landfill

HOW ARE WE GOING TO GET THERE?

NATIONAL WASTE POLICY

The new Fine Gael/Labour coalition government must make the achievement of the EU targets for diversion of BMW from landfill by 2013 and 2016 a priority and publish a national waste policy with that as its primary focus in the short term.

We welcome the inclusion in the Government for National Recovery document of the commitment to "develop a national waste policy that will adhere to the EU waste hierarchy and favours a coherent approach to waste

management that minimises waste going to landfill, and that maximises the resources that can be recovered from it."

We need urgently an open, rational and informed public debate, involving people with expertise and experience of the various waste management technologies in use across Europe for many years, about the relative merits of the various technologies and what might be an appropriate mix of waste management technologies for Ireland taking environmental, economic and societal aspects into account. By this means all stakeholders will be enabled to make informed, rational, decisions about a sustainable waste management strategy that suits Ireland's needs.

Achieving zero-waste means implementing a diverse range of waste and resource management options.

Prevention

A programme of public awareness will be required to encourage "sustainable consumption". Consumers should be encouraged to take into account the efficient use of resources in manufacture, longevity, reparability and recyclability of the products they purchase. The public have got used to energy efficiency labels on the electrical goods they purchase. The adoption of "sustainability labels" should be considered for products taking account of the factors already mentioned. What is needed is behavioural change in consumption.

'Community-based social marketing' is an alternative to the usual 'information based' and 'media advertising' campaigns aimed at bringing about behavioural change. 'Social marketing' is already recognised as a successful strategy to bring about change in relation to health in anti-smoking and healthy eating campaigns where long term behavioural change is the objective. 'Food Dudes' is an example of a successful social marketing approach to increasing school children's intake of fresh fruit. A paper written by Doug McKenzie-Mohr[26] presents a good introduction to 'community-based social marketing'. He has also developed a website (www.cbsm.com) which provides a guide to fostering sustainable behaviour. There are a number of case studies available at this website and also at the Tools of Change website www.toolsofchange.com where examples of the application of 'community-based social marketing' to promote sustainability can be found. The Centre for Innovation and Structural Change (CISC) in NUI Galway can advise in relation to the development of innovative strategies 'social marketing' strategies.

Waste as a Resource

A programme of public awareness will be required to persuade society to look at waste as a resource that has a value to increase the effectiveness of segregation at source to maximise value. 'Community-based social marketing' should be considered as the approach to achieving this objective.

MBT

MBT has a role to play but not at the expense of segregation at source. It is recognised MBT may be required to separate out the biodegradable fraction of municipal waste even after source segregation.

Biodegradable Municipal Waste (BMW) Collection

In 2009 in the Connacht Region only Galway City and County Galway had a 3rd bin (organic) collection service. In Galway city the 3rd bin market penetration was 83% and in the county only 5%. A total of 5,990 tonnes of organic waste was separately collected in 2009, 5,229 tonnes in Galway City and 761 tonnes in County Galway. This represents 4.7% of the total kerbside collected waste of 126,736 tonnes in 2009 in the Connacht Region and compares to the national average of 5.5%.

EPA municipal waste characterisation studies[27] (EPA, 2008) indicate that organics (food and garden waste) comprise circa 23% by weight of the gross household bin waste stream. This equates to an estimated 'available' organic waste content from the Connacht Region of circa 29,149 tonnes in 2009 compared to the 5,990 tonnes segregated and kerb collected in the 3rd (brown) bin. While it is accepted that not all of that of that presently unsegregated 23,159 tonnes 'available' will not be suitable for brown bin collection, a large part of it could be captured and diverted from landfill if the 3rd bin was rolled out more extensively throughout the Connacht Region.

Composting

Galway City Council operates a facility at Carrowbrowne with a capacity of 9,500 tonnes per annum. Barna Waste's application for treating catering and food waste is in the DAF&F approval process - they have developed a facility to handle 20,000 tonnes per annum. Taken together these represent significant infrastructure for waste management in the West Region.

Waste to Energy (WtE) Facilities

Experience in Ireland to date indicates that there is likely to be considerable delays in the planning process for any Energy Recovery (Waste to Energy) facilities.

If one were to consider an Incinerator for the Connacht Region we suggest that it be located beside a railway line so that it can be serviced by a siding. This would facilitate the transport of waste to the facility by rail. As incinerators are most efficient when the heat energy it generates can be utilised fully as well as the electricity generated, it should be located so that it could supply heat to a district heating system. It should be located close to the electrical grid to facilitate its connection to the grid.

Anaerobic Digesters (AD) may provide a more viable option for dealing with organic wastes in the Connacht Region as they can handle agricultural waste, and sewage sludge as well as Biodegradable Municipal Waste (BMW). AD plants have two benefits in that they divert biodegradable waste from landfill and they

capture greenhouse gases such as methane. A Joint Oireachtas Committee[28] favours the development of AD plants throughout the Region for the generation of renewable bioenergy. The biodegradable fraction of municipal waste can be a feedstock for AD plants. Agricultural waste can also be a feedstock for AD plants as well as grass and maize. The location of AD plants of 380kW capacity throughout the Region would make it feasible for towns in the Regions to send their biodegradable waste, collected in the 3rd (brown) bin, to AD plants nearby and in return get either a biogas supply or heat from High Efficiency CHP plants delivered into district heating schemes. Farmers in the hinterland of the town would supply feedstock to the AD plant to be treated in conjunction with the waste from the town. Both the residential communities in the towns and the farming communities in the hinterlands of towns would benefit from the roll out of AD plants. It is imperative that a participative approach is taken to the deployment of AD plants to get all stakeholders on board and avoid the situation that has arisen in this country in relation to incinerators.

RECOMMENDATIONS

Bring forward a strategy as a matter of urgency to meet the targets for diversion of Biodegradable Municipal Waste from landfill by July 2013 and July 2016.

Expand the availability of 3 bin collections to as many households as economically possible, taking advantage of the public willingness to segregate waste at source. This will facilitate a higher quality of recyclable material than that available from sending mixed waste to MBT facilities.

Have an informed, rational public debate, about the most suitable waste management technologies, involving people with expertise and experience of the best available technology in use in other EU member states and elsewhere, and the most appropriate mix of those technologies for the West Region.

Provide for co-ordination of the activities of the various Waste Management Regions at National Level.

Adopt 'community-based social marketing' to bring about behavioural change in the community in relation to waste prevention and recycling. The Centre for Innovation and Structural Change (CISC) in NUI Galway can assist in developing innovative strategies to effect significant improvements in waste prevention and recycling in the community in the interests of the common good.

Encourage sustainable manufacturing ensuring resource use efficiency and incorporation of recycled materials into manufacturing.

Expand the availability of Civic Amenity sites especially in rural areas. These should be located strategically close to other facilities in towns and villages so that the public can access them while visiting other facilities nearby during the same journey. These Civic Amenity sites should be designed to accept a wide range of source

segregated waste. Segregation of waste at source should be incentivised by charging a fee by weight for non-segregated waste brought to the site.

Transpose the new EU Waste Framework Directive (2008/98/EC) into national legislation as soon as possible.

Resolve the issue of "who owns the waste" so that there is certainty about this.

Provide for Local Authorities to invite tenders from waste contractors for collection services to avoid the current situation where several waste contractors traverse the same area collecting waste.

Oblige householders to avail of a waste collection service if one is available in their area.

Encourage the development of composting facilities in other parts of the Region. There are adequate facilities in the vicinity of Galway City but, based on the proximity principle, a distribution of composting facilities around the Region is necessary.

Support the development of waste to energy infrastructure as part of a sustainable waste management strategy.

GLOSSARY

AD	Anaerobic Digestion
BMW	Biodegradable Municipal Waste
CBI	Confederation of British Industry
CWM	Connacht Waste Management
CWMR	Connacht Waste Management Region
EPA	Environmental Protection Agency
MBT	Mechanical Biological Treatment
MSW	Municipal Solid Waste
WtE	Waste to Energy

BIBLIOGRAPHY

1 Council Directive 1999/31/EC of 26th April 1999 on the landfill of waste

2 EPA National Waste Report 2009

3 Directive (2008/98/EC)

4 International Review of Waste Management Policy: Summary Report, Department of Environment Heritage and Local Government. Authors: Dr Dominic Hogg, Dr Adrian Gibbs, Ann Ballinger, Andrew Coulthurst, Tim Elliott, Dr Debbie Fletcher, Simon Russell, Chris Sherrington, Sam Taylor (Eunomia), Duncan Wilson (Eunomia New Zealand), Sean Finlay, Damien Grehan, Mairead Hogan, Pat O'Neill (Tobin), Martin Steiner (TBU), Andreas Hermann, Matthias Buchert (Oko Institut), Ilse Laureysens, Mike van Acoyleyn (Arcadis), Enzo Favoino and Valentina Caimi (Scuola Agraria del Parco di Monza), 29th September 2009

5 An Economic Approach to Municipal Waste Management Policy in Ireland by Paul K. Gorecki, Jean Acheson and Seán Lyons of the Economic and Social Research Institute, Final Report for Dublin City Council, 03/02/2010

6 Further Issues in Municipal Waste Management Policy in Ireland: A Response to the Comments Received on An Economic Approach to Waste Management Policy in Ireland by Paul K. Gorecki and Seán Lyons, Economic & Social Research Institute, 04/03/2010

7 "Waste Policy in Ireland: Comments on Radical Proposals on the Way Forward,

A Submission to the Ministerâ€™s Reopening of the Consultation on the Proposed Section 60 Policy Direction Capping Incineration of Municipal Waste and Other Matters and the Consultation New Draft Statement of Waste Policy by Paul K Gorecki, Sean Lyons and Richard S J Tol, 01/10/2010".

8 Section 60 Policy Direction Capping Incineration of Municipal Waste and Other Matters, Environmental Report, Department of the Environment, Heritage and Local Government, Authors: Dr Dominic Hogg, Chris Sherrington, Ann Ballinger, June 2009

9 Waste Management in Ireland, Benchmarking Analysis and Policy Priorities: Update 2010, Forfás

10 Waste Management (Food Waste) Regulations, SI No. 508 of 2009

11 Mechanical Biological Treatment - A guide for decision makers - Process, Policies and Markets by Juniper Consulting Services, 2005

12 Briefing Note: 10 Questions about MBT by Juniper Consultancy Services Ltd for CEWEP, Ireland, 2007

13 STRIVE Report Series No. 16 - Critical Analysis of the Potential of Mechanical Biological Treatment for Irish Waste Management for the EPA, 2007

14 Infrastructure for an Island population of 8 million, prepared by The Irish Academy of Engineering and Engineers Ireland, commissioned by InterTradeIreland

15 http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/documents/filled_Municipal_waste_incinerated_1000t_11022011.mht

16 Energy from Waste, State-of-the-Art-Report, Statistics, 5th Edition Augusts 2006, prepared by Rambøll for the Working Group on Thermal Treatment of Waste, International Solid Waste Association

17 Waste Management in Ireland -Benchmarking Analysis and Policy Priorities: Update 2010, by Forfás

18 CBI Brief October 2010, Going to Waste: Making the case for energy from waste

19 www.foodwaste.ie

20 Eurostat News Release, 37/2011 - 8 March 2011, Environment in the EU27

21 Replacement Waste Management Plan for Connacht Region 2006-2011

22 Based on 2009 fill rate (2008 for W0021-01)

23 Remaining lifespan assumes constant MSW, industrial and other waste input as that recorded in 2009 for these facilities.

24 EPA National Waste Report 2009, from Appendix D

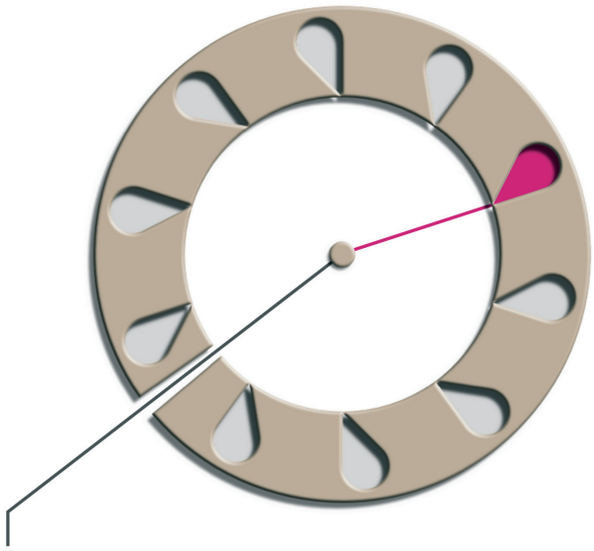
25 EPA National Waste Report 2009, from Table 44

26 Promoting Sustainable Behavior: An Introduction to Community-Based Social Marketing by Doug McKenzie-Mohr, St. Thomas University, Journal of Social Issues, Vol. 56, No. 3, 2000, pp. 543-554

27 Municipal Waste Characterisation Surveys 2008 by RPS Consulting Engineers and the Clean Technology Centre (CTC) for the EPA

28 Tithe an Oireachtais, Joint Committee on Communications, Energy and Natural Resources, Fourth Report: The Development of Anaerobic Digestion in Ireland, January 2011

SUSTAINABLE TRANSPORT



"encouraging low carbon modes of transport to reduce emissions, reducing the need to travel"

Section Contents

KEY RECOMMENDATIONS

01 Complete the M17/M18 Gort to Claremorris section of the Atlantic Road Corridor.

02 Construct the N6 Galway City Outer Bypass to relieve traffic congestion in Galway city and facilitate the implementation of sustainable transport measures.

03 Prioritise investment to upgrade N5 route: Westport to Roscommon/Longford borders. Upgrade National Secondary and Regional roads of strategic importance.

EXECUTIVE SUMMARY

As a Region on the western periphery of Europe, the provision of good transport infrastructure is vital to the economic development and social well-being of the West Region. To ensure sustainable development and attract inward investment, the Region requires well developed road, rail, airport and port infrastructure links both within and from the Region.

The road network in Ireland is by far the most used transport infrastructure for the movement of goods and people. According to the National Development Plan (NDP) 2007-2013, 98% of all goods are transported on the road network in Ireland. In particular, the road network in the West Region is of critical economic and social importance due to the dispersed nature of the population and industrial development. In many cases, the rural road network is the only means of access for local economic activity.

There are 16,920Km (1,097Km National roads and 15,823Km of Non-National roads) of road network in the West Region accounting for 18.3% of the overall network in Ireland. The network of national secondary, regional and local roads are of vital importance to provide mobility within the region and to provide connectivity to the strategic motorway and national primary network, rail network, airports and ports, which are the links to the gateways and hub cities and towns, to other regions and to international markets.

The road network is and will remain the primary mode of transport infrastructure for the foreseeable future. Significant investment in roads has been targeted at upgrading roads with the highest capacity to improve the level of service, in particular on the primary routes and the motorways. The remainder of the road network in the West Region consists generally of poorly-maintained roads which do not provide an adequate level of service to users and are not to an acceptable international standard.

A well resourced, high quality road network is of vital importance to the West Region. The road network must be developed and maintained to ensure a high level of service to reduce travel times, reduce transport costs and provide a safe and efficient mode of transport for goods and people. The new Programme for Government commits to drawing up a new NDP that, in the initial years, will prioritise investment in "non-national roads" and gives a commitment to provide funding on a once-off basis to repair damage done to non-national roads due to recent severe weather conditions.

The car is the dominant mode of travel used by the workforce of the West Region. Increased use of public transport, bus and rail, and more

SUSTAINABLE TRANSPORT

04 Continue to pursue with urgency and determination, within the West Region, the 5 key goals on which the "Smarter Travel" policy is based.

05 All new developments, industrial, commercial and housing, must be located and designed so as to facilitate public transport services.

06 Develop a state-of-the-art integrated transport hub at Ceannt Station including both a rail terminus and a Bus Éireann terminus.

cycling and walking will be necessary if we are to move towards a low carbon economy.

If rail is to compete with buses on the Galway-Dublin route it will have to offer shorter journey times either by increased speed and/or offering at least some non-stop services.

The extension of the Western Rail Corridor to Tuam, the construction of a new rail station at Garraun, Oranmore and the construction of a passing loop somewhere between Athenry and Galway would facilitate commuting by rail.

Freeing up road space for buses with more Quality Bus Corridors and the providing of real-time information about bus running times would greatly enhance the service and persuade more commuters to use buses. Decongesting the Galway city traffic by building the Galway City Outer Bypass would make bus transport much more attractive to commuters and contribute significantly to the quality of life of those living and/or working in the city. The design of new housing developments taking sustainable travel into account in the layout and the provision of bus services immediately on first occupation of those developments would also attract commuters to use buses.

The development of an integrated, multi-modal transport hub at Ceannt Station, with adequate facilities for pick-up and drop-off by taxis, hackneys, etc. and appropriate facilities for cyclists to encourage them to cycle to and from the termini when using bus and rail services, would make commuter rail and bus services more attractive to use.

The PSO support for the Galway-Dublin air service should be maintained until such time as the M17/M18 and N17 upgrade has been completed from Gort to Claremorris to improve access to Ireland West Airport Knock and Shannon.

The proposed development of Galway Port offers the opportunity to provide for the West Region's need for import of goods and to generate a very significant boost in tourism income into the Region from the growing sea cruise sector.

The Rural Transport Programme is of vital importance to the rural areas of the West Region and must be supported and extended. There are significant social and health benefits associated with it.

The city of Galway and rural towns need to be made more cyclist and pedestrian friendly to encourage a switch from other transport modes. This would bring significant health benefits and a general improvement in quality of life.

SUSTAINABLE TRANSPORT

BACKGROUND - THE WEST REGION

The West Region consists of counties Galway, Mayo and Roscommon. The functional area of the West Region extends some 14,287 square kilometres and incorporates four local authorities[1]:

- Galway County Council
- Galway City Council
- Mayo County Council
- Roscommon County Council

It also includes Ballinasloe, Loughrea and Tuam Town Councils (County Galway); Ballina, Castlebar and Westport Town Councils (County Mayo); and Boyle Town Council (County Roscommon). The population of the Region was 414,277 in 2006 (CSO: 2006).

The National Spatial Strategy (NSS) 2002 - 2020[2] is a 20 year planning framework that aims to achieve a better balance of social, economic and physical regional development. The main focus of the strategy is to develop areas of sufficient scale and critical mass through a network of gateways and hubs to drive the development of regions in which they are located. Under the NSS, there is one 'Gateway' (Galway City), one 'Hub' (Tuam) and one 'Linked-Hub' (Ballina - Castelbar) within the West Region. Galway City is a key national and regional economic location. In addition, part of south Roscommon (Monksland) is located in the Midlands Gateway of Athlone. The Galway Gateway has the largest population concentration and is the main economic driver of the Region.

Other urban centres in the West Region include Tuam, Ballinasloe, Loughrea, Gort, Clifden (County Galway); Ballina, Westport, Castlebar, Claremorris (County Mayo), and Boyle, Castlerea and Roscommon Town (County Roscommon). All of these areas have experienced rapid economic and population growth in recent times, and it is vital that a high quality transport infrastructure is in place to service these locations. The small town of Athenry (County Galway) will be a key location for development to support the Gateway and Hubs in the Region. Athenry is located at the intersection of the M6 and the M17/M18 motorways. It is also at the intersection of the Galway-Dublin railway line and the Western Rail Corridor. The IDA has designated a strategic development site at this location.

The NSS seeks to strengthen the critical mass of the Atlantic gateways by proposing a linked corridor that will include the Gateways of Galway, Limerick-Shannon, Cork and Waterford. The Atlantic Gateways Initiative[3] examines how these four regional gateways can perform as an investment corridor. The NSS envisaged that the Atlantic Gateways would offset the gravitational pull of the corridor on the east of Ireland comprising the cities of Dublin and Belfast. The creation of an Atlantic Gateways Corridor[4] is critical to balanced regional development, connectivity to other regions, gateways and airports, and to allow the West Region to compete successfully with other economic corridors and regions.

National Development Plan 2007-2013

The National Development Plan (NDP) 2007-2013[5] is a €184 billion capital investment framework that aims to address the infrastructural deficits in the country. The NDP is closely linked with the objectives of the NSS to ensure more balanced social, economic and physical development across the regions. Transport 21[6] forms part of the NDP and comprises a 10 year investment framework which proposes to invest approximately €34 billion in key infrastructural projects for the development of national roads, public transport, airports and ports. Transport 21 seeks to promote balanced regional development and competitiveness through the provision of a high quality integrated transport system. Given the current challenging economic climate, it is likely that the remainder of the envisaged investment under the NDP will be constrained.

Transport Infrastructure

As the West Region is on the western periphery of Europe, the provision of good transport infrastructure is vital to economic development and social well-being. To ensure sustainable development and attract inward investment, the West Region requires well developed road, rail, airport and port infrastructure links both within and from the Region. Figure 1 shows a map of the locations, road, rail and air networks in the West Region[1].

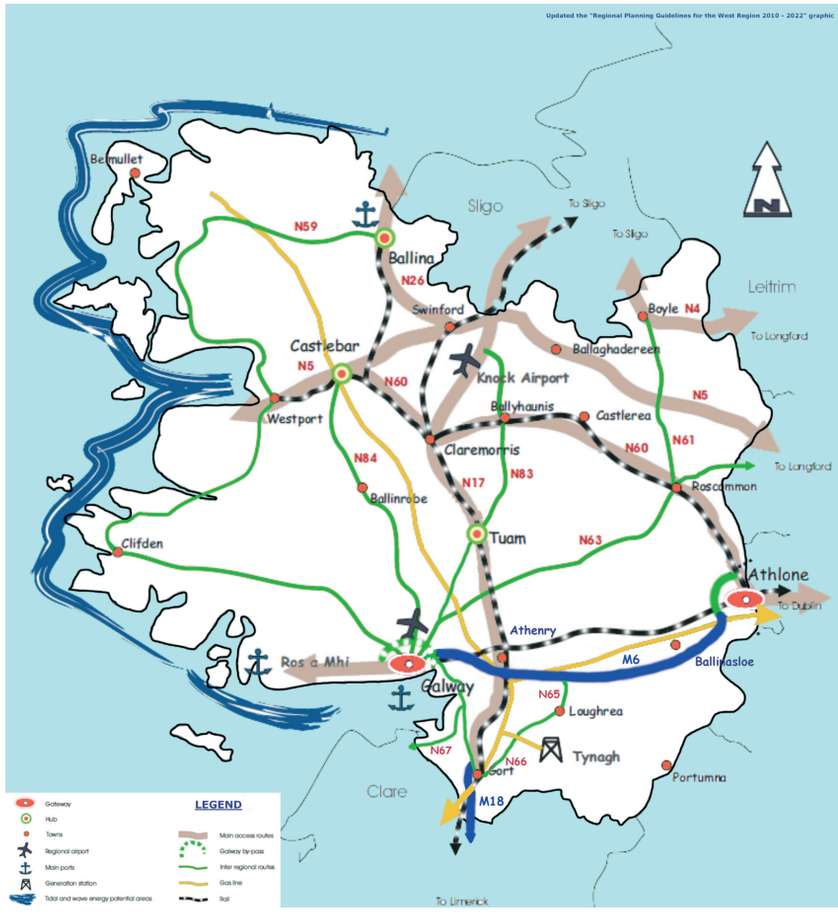


Figure 1 Map of Infrastructure in the West Region.

The road network in Ireland is by far the most used transport infrastructure for the movement of goods and people. According to the National Development Plan (NDP) 2007 - 2013, 98% of all goods are transported on the road network in Ireland. Under Transport 21, €17.6bn was allocated to the roads sub-programme. The need to upgrade the national road network has been recognised in Transport 21

with the completion of the M6 Galway - Dublin, M18 Gort - Crusheen, and the inclusion of projects to upgrade the N5 Dublin - Mayo, route N6 Galway City Outer Bypass and the M17/M18 section of the Atlantic Road Corridor extending to Tuam and Claremorris.

With the development of the Western Rail Corridor, rail will play an increased transport role within the Region. The Western Rail Corridor section from Ennis to Athenry has been opened and the next section from Athenry to Tuam should be prioritised.

There are two airports in the West Region which are the Ireland West Airport Knock and the airport in Galway. Galway Port is the only commercial port catering for cargo traffic in the Region with Ros an Mhíl, a designated fishing harbour, also catering for passenger traffic to the Aran Islands[1].

The Rural Transport Programme (RTP), which is managed by Pobal on behalf of the Department of Transport, is designed to address social exclusion in rural areas arising from unmet transport needs and is very important in the context of the West Region[1].

Distance (Km)	% of Workforce
0 - 9.9	47.7
10 - 24.9	28.6
25 - 49.9	15.6
50+	8.1

Table 1 Distance Travelled by Workforce in the West Region (Source: CSO 2006)

The most recent census in Ireland shows that there has been a shift towards longer journeys to work and an increased use of car-based travel from 1986 to 2006[7]. The average travel to work distance in 1986 was 9.9km but by 2006 this was 16.7km in the West Region[1]. Table 1[1] shows the percentages of the workforce for various distance brackets in the West Region.

Table 2 shows the percentage workforce by mode of travel in the West Region. The car is the dominant mode of travel used by the workforce of the West Region. However, public transport in the form of bus and rail, and other forms of transport such as cycling are critical if we are to move towards a low carbon economy. There have been some moves in that regard in the West Region including improvements in journey times from recently constructed bus lanes on the approaches to and in Galway City, and the provision of adequate and suitable car parking at existing train stations. If we are to convince people to discard the private vehicle, we need to make these forms of travel more attractive and realistic for even part of their journey.

Mode of Travel	% of Workforce
Work from Home	7.2
Foot / Bicycle	11.3
Car / Van	78.2
Public Transport	2.5
Other	0.8

Table 2 Mode of Travel used by Workforce in the West Region (Source: CSO 2006)

ROAD TRANSPORT

CURRENT STATUS

The roads network in Ireland consists of 5,444 kilometres of National network (Motorway, National Primary and National Secondary)[8] and almost 91,000 kilometres of Non-National roads (Regional and Local roads)[9]. The Non-National roads are further subdivided into Regional, Local Primary, Local Secondary and Local Tertiary roads. The regional and local roads which account for 94% of the road network carry around 54% of all road traffic[8].

Table 3 shows a breakdown of the road network in Ireland and the proportion in the West Region[8,10]. There is 16,920 kilometres of road network in the West Region accounting for 18.3% of the overall total nationally. The West Region network comprises 393Km National Primary roads, 704Km National Secondary roads and just over 15,800Km of Non-National roads. Based on the latest data from the NRA, there is 907Km of Motorway in Ireland with 98Km of Motorway (M6 & M18) in the West Region.

The National Roads Authority (NRA) is responsible for implementing the roads portion of the Transport 21 investment framework under the NDP. Under Transport 21, €17.6bn was allocated to the roads sub-programme. In recent years, there has been progress in the development of the major inter-urban (MIU) motorways and parts of the national network. The need to upgrade the national roads infrastructure in the West Region was recognised by the inclusion in Transport 21 of projects to upgrade the N6 Galway to Dublin, N6 Galway City Outer Bypass, N5 Mayo to Dublin and the N17/N18 Atlantic Corridor route extending through Limerick, Ennis, Gort, Tuam, Claremorris and Sligo. Since the launch of Transport 21, the M6 Galway to Dublin motorway, M18 Gort to Ennis and the N5 Charlestown Bypass have been completed. The stretch of the

Road Class	Ireland (Km)	West Region (Km)	West Region Proportion (%)
National Primary	2,736	393	14.4
National Secondary	2,708	704	26.0
Regional	11,349	1,684	14.8
Local Primary	23,611	3,716	15.7
Local Secondary	32,021	5,717	17.9
Local Tertiary	20,169	4,706	23.3
Total	**92,594**	**16,920**	**18.3**

Table 3 Breakdown of Road Network

M6 from Ballinasloe to Galway was built as a PPP scheme. The works on the M17/M18 project from Gort to Tuam are due to start in 2011.

The National Roads Authority (NRA) are also responsible for the allocation of funding for the National network under Transport 21 and for the administration of state grant payments to local authorities for the restoration and maintenance of non-national roads. From 1997 to 2010 over €6 billion has been invested in the local and regional road network[9]. Table 4[11, 12, 13] and Table 5[9,11, 12, 13] give the investment figures on National and Non-National Roads Programmes from 2007 to 2010 and the proportion received in the West Region. The investment in the roads programme has been falling since 2008 and given the current challenging economic circumstances, it is likely that investment in the coming years at least will also be constrained.

The roads network in the West Region is of critical importance to employment and economic activity in the Region including activities such as the life science sectors, agriculture, tourism, forestry and fishing. In many cases, the rural roads network is the only means of access for local economic activity. The network of national secondary, regional and local roads are of vital importance to provide mobility within the Region and to provide connectivity to the strategic national primary network, rail, airports and ports which are the links to other regions and to international markets.

Year	National Roads Programme (€)	West Region Allocation (€)	West Region Proportion (%)
2007	1.53 billion	138.5 million	9.1
2008	1.68 billion	158.5 million	9.4
2009	1.44 billion	170.8 million	11.9
2010	1.115 billion	197.8 million	**17.7**

Table 4 National Roads Programme Investment 2007 to 2010

Year	National Roads Programme (€)	West Region Allocation[x] (€)	West Region Proportion (%)
2007	607.5 million	79.9 million	13.2
2008	618.0 million	84.4 million	13.7
2009	451.5 million	64.4 million	14.3
2010	411.4 million	61.7 million	**15.0**

Table 5 Non-National Roads Programme Investment 2007 to 2010

[x] Including County Councils, City Councils & Town Councils

The new motorway, dual carriageway and National Primary roads completed in recent years in the West Region are in excellent condition. The sections of National primary road completed include[8]:

- M6 Galway to Athlone,
- M18 Gort to Crusheen
- N4 Hughestown to Meera
- N5 Charlestown Bypass
- N5 Strokestown/Longford (Scramoge)
- N65/N66 (formerly N6) Loughrea Bypass
- N17 Knock to Claremorris Bypass
- N26 Ballina to Bohola (Stage 1)

Figure 2 shows a overview of a section of the M6 Galway to Ballinasloe. However, the reality of road maintenance will dictate that these roads will require investment over the next ten years and beyond, including routine maintenance, resurfacing and improvement works. In contrast there has been little investment in upgrading the National secondary network and the condition and safety of this network are likely to deteriorate unless improvement works are implemented.

Over the past decade, the investment in roads has been targeted at upgrading roads where there is the highest capacity to improve the level of service, in particular on the primary routes. The remainder of the roads network in the West Region consists in general of poorly-maintained roads which are not providing an adequate level of service to users and are not to an acceptable international standard. Over recent years, improvement works have been carried out on some national secondary and key regional roads, with limited improvement works on other roads and most resources targeted towards sealing and patchwork repairs. In the past decade, there has also been a substantial increase in the traffic loadings on these roads which has contributed to the deteriorating condition. The most recent "Pavement Condition Study on Non-National Roads (Regional and Local Roads)" carried out by the DEHLG in 2004 confirm the substantial need for investment of the restoration and strengthening of these roads in the West Region[10]. In addition, the deterioration of national secondary, regional and local roads has been further accelerated by the flooding and prolonged severe cold weather experienced over recent winters, in particular 2008 to 2010.

WHERE DO WE WANT TO GET TO?

It is envisaged that roads will remain the primary mode of transport infrastructure at least up to 2030[14]. It is essential that we have a high quality road network in the West Region to improve

Figure 2 Overview of a Section of the M6 Galway to Ballinasloe

connectivity both within the Region and to other regions and cities. Motorway and dual carriageway links will be required between our main cities and in particular along the Atlantic Road Corridor. The following objectives are a key priority to reduce transport costs and improve efficiency for the roads infrastructure in the West Region:

National Primary Roads

Prioritise investment in the remainder of the Atlantic Road Corridor to improve connectivity between Galway, Limerick and Sligo and provide access to Shannon international airport by;

- Construction of the M17/M18 from Gort to Tuam motorway
- Complete the N17 Tuam to Claremorris dual carriageway (currently at Route Selection)
- Upgrade the N17 from Claremorris to Sligo to dual carriageway status including the N17 from Knock to Tubbercurry.

Prioritise investment in the N5 Westport to Roscommon/Longford borders route which is critical to transport costs for significant export led industry in Mayo by;

- Construction of the N5 Westport to Bohola dual carriageway (currently at Preliminary Design).
- Upgrade of the N5 Charlestown to the Roscommon/Longford borders including the N5 Ballaghaderreen Bypass (currently at Preliminary Design).

Prioritise investment in other National primary roads including;

- Construction of the N6 Galway City Outer Bypass (currently at Preliminary Design) which is important to the development of Galway City and connectivity to industry in Conamara.
- Complete the N17 Claregalway Bypass on the busy commuter route linking the Galway Gateway to the Hub town of Tuam.
- Upgrade the N4 Carrick-on-Shannon to Castlebaldwin.
- Complete the N26 Ballina to Bohola Phase 2 (currently at Preliminary Design).

National Secondary Roads

Upgrade and improve all National Secondary Roads, in particular:

- Complete the critical bypasses on National Secondary routes; N59 Moycullen Bypass, N59 Ballina Relief Road, N83 Ballyhaunis Relief Road, N84 Ballinrobe Relief Road.
- Upgrade the N59 Galway to Ballina route including N59 Clifden to Oughterard (currently at Preliminary Design) and N59 Westport to Mulranny (currently at Preliminary Design).
- Reclassify and upgrade the N60/N61 Athlone to Castlebar via Roscommon as a National Primary route, including the N61 Roscommon Town Bypass (currently at Route Selection) and N60 Claremorris to Castlebar (currently at Route Selection).
- Upgrade the N61 Roscommon to Boyle and complete the N61 Boyle Town Bypass (currently at Preliminary Design).
- Upgrade the N84 Galway to Castlebar connecting the Galway Gateway to the Linked Hub towns of Ballina - Castelbar.
- Upgrade the N63 Galway to Roscommon connecting the Galway Gateway to the County town of Roscommon.
- Upgrade and improve the condition of the N65 Portumna to Loughrea, N66 Loughrea to Gort, N67 Kilcolgan to North Clare.

Regional Roads

Upgrade the following Regional Roads:

- R312 Castlebar to Ballacorrick
- R313 Bangor to Belmullet.
- R321/R323 Bohola to Knock (including the bypass of Kiltimagh) linking the N5 to the N17.
- Upgrade and provide new alignment on the R336 road from Galway to the designated fishery harbour of Ros an Mhíl.

HOW WILL WE GET THERE?

The roads network in the West Region is of critical economic and social importance due to the dispersed nature of the population and industrial development. The quality of the road network is a key factor to attracting Multi-National Companies (MNC's) and foreign direct investment to the Region. It is also an essential component in the survival of indigenous industry, export-led industries, the SME sector and social activity within the Region.

The importance of a well resourced, high quality road network for the efficient and safe movement of goods and people is of vital importance to the West Region. The road network in the West Region must be developed and maintained to ensure a high level of service to reduce travel times, reduce transport costs and provide a safe mode of transport for users. A proper road network enhances the quality of life for people, connects communities and underpins prosperity through facilitating greater competitiveness.

The road network is and will continue to be for the foreseeable future the only means of access for both private vehicles and public transport (buses, taxis) to and from most areas in the West Region. The National Secondary and Regional road network are of strategic importance in this regard and provide links to the Motorway and National Primary network which connect to the Gateways and Hub cities and towns. The National network or primary and secondary routes is surveyed annually by the NRA to assess road condition and prioritise sections for improvement. The report on the National Secondary Roads Needs Study[15] has just been published by the NRA in March 2011. It is 2004 since a survey of the Non-National (Regional and Local) roads has been conducted[10]. The condition of the Regional road network is being assessed in 2011. The current condition of the Local roads should also be established. Going forward, the condition of the Non-National network, in particular the strategic regional roads should be monitored annually to prioritise investment where it is needed most. In general, the stretches of road that have been newly constructed or strengthened under the National and Non-National Roads Programmes over the past 15 years have performed well during the severe flooding and freezing weather over the last number of years. This underlines the need to balance expenditure between routine maintenance activities and ongoing strengthening and improvement work, even under the current budgetary constraints[16].

The investment in the upgrade and improvement of critical roads infrastructure in the Region which includes National Secondary roads and strategic Regional roads should be prioritised.

SUSTAINABLE TRANSPORT

The transport policy objectives of the NDP and Transport 21 should be implemented to provide an efficient network of National routes to international standards. The National Secondary Roads Needs Study report outlines the deficiencies in the National secondary network, the priorities for improvement and the investments required. Given the current challenging economic climate, it is likely that further investment under the NDP will be constrained. The new Programme for Government, Government for National Recovery 2011-2016, commits to draw up "a new National Development Plan that reflects Ireland's changed economic circumstances, covering the seven year period 2012 - 2019"[17]. It states that in the initial years, when resources will be most heavily constrained, it will prioritise investment in "school building, non-national roads, healthcare and in job-creation". In addition, the new programme gives a commitment to provide funding on a once off basis to repair damage done to non-national roads due to recent severe weather conditions.

RECOMMENDATIONS

Complete the M17/M18 Gort to Claremorris section of the Atlantic Road Corridor.

Construction of the N6 Galway City Outer Bypass.

Prioritise investment to upgrade the N5 route from Westport to Roscommon /Longford borders.

Prioritise investment to upgrade and improve National Secondary and Regional roads that are of strategic importance as outlined in this report.

PUBLIC TRANSPORT

INTRODUCTION

LINKS WITH OTHER ONE PLANET LIVING PRINCIPLES

There is a mutually dependent relationship between Public Transport and many of the principles of One Planet Living:

- Health and Happiness
  - *A report[18] prepared for the American Public Transportation Association in July 2010 included the following among its findings;*
    - *High quality public transportation (convenient, comfortable, fast rail and bus transport) and transit oriented development (walkable, mixed-use communities located around transit stations) tend to affect travel activity in ways that provide large health benefits, including reduced traffic crashes and pollution emissions, increased physical fitness, improved mental health, improved basic access to medical care and healthy food and increased affordability which reduces financial stress to lower-income households.*
    - *Traffic casualty rates tend to decline as public transit travel increases in an area. Residents of transit-oriented communities have only about a quarter the per capita traffic fatality rate as residents of sprawled, automobile-dependent communities.*
    - *Current demographic and economic trends (aging population, rising fuel prices, increasing health and environmental concerns, and rising medical care costs) are increasing the value of public transportation health benefits.*
    - *When all impacts are considered, improving public transit can be one of the most cost effective ways to achieve public health objectives, and public health improvements are among the largest benefits provided by high quality public transit and transit-oriented development.*

We suggest that the above findings are relevant to Ireland and to the West Region also.

Zero Carbon

A significant switch from the use of private cars to the use of efficient public transport and an increase in cycling and walking would move the Region toward the "Zero Carbon" objective and reduce the Region's dependence on imported fossil fuels.

CURRENT STATUS

RAIL

The most recent annual report available from Iarnród Éireann is that for 2009[19]. It indicates that passenger numbers on InterCity, DART and Commuter services have fallen from 45.5 million in 2008 to 38.8million in 2009, a fall of 13%. This follows a fall in 2008 from the 2007 peak of 47.7 million. Passenger numbers in 2009 were just above the numbers for 2005 (37.7 million). Iarnród Éireann has put this down to the effects of the economic recession.

During 2008 and 2009 new Intercity trains were introduced on the Galway and Westport Services replacing aged rolling stock with modern efficient and fully accessible trains. These trains have "the most energy efficient train engines in the world". "Intercity and commuter diesel trains reduced their fuel use by 6% in 2009 through more efficient schedules and automatic train shutdown on arrival at destination."

The punctuality of trains in 2009 was 93.9% on the Galway service and 90.8% on the Westport service, both exceeding the target of 90%.

The first phase of the Western Rail Corridor from Ennis to Athenry was completed with the laying of 36 miles of track and the construction of 4 stations by the end of 2009 and went into service in the first half of 2010. A recent article[20] in the Irish Times reported that passenger numbers on the service are falling short of the 100,000 trips that had been assumed in the business case. Passenger numbers averaged 4,800 per month from May to September 2010 and fell to 4,330 per month for the period October to December 2010. "The Iarnród Éireann business case anticipated the service would require an annual subsidy of €2.4 million to operate".

The subvention to Iarnród Éireann from government decreased by 11% (€20.6 million) in 2009 compared to 2008.

BUS

The most recent Annual report available from Bus Éireann is that for 2009[21]. Bus journeys fell by 17.3% to 84,650 milion in 2009 from 93,874 million in 2008 and a peak of 95,728 million in 2007. Bus Éireann put this down to the economic recession. Of the 84,650 million customer journeys in 2009, just over 50% (42,388 million) of them were accounted for by the School Transport Service.

Under Transport 21, Bus Éireann introduced 239 new buses and coaches in 2008 and 2009. It also

purchased 60 new Expressway coaches in 2008 from its own resources. This means that 40% of the fleet meet the highest EU emissions standards. The additions to the fleet provide improved accessibility and comfort.

A new 3,500m² state-of-the-art bus garage has been built in Galway City and there are plans for a new bus passenger terminal as part of the proposed Ceannt Station redevelopment.

Bus Éireann express the problems that traffic congestion presents to them in their 2009 Annual Report;

"Although traffic congestion was not as high as previous years due to the economic downturn, it remained a significant impediment to our operations, which impacts on the company's costs and reliability of service.

Congestion results in Bus Éireann services, particularly those at peak times operating at greatly reduced operating speeds with a resulting increase in journey times and costs. This also affects the reliability of services.

Traffic flows and average speeds are considerably worse than in comparable cities and towns in other European countries. In order to tackle this problem, Bus Éireann has long supported the introduction of bus lanes and bus priority measures in cities and towns across Ireland. Freeing up road space for public transport results in shorter journey times and increasing the appeal of public transport. This in turn reduces the number of private cars on the road, which improves the general traffic conditions and reduces emissions.

Bus Priority Measures

The introduction of bus priority measures, green routes and quality bus corridors are critical to the provision of a cost effective and efficient service geared towards meeting the needs of customers."

The National Transport Authority (NTA) is responsible for the licensing of commercial public bus passenger services, under the Public Transport Regulation Act 2009. Apart from Public Services obligation services provided by Bus Éireann governed by public service contracts, the NTA is responsible licensing of services provided mainly by private operators, and a small number of Expressway services provide by Bus Éireann, in accordance with guidelines published by the NTA[22]. The Act provides the basis for an efficient and effective licensing system for commercial public bus passenger services in Ireland. There are 642 Bus Services Passenger Licences[23] as of (17th March 2011), 128 (19.9%) of those are for services serving the West Region.

There is a new Coach Station for private bus operators at Fair Green in Galway. Regretfully, the arrangements for set down and pick-up by car and taxi are totally inadequate. It is however close to the city centre, the Bus Éireann terminus and Iarnród Éireann terminus at Ceannt Station.

According to the CSO 3.7 million passengers travelled on Galway City Bus Services in 2008[24]. Bus Éireann had a fleet of 31 buses in Galway in 2008.

Small Public Transport Vehicle

The NTA manages the regulation of the Small Public Transport Vehicle (SPTV) sector in Ireland through the Taxi Regulation Directorate.

The high percentage of hackneys (15.78%) and low percentage of taxis (4.86%)in the West Region relative to the percentage of all SPTVs (7.29%) in the state reflects the rural nature of the West Region, (see Table 6[25, 26]) as does the ratio of SPTVs(7.29%) in the West Region relative to the percentage of the State's population living in the West Region (9.77%).

Traffic Congestion in Galway City

In 2010 an issue of the Irish Examiner carried the headline

"Gridlocked Galway heads list of congested cities."

This followed the publication of a survey by TomTom, the suppliers of satellite navigation systems, which found that over 37% of roads in Galway are frequently congested. Galway ranked ahead of Dublin at 28.6% and Limerick at 28.3%. Traffic was defined as congested where cars were travelling at 70% per cent or less of the speed limit. Traffic in Galway is very vulnerable to interruptions. For instance, an accident on the Headford road route out of the city one afternoon in late 2010 caused virtual gridlock across the whole city for several hours.

Traffic congestion impacts very negatively on the city bus services, intercity and regional bus services coming into an leaving both the Bus Éireann terminus at Ceannt Station and the Coach Station used by private bus operators and taxi and hackney services.

Rural Transport Programme (RTP)

The RTP[27] was officially launched in 2006 as a response to the growing acknowledgement of the economic and social impacts of inadequate transport in rural areas and the increasing level

	Hackney	Limousine	Taxi	Wheelchair Accessible	Total (SPTV)	Popupation Census 2006[25]
Co. Galway	314	51	699	81	1,145	231,670
Co. Mayo	195	32	186	21	434	123,839
Co. Roscommon	108	13	43	12	176	56,768
West Region	617	96	928	114	1,869	414,277
26 Counties	3,910	1,217	19,063	1,447	25,637	4,239,848
West Region as % of State	**15.78**	**7.89**	**4.86**	**7.88**	**7.29**	**9.77**

Table 6 Vehicles licensed by county and category 2010

of interest amongst community and local development groups in developing and implementing locally based solutions. The programme mission statement is 'to provide a quality nationwide community based public transport system in rural Ireland which responds to local needs'.

The Programme's aims and objectives are:

- "To provide, enhance and sustain a nationwide community based public transport system in rural areas.
- To maximise existing transport assets and to utilise new technology where necessary in the co-ordination and development of transport.
- To act as a catalyst in providing models of partnership at all levels where key sectors actively engage in transport provision.
- To ensure equality of access for all, including older people as well as people with mobility, sensory and cognitive impairments.
- To maintain, promote and develop models of good practice.
- To continue to contribute to rural public transport policy."

The following are some of the unique features of the Programme:

- "The Programme is delivered nationally through 36 community based groups, all of which are either not-for-profit companies limited by guarantee or co-operatives.
- There is a bottom-up approach to service development i.e. the RTP works with local communities to plan and deliver flexible transport services that meet the needs of the community, including those who experience social exclusion.
- 75% (2008) of all journeys are delivered on a door-to-door basis, collecting people from their homes and assisting them to their destination.
- All journeys tend to be local in nature, with an average distance of about 15 miles.
- RTP services are open to everyone and people with a Free Travel Pass may travel free of charge.
- The needs and welfare of passengers are central to service delivery. This might involve helping older people with their shopping, assisting mobility impaired passengers to access vehicles, or even calling on the homes of people who may have missed their routine trips due to illness.
- A range of transport models have been developed within the Programme utilising a variety of transport modes."

At a national level 1.3 million passengers were carried by RTP during 2009, up from 305,000 in 2003[28].

There are a number of Rural Transport Programme Projects administered by Local Area Groups in the West Region. These programmes make a significant contribution to the transport needs of those living in areas of the West Region not otherwise well served by public transport and to the quality of life of its users.

Air Travel

There are no state airports in the West Region but there are two regional, privately owned, airports - Ireland West Airport Knock and Galway Airport. There is another Airport at Na Minna, in Connamara from which Aer Arann provides services to the 3 Aran Islands. Most of County Mayo, including the twinned hub towns of Castlebar and Ballina, are more than two hours from a State Airport (Dublin, Cork, or Shannon).

In June 2010 the Department of Transport carried out a value for money (VFM) review of

exchequer expenditure on the Regional Airports Programme[29] "to evaluate past Exchequer expenditure against Programme objectives and to examine the scope for achieving those objectives more efficiently and effectively in the future. "

> *"There are six regional airports at Waterford, Kerry, **Galway**, **Knock**, Sligo and Donegal. The Review focuses on a programme that consists of three Exchequer support schemes for capital expenditure grants (Capex), operational expenditure subvention (Opex) and a scheme for subventing PSO air services operating between Kerry, **Galway**, **Knock**, Sligo, Donegal and Derry Airports and Dublin Airport."*

The recommendations included in this report have serious implications for Galway Airport in particular and somewhat less serious for Ireland West Airport Knock.

The VFM report highlighted a number of key trends among which were the following;

- "Kerry Airport and **Knock Airport** stand out from the other regional airports as having good air services connectivity in their own right. They have jet runway capacity, which means they can attract more airlines and serve more routes than the other regional airports.
- Recent falling passenger numbers has led to increasing subvention Costs per Passenger on PSO services (e.g. €170 and €111 per passenger at **Knock** and Derry respectively in 2009.)
- The overall cost base at **Galway** and Waterford is excessive relative to the revenues being generated. OPEX subvention to the regional airports amounted to €3.345m in 2009, including €962,000 for **Galway** and €1.494m for Waterford.
- When compared to bus and rail travel over the last five years, the combined subvention (Opex and PSO) per passenger of airport regional air services has cost twice as much as rail travel and over ten times as much as bus travel."

The VFM report concluded that "there is a strong case for rationalisation of the regional airports along the western seaboard. There are substantial overlapping catchment areas between these airports, while the improvements in road and rail mean that access from the regions to Dublin, Cork and Shannon is more speedy and reliable than ten years ago."

Among the VFM report's recommendations were the following;

- "Exchequer support for regional airports in Connaught should be focused on **Knock Airport**, which can adequately serve both **Galway** and Sligo with a greater range of services than offered by **Galway** or Sligo Airports. This focus on **Knock** should also increase **Knock's** "critical mass" and enhance its finances. Galway city will also have the benefit of improving journey times to Shannon Airport.
- The Donegal-Dublin PSO service should be retained and the PSO services from Dublin to Kerry, **Galway**, Sligo, **Knock** and Derry should be ended. Donegal is relatively remote in Irish terms. The cost per passenger of subsidising PSO services is difficult to justify at the other airports having regard to improved public transport and/or road journey times to Dublin.
- Opex support for **Galway** and Sligo should end.

- Capex grants would be confined to essential safety and security work and would be of the order of €10m in the next few years.

The recommended retention of Opex support for Waterford is a finely balanced one. It reflects a view that the Airport could contribute to developing tourism in the South East and recognises that it is the only provincial city that would have a 2-hour surface journey time to a State Airport (Cork and Dublin Airport will be about 2 hours away). All of the other provincial cities will have an hour's journey time or less."

The report acknowledges that the implications for Galway Airport of the recommendation to discontinue the PSO (Public Sector Obligation) on the Galway-Dublin rotes are serious.

*"Without Exchequer funding for OPEX and CAPEX, and following the withdrawal of the PSO services, the airport would find it difficult to remain viable. There would also be an impact for Aer Arann in this situation as they have a base in **Galway** which would have to be transferred elsewhere."*

In relation to Knock, the report acknowledges that

*"withdrawal of the PSO service would have an initial impact on **Knock**. However, it would not be as severe as would be the case for **Galway** or Sligo. **Knock** still operates twelve other routes. **Knock** would benefit from the rationalisation of airports on the west coast and it could also serve the north-west hinterland affected by the loss of services from Sligo and **Galway**."*

The report acknowledges that there would be potential future safety related grant aid on capital expenditure at Ireland West Airport Knock of the order of €3.6m.

*[Note: Emphasis in '**Bold**' on Knock and Galway added in this report to the extract from the VFM report.]*

Shannon Airport is the nearest "State Airport" to the West Region. The past couple of years have seen a decline in transatlantic and European air services available from Shannon and a consequent decline in passenger numbers. For the period from 31st October 2010 to 26th March 2011 there were services available to 8 UK destinations, Paris 3 days per week, flights daily to Newark, flights to Boston 3 days per week until the 3rd January only and New York 5 days per week until 3rd January and only 4 days per week since. Services to three holiday destinations were also available.

The limited services from Shannon mean that to access a broader range of flights customers from the West Region must travel to Dublin Airport.

Sea Transport

Galway Port handled a total of 723,000 tonnes of goods in 2009, 686,000 tonnes received plus 37,000 tonnes forwarded[30]. This ranked it 7th behind Dublin, Cork, Shannon Foynes, Rosslare, Waterford and Bantry Bay ports (see Table 7[31]).

Year	2003	2004	2005	2006	2007	2008	2009
Quantity (000's tonnes)	903	961	1,018	944	945	775	723

Table 7 Goods handled in Galway Port

Galway Port is hampered by the current sea channel and the fact that it is a gated port which means that access and egress is dependent on tidal conditions and access is restricted by the width of the dock gates. In order to grow the port must be capable of handling larger vessels and access and egress must not be subject to the tides. At the moment the harbour can only take vessels up to 6,000 tonnes. The core business of the port is in the importation of oil, bitumen, steel and general cargo. Companies importing these goods are opting to import larger quantities with the aim of getting more competitive prices. The trend is to larger vessels with a reduced carbon footprint. Galway needs to be able to accommodate vessels in the range 12,000 to 20,000 tonnes into the future.

Cycling and Walking

While Galway has some cycle lanes it has many roundabouts which are "unfriendly" to cyclists. The roundabouts are also "unfriendly" for pedestrians. As some of the approach roads to the city centre are heavily congested much of the time this renders them unattractive for cyclists. Some city centre streets have been pedestrianised over recent years.

A press release[32] from Galway City Council in March 2011 included the following statistics;

"Although 24% of Galway City's residents live less than 2km from their workplace, 64% of those residents travel to work each day by car."

Where do we want to get to?

We need a network of roads that enable the carrying on of business and the transport of goods safely and securely in an efficient manner within the West Region, to and from other regions and to and from the main ports for export. We need access to international airports within a reasonable journey time for businesses based in the Region.

A good quality road network enhances the quality of life for people and connects communities. We need a network of roads that enable the population living and working in the Region to get to and from work, school, etc. safely and to facilitate access to an international airport within a reasonable journey time.

Public transport in the form of bus and rail, and other forms of transport such as cycling are critical if we are to move towards a low carbon economy. There have been some moves in this regard in the West Region including improvements in recently constructed bus lanes on the approaches to and in Galway City, recently constructed bus lanes from Claregalway

to Galway City, and the provision of better car parking at existing train stations. If people are to be convinced to discard the private vehicle, we need to make these forms of travel more attractive and realistic for even part of their journey.

We need an efficient, economic, attractive low carbon public transport system with a mix of bus, rail and SPTVs.

We need a transport network that enables tourists to get to the various destinations within the West Region from international airports and ferry ports safely and securely within a reasonable journey time.

Galway Port should be developed to accommodate the current and future shipping needs of the West Region as part of a sustainable transport system for the West Region.

Galway Port should be developed to take advantage of the growing sea cruise leisure business and bring a sustainable tourism business to see the many natural and cultural heritage attractions in Galway City and its hinterland.

Galway City and towns in the West Region should be attractive to cyclists and pedestrians.

HOW WILL WE GET THERE?

SMARTER TRAVEL - A SUSTAINABLE TRANSPORT POLICY

The Regional Planning Guidelines[33] make reference to the Smarter Travel Policy[34] document. The five key goals which form the basis of the policy are;

- Improve quality of life and accessibility to transport for all and, in particular, for people with reduced mobility and those who may experience isolation due to lack of transport.
- Improve economic competitiveness through maximising the efficiency of the transport system and alleviating congestion and infrastructural bottlenecks.
- Minimise the negative impacts of transport on the local and global environment through reducing localised air pollutants and greenhouse gas emissions.
- Reduce overall travel demand and commuting distances travelled by the private car.
- Improve security of energy supply by reducing dependency on imported fossil fuels.

DECONGESTING GALWAY CITY

The Galway Transportation Unit in Galway City Council are looking at a range of measures to relieve traffic congestion in Galway City including encouraging a significant switch from private car use to public transport modes, cycling and walking.

To make public transport more efficient and punctual will require diverting through car traffic away from the centre of the city. The Galway City Outer Bypass is critical to the achievement of this objective.

The Seamus Quirke Road/Bishop O'Donnell Road Scheme is currently under construction. On completion, this scheme will involve an investment of circa €10 million (in the Westside area and deliver 2 new general traffic lanes, 2 new bus lanes, 2 metre footways in both directions, new public lighting, landscaping and 2 metre off-road cycle lanes along the route.

Galway City Council has recently announced the Bóthar na dTreabh (N6) Multi-Modal Corridor Improvement Scheme[35]. The scheme has been established to take account not just of car users, but also the needs of public transport users, cyclists and pedestrians. Key objectives of the programme are as follows:

- "Ensure the national road network within Galway protects and supports growth of the regional economy;
- Reduce the environmental impact of transport in Galway City;
- Facilitate and encourage the use of sustainable travel modes;
- Ensure future development of the N6 is integrated with a shared vision for future development of the public transport network;
- Promote integration of walking and cycling links;
- To ensure future development of the N6 is integrated with proposals for upgrading the local and regional road network;"
- Improve road safety for all road users on the N6 links and junctions within Galway City.
- Improve access to Galway's vital social infrastructure such as schools, third level institutions, hospitals and large employment areas.

Ensuring that public transport is available to the residents of new developments at the time they are first occupied is critical to capturing converts to public transport before they become committed to using their cars.

The above measures together with some of the recommendations in the following sections will contribute to relieving Galway City traffic congestion.

Rail Transport

Engineers Ireland West Region favours the further development of rail transport for commuters. Iarnród Éireann applied for planning permission[36] for a proposed new railway station and 150 bay car park at Garraun, Oranmore, which is located to the west of Oranmore. Galway County Council decided to grant permission for this development in February 2011. When constructed it will provide an opportunity to develop rail based commuter services from the South and East to the large Business Parks at Parkmore and Ballybrit and other areas to the east of the city using shuttle buses to convey passengers to and from those areas morning and evening. The extension of the Western Rail Corridor to Tuam would offer an alternative, sustainable mode of transport to the many commuters to the North of the city currently using the N18. In conjunction with a Park & Ride facility it would mean that rail users would not have to go into the city to get onto the train to Dublin thus relieving traffic into the city.

There is only a single railway line from Ceannt Station. This may become a restriction on the extent of commuter services as intercity services

also have to be accommodated on this line. We believe that a passing loop somewhere between Galway and Athenry could serve to increase the capacity on this line in the short term at a modest cost. When the railway line was built originally the bridges between Galway and Athenry were built wide enough to accommodate a second line. The construction of a second line would entail significant capital expenditure. This may be required in the longer term if there is sufficient growth in intercity and commuter services.

The intercity rail service is competing with the extensive bus services and private cars on the M6 motorway to Dublin. The rail services will have to be enhanced to attract more motorists out of their cars. While many of the bus services offer Wi-Fi services the train service does not. It is quicker to travel by bus or car to central Dublin, and more so to Dublin Airport, than by rail. The journey time, at least on some services, needs to be improved so as to compete better on time and attract more customers.

Integrated ticketing (rail, Dublin Bus, Luas and DART) would also make rail transport on the Galway to Dublin route more attractive.

The development of a modern, state-of-the-art train station at Ceannt Station, with easy access to other modes of public transport, would enhance the service and make it more attractive to customers.

The new Government's plan[37] recognises that a "modern high speed transport system is essential to ensure our economic competitiveness." The plan commits to supporting "the expansion in range and frequency of high capacity commuter services, which will be subject to cost benefit analysis".

Bus Transport

There is vigorous competition between the extensive intercity services. There is a modern Coach Station in Galway City at Fair Green for travellers on buses operated by private operators. The arrangements for pick-up and set down are unsatisfactory. Bus Éireann operates from totally inadequate facilities at Ceannt Station. A modern, state-of-the-art facility is required. Bus Éireann have plans for such a facility adjacent to the proposed redeveloped Ceannt Station. This should be carefully designed to allow for a fully integrated transport hub which intercity rail and bus travellers can be access easily by bus, taxi, hackney, bicycle or on foot or by possible future light rail and where passengers can easily switch from one mode of public transport to another.

Galway City bus services are operated mainly by Bus Éireann but there is a private bus operator who operates on certain city routes. Traffic congestion is a major problem for bus operators in Galway City which means the services have difficulty operating a punctual, reliable service. The city streets need to be decongested by diverting car through traffic away from city centre routes.

A press release[38] from Galway City Council in March 2011 contained the following statements;

"Although 24% of Galway City's residents live less than 2km from their workplace, 64% of residence travel to work each day by car."

"The N6 corridor is heavily car dominated and carries a Daily Traffic Flow of 50,000 vehicles."

"There is currently no public transport priority on the N6, this means public transport offers a poor alternative to driving."

"Traffic movement on the N6 is through large and busy roundabouts, this means there is very little control over traffic movements and little potential to help alleviate congestion in the City."

The proposed Galway City Outer Bypass, currently delayed, would, if constructed, facilitate more efficient and reliable city bus services and thus would attract more commuters away from the use of private cars. It would free up road space so that giving dedicated road space to buses could be considered.

Ensuring that public transport is available to the residents of new developments immediately on first occupation is critical to capturing converts to public transport before they become committed to using their cars.

Real time information at bus stops and/or via mobile phones would encourage more commuters to use buses. . The increased use of modern, comfortable buses on the Galway-Dublin route since the opening of the new M6 shows that the public are more than willing to use a fast, reliable, punctual bus service.

On the 24th March 2010 the Minister for Transport announced details of the Government's €14 million investment programme in Bus Priority and Park & Ride in the regional cities of Cork, Galway, Limerick and Waterford for 2010. The amounts included for Galway City are shown in Table 8.

Engineers Ireland West Region would like to see the improvement of bus services between the Gateway city of Galway and the hub towns of Tuam and the twin hub towns of Castlebar/Ballina and the provision of rural bus

Council	Measure	2010 Grant Allocation (€)
Galway City Council	Galway Transport Unit (GTU)	266,808
	Bishop O'Donnell / Seamus Quirke Road QBC	2,500,000
	Bother Uí Eithir / Forster Street Bus Lane	300,000
	Park and Ride Facilities at Doughiska : Design and Planning	48,000
	Total Allocation - Galway City Council	**3,114,808**

Table 8 2010 Bus Priority and Park & Ride Grants for Galway City

shelters as a necessary component of a good rural public transport system.

The new Government's plan recognises "the need to rebalance transport policy to favour public transport" and commits to establishing "a Cabinet sub-committee on Infrastructure to explore the benefits to the public transport passenger of more diverse bus service provision"

Taxis

Additional taxi rank facilities are required to stop on-street queuing of taxis for taxi rank places.

There are currently inadequate facilities for set down and pick-up at either the Bus Éireann/Iarnród Éireann terminus at Ceannt Station or at the new Coach Station for private bus operators at The Fair Green.

Congested streets are a major problem for taxi services as they are for buses.

The new Government's plan undertakes to "update regulation of taxis to ensure that taxi services are recognized as a key component of the public transport system and we will provide for a forum for discussion between the regulatory authorities and taxi providers."

GLUAS - Light Rail for Galway

A group of Galway citizens - the GLUAS group - who believe that Galway deserves a better public transport system are advocating for a LUAS-type light rail system for Galway - GLUAS[39]. They believe it would represent a milestone in the development of a sustainable, cost-effective and efficient transport system for Galway city and its environs. Their aim is to both inform and work towards positive change that will make Galway an even better place to live and work.

The term 'light rail' is used to describe modern tram systems that use electric rail cars. Light rail often operates on tracks that are separated from other traffic but it can also share road space with other modes of transport where necessary and/or appropriate. Light rail is a form of public transport that is generally lower in capacity and speed than heavy rail and metro systems. It is particularly suitable for urban centres and their hinterlands.

The GLUAS group have conducted a feasibility study that has identified possible routes for the GLUAS System - see Figure 3. The proposal would interconnect with the proposed integrated transport hub at Ceannt Station and the nearby Coach Station so as to provide for a multi-modal public transport interchange.

The viability of the project may hinge on the cost of relocating underground services. The GLUAS group have estimated the cost of a system with two routes over 21km long, with 17 trams servicing 50 stops, at between €200m and €250m.

Should the cost of relocating the underground services prove to be prohibitive Engineers Ireland West Region believe a Bus Rapid Transit (BRT) system should be considered. These can be operated on a mix of segregated and unsegregated routes as necessary. The proposed Clyde Fastlink system for Glasgow is a BRT system that will have segregated running

for most of its length outside the city centre. BRT systems are effective if combined with priority at traffic lights at junctions. BRT vehicles are available with diesel hybrid drive systems using diesel engines and a battery charged by regenerative braking. They are more economical and quieter than diesel vehicles. If BRT systems prove to be popular in Galway and the passenger number increase significantly it still leaves the option open to replace the BRT system with a Light Rail System which have higher capacities.

A BRT system has merit as part of an integrated sustainable transport solution for Galway right now while a LRT system may be the more appropriate solution in the years ahead provided that land use planning has sustainable transport at its core, as it must. Proposed new developments in the city centre at Ceannt Station and at Galway Harbour and the proposed new development at Ardaun to the East of the city should all be planned with sustainable transport at their core. A system such as GLUAS could play a vital part in the sustainable transport solution for Galway City in 2020 and beyond.

The new Government's plan recognises that a "modern high speed transport system is essential to ensure our economic competitiveness." The plan commits to supporting "the expansion in range and frequency of high capacity commuter services, which will be subject to cost benefit analysis".

Air Transport

In November 2010 the board of Galway Airport agreed a five year vision for Galway and on the role of the airport in helping achieving that vision[40]. The vision was underpinned by the following considerations;

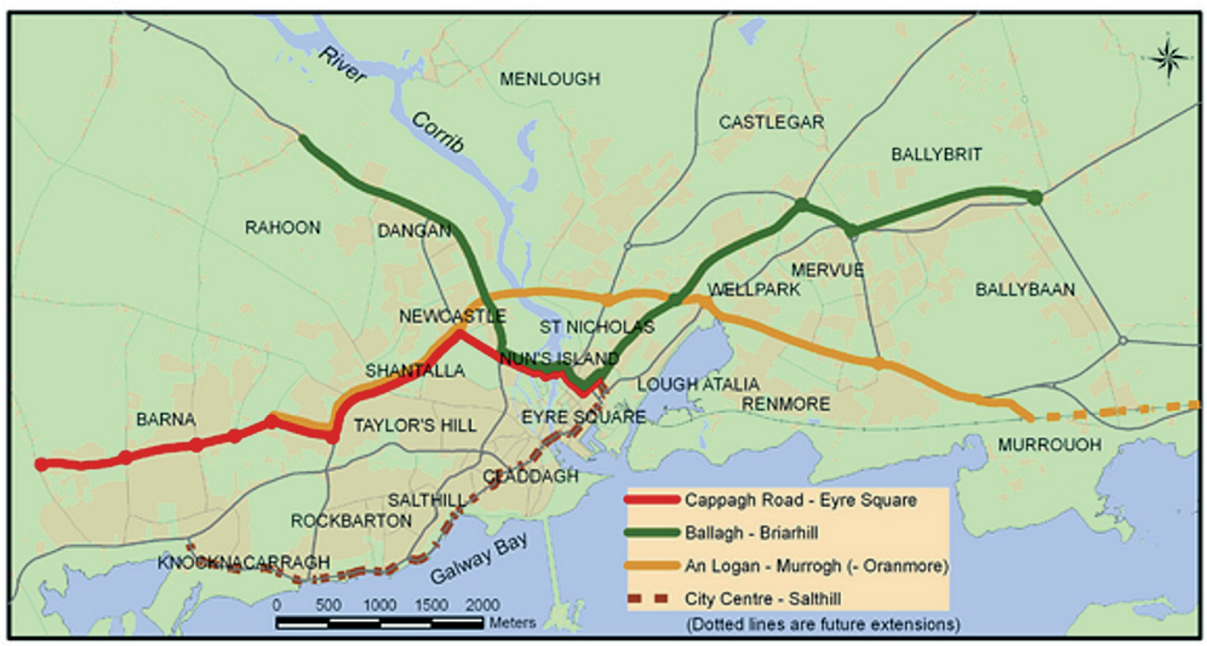


Figure 3 Possible GLUAS Lines

1. A cultural 'Hub' encompassing our unique heritage.
2. A centre for Innovation, Entrepreneurship and Opportunity.
3. A competitive environment providing value for money.
4. A destination of excellence.
5. Providing an excellent environment and standard of living.
6. A vibrant location.
7. An economic engine.

It was agreed by all stakeholders that Galway Airport is an essential element in the achievement of the above vision.

The meeting recognised the constraints on Government expenditure but agreed that continued funding will be of critical importance to Galway Airport to facilitate its role as a provider of vital services to multinational and indigenous companies in support of the IDA, Enterprise Ireland and Údarás na Gaeltachta in developing industry and also in support of Fáilte Ireland and the tourism industry.

Galway Airport provides critical air access to international markets with 85% of the airports' annual passenger traffic either departing from or arriving to the island of Ireland.

Independent economic analysis has estimated that Galway Airport directly contributes €31 million annually to the Region with the indirect impact associated with maintaining access to international markets being far greater.

Carmel Brennan, President of Galway Chamber is quoted as saying that;

"Galway Airport plays a central role in the Chamber's Traffic and Transportation vision for this city and region and will continue to do so. The Chamber will support the strategy for Galway Airport into the future on behalf of our members and the business community in whose interest it is that our airport continues to play a central role in our business connectivity worldwide".

The Western Development Commission recently published a policy briefing[41] on air access and the Western Region in which the following conclusions were reached;

- "Policy on air access should be linked to and consistent with tourism and enterprise policy as well as the NSS.
- There is a need to maximise international air access from the Western Region's airports to drive regional industry and tourism.
- Until there are improved service levels from the region's airports and a reduction in journey times to State airports, where EU guidelines allow, PSO air links to Dublin airport should be continued."

The website of the American Chamber of Commerce Western Region, representing circa 70 US businesses in the West Region employing more than 12,000 people, has the following to say about access to the West Region;[42]

- "Galway Airport provides the region with vital access to hub airports like London Luton, Manchester International and Dublin. Through these hubs, the population of the region has easy and immediate access to a multitude of onward destinations worldwide.
- Knock Airport in Mayo provides links to international hubs such as Dublin and

Birmingham. The airport is currently undergoing an expansion that will increase its annual capacity to 1 million passengers.

- Shannon International Airport is also within easy reach and provides links with a number of locations in the US and Europe."

The PSO should be retained for Galway Airport until such time as theM17/ M18 from Gort to Tuam and the upgrade of the N17 from Tuam to Claremorris have been completed to provide improved access to Knock and Shannon Airports. If the air services from Shannon continue to decline and there was no service to Dublin from Galway this would have a negative impact on Foreign Direct Investment in the Galway area. Investors considering investment in a region have a strong preference for proximity to an international airport. Galway might be perceived as being "inaccessible" by those making FDI decisions. The impact of this would be far in excess of any saving that might accrue from reducing subventions to Galway Airport. The situation should be reviewed again on completion of the M17/M18 taking account of services available from Shannon and Knock at that time.

SEA TRANSPORT

Galway Harbour Company has prepared an ambitious plan[43] for the redevelopment of the port which includes;

Stage 1

- Reclamation of 17.32 hA of quay areas and back up land.
- Formation of 400m quay - 30m wide.
- Formation of 260m quay - 20m wide.
- Pier Head breakwater.
- Dredging of channels to -3.5 and -8m Chart Datum depth.
- Dredging of 400m diameter turning circle to -8m Chart Datum depth.
- Dredging of a -12m Chart Datum depth pocket adjacent to the proposed quays.
- Full new oil handling capacity.
- Commercial Port formed.

Stage 2

- Formation of reclamation bund allowing for the reclamation of 5.79hA of additional back up land.
- Construction of a rail embankment for cargo.

Stage 3

- Reclamation of 5.79hA of back up land and 0.5hA as a fisherman's pier and slipway areas
- Formation of Marina Breakwater
- Dredging of future Marina to -3.5m Chart Datum depth
- Construction of Fisherman's Pier
- Construction of Slipway
- Construction of rail lines for cargo

Stage 4

- Western Marina with 216 berths

The above developments will enable Galway Port to develop new businesses as a cruise ship port, marina and in event hosting such as the extremely successful Volvo Ocean Race, Marine Research facilities, offshore renewable energy servicing, additional import and export capacity and marine based recreation and leisure activities.

The Volvo Ocean Race's first ever stopover in Ireland was worth €55m to the west of Ireland according to a study by Deloitte[44]. It attracted 650,000 visitors to the Race Village in Galway Harbour and to Salthill during the two week stopover.

Cruise Ships - An Opportunity

A newspaper article[45] in April last year carried the headline "Dublin to host 86 cruise ships". The article quoted Dublin port Company as stating that "the cruise ship industry has been a major tourism contributor since the mid-1990s, bringing in more than €350 million in the past decade." Enda Connellan, Dublin Port Company Chief Executive, was quoted as saying "Our location, in the heart of Dublin city, is ideal for tourists to venture into our capital. We are bringing an important industry to the city which this year alone will benefit this city's economy by between €35 million to €55 million.

Earlier this year Frank McDonald, Environment Editor of the Irish Times, wrote in an article[46] under the headline "Dún Laoghaire developing plans to attract 'next generation' cruise liners" about the "plans to turn Dún Laoghaire harbour into a port-of-call for "next generation" cruise liners with a capacity for up to 5,000 passengers".

When one considers the approach along the West Coast past the majestic Cliffs of Moher, the unique natural environment of the Burren, the dominating stone fort of Dún Aonghusa on the Aran Islands on the Atlantic rim of Europe (the latter two included on the tentative list of World Heritage Sites) and in through the world renowned Galway Bay to land at a modern port within an easy stroll of the centre of the medieval city of Galway one cannot but conclude that it would represent a more attractive option for cruise liners than Dublin, Dun Laoghaire, Waterford or Cobh. The contribution to tourism in the West Region could be enormous. Many of the scenic parts of the West Region would be within a one day tour distance of the port.

Cycling and Walking

We welcome the announcement by press release[47] in March 2011 that the Galway Transportation Unit, Galway City Council and the National Roads Authority (NRA) are working to deliver the Bóthar na dTreabh (N6) Multi-Modal Corridor Improvement Scheme which includes the following among its key objectives;

- "Facilitate and encourage the use of sustainable travel modes;
- Promote integration of walking and cycling links;
- Improve road safety for all road users on the N6 links and junctions within Galway City;"

The press release goes on to say that "the Galway City Scheme is being used as a pilot for the other major urban centres. The National Roads Authority has designated €4m in funding for 2011 to Galway City Council for the scheme, specifically to improve accessibility for pedestrians and cyclists. The NRA funding is part of their national scheme to upgrade facilities for vulnerable road users on national roads in urban areas. The impact of this congestion has been highlighted in a survey of almost 600 residents in the area carried out by the Health Service Executive (HSE) in 2009."

The new Government's plan undertakes to "continue to invest in the National Cycle Policy and we will look to extend the Dublin Bikes Scheme across the wider Dublin area and to

other cities and integrate the scheme much more effectively with public transport links."

Rural Transport Programme Strategy 2011-2016

The Rural Transport Programme Strategy 2011-2016[48] has been drawn up by the Rural Transport Network (RTN). The RTN was formed in 2009. It is a representative body of the 36 companies delivering the Rural Transport Programme in Ireland. The role of the RTN is "to establish an Independent voice for the ongoing development and mainstreaming of Rural Transport in Ireland." The Strategy "encompasses the concepts of transport with wellbeing; with accessibility (both geographical and physical) and mobility. It provides a gateway to accessing essential services including health, retail, banking, pension collection, as well as acting as a platform for social interaction, providing options to people and combating isolation, particularly prevalent in the rural context."

Rural transport is a key factor in maintaining viable, sustainable rural communities and as such must continue to be supported. The new Government's plan recognises that "the rural transport network is vital for rural communities as a reliable and sustainable transport service" and commits to maintaining and extending "the Rural Transport Programme with other local transport services as much as is practicable."

Recommendations

Continue to pursue with urgency and determination, within the West Region, the 5 key goals on which the "Smarter Travel" policy is based.

Proceed with the Galway City Outer Bypass as soon as possible to facilitate the implementation of sustainable transport measures in Galway City

All new developments, industrial, commercial and housing, must be located and designed so as to facilitate public transport services.

Develop a state-of-the-art integrated transport hub at Ceannt Station including both a rail terminus and a Bus Éireann terminus.

Proceed with the construction of the proposed new railway station at Garraun served by shuttle buses to facilitate commuter traffic to the main business parks on the east side of the city.

Extend the Western Rail Corridor to Tuam to facilitate commuters travelling by rail to Galway City and its business parks.

Consider the construction of a passing loop between Galway and Athenry in the short term to facilitate increased commuter rail traffic at peak times.

Develop a state-of-the-art integrated transport hub at Ceannt Station including both a rail terminus and a Bus Éireann terminus.

Continue with the provision of Quality Bus Corridors, introduce bus priority measures at traffic lights at junctions and real-time information systems.

Maintain and extend the Rural Transport Programme.

Carry out a thorough feasibility study of the GLUAS light rail proposal.

Retain the PSO for the Galway Dublin air service until the M17/M18 road has been fully completed to give improved access to Ireland West Airport Knock and Shannon Airport at which time the continuation of the PSO on the Galway Dublin route can be reconsidered in the light of services available at those airports at that time.

The design of new housing developments, taking sustainable travel into account in the layout and provision of bus services immediately on first occupation of those developments, would also attract commuters to use buses as a means of transport.

BIBLIOGRAPHY

1 Regional Planning Guidelines for the West Region 2010 - 2022, The West Regional Authority, October 2010.

2 National Spatial Strategy (NSS) 2002 - 2020

3 Atlantic Gateways Initiative, Department of the Environment, Heritage and Local Government, September 2006.

4 Atlantic Gateways Corridor Development Frameworks Overview Report, Department of the Environment, Heritage and Local Government.

5 National Development Plan 2007-2013, www.ndp.ie

6 http://www.transport21.ie/

7 CSO, 2006 Census, Central Statistics Office, Apr 2007.

8 National Route Lengths as on 31/12/2009, National Roads Authority, www.nra.ie

9 Department of Transport website, www.transport.ie

10 Non-National Roads Pavement Condition Study Report, Department of the Environment, Heritage and Local Government, December 2004.

11 Local Authority News, Volume 27, No. 3, 2007.

12 Local Authority News, Volume 28, No. 6, 2008.

13 Local Authority News, Volume 30, No. 5, 2010.

14 Infrastructure for an Island Population of 8 million, Engineers Ireland, February 2010.

15 "National Secondary Roads Needs Study Network Options Report, National Roads Authority, March 2011".

16 Irish Examine, January 30, 2010.

17 Programme for Government, Government for National Recovery 2011-2016, March 2011.

18 Evaluating Public Transportation Health Benefits, Victoria Transport Policy Institute, 14 July 2010.

19 Iarnród Éireann Annual Report and Financial Statements, 2009.

20 "Rail route numbers low" by Gordon Deegan, The Irish Times, 10th March 2011.

21 Bus Éireann Annual Report and Financial Statements, 2009.

22 Guidelines for the Licensing of Public Bus Passenger Services, November 2010, published by the National Transport Authority.

23 http://www.nationaltransport.ie/bus_licensing.html

24 CSO Transport, 2008.

25 Central Statistics Office Ireland, Census 2006.

26 Extracted from Vehicles licenced by county and category 2010, http://taxiregulation.nationaltransport.ie/for-everyone/statistics/vehicle-licences-county-and-category-2010/

27 www.pobal.ie/funding%20programmes/rtp/pages/background.aspx

28 Rural Transport Programme, Performance and Impact Report, 2009.

29 Value for Money Review of Exchequer Expenditure on the Regional Airports Programme, Department of Transport, June 2010.

30 Statistics of Port Traffic 2009, Central Statistics Office.

31 Irish Maritime Transport Economist, Volumes 1 to 7.

32 Galway City Council Press Release: Bóthar na dTreabh (N6) - Multi-Modal Corridor Improvement Scheme, 21st March 2011.

33 The Regional Planning Guidelines for the West Region 2010 -2022.

34 Smarter Travel - A Sustainable Transport Future, A New Transport Policy for Ireland 2009-2020.

35 www.galwaycity.ie/GeneralNews/210311_02.html

36 Planning Reference No. 10/1877.

37 Government for National Recovery 2011-2016.

38 Galway City Council Press Release: Bóthar na dTreabh (N6) - Multi-Modal Corridor Improvement Scheme, 21st March 2011.

39 www.gluas.ie

40 www.galwayairport.com/about/Current_Press_Releases/8/ Galway_Airport_stakeholders_agree_5_Year_Plan_109

41 WDC Policy Briefing No.3 February 2011- "Air Access and the Western Region - A Regional Perspective".

42 www.amcham.ie/article.aspx?id=138

43 "Galway Port Development Plan - It's your harbour" by Galway Harbour Company, www.galwayharbour.com

44 Deloitte: Volvo Ocean Race 2008-09, Economic Report on Galway and Ireland.

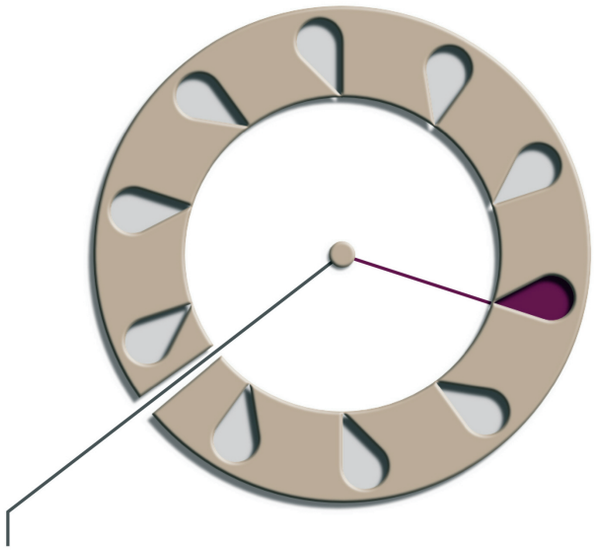
45 Irish Times, April 13, 2010.

46 Irish Times February 5, 2011.

47 Galway City Council Press Release: Bóthar na dTreabh (N6) - Multi-Modal Corridor Improvement Scheme, 21st March 2011.

48 Rural Transport Programme Strategy 2011 - 2016, Proposed and Developed by the Rural Transport Network.

SUSTAINABLE MATERIALS



"using sustainable and healthy products, such as those with low embodied energy, sourced locally, made from renewable or waste resources"

Section Contents

KEY RECOMMENDATIONS

01 Life-cycle costing should be used at the design stage of all buildings and new products.

02 Sustainable manufacturing systems such as 'lean and green manufacturing' should be embedded in all industries across the West Region.

03 Green Procurement Policies should be used by the public sector and all businesses in the West Region.

EXECUTIVE SUMMARY

The impact of human activity on the environment has been the focus of much attention in recent times. A significant area of concern is the production and use of materials for a range of activities including construction, manufacturing and packaging. The environmental impact can be described in terms of resource use, energy consumption and waste generation. Economic development has resulted in increased exploitation of natural resources resulting in a scarcity of raw material supply in various sectors across the EU. The extraction of raw materials and their processing into products can have a significant energy demand. A significant amount of waste material is generated each year in the construction and manufacturing sectors.

In order to address these issues, it is imperative that we make more efficient use of primary raw materials, and increase the rate of recycling and the use of renewable materials. A balance must be achieved between the rate of resource use and the rate at which renewable materials can regenerate. In order to be sustainable, the impact of material selection and use in products and infrastructure must be evaluated over the lifetime of the product. This can be achieved using life cycle assessment (LCA) tools, which use measures such as embodied energy to quantify the energy consumption and emissions. Embodied energy includes all the energy used during extraction of the raw materials and associated transport, manufacturing the raw materials into a product, transporting and installing the product, maintenance of the product, as well as finally removing or recycling the product. As part of the LCA assessment, the embodied water inherent in building material and products processing may need to be considered.

Many companies already use sustainable approaches to product design, which incorporate life-cycle environmental impact assessment of a product, assessment of environmental performance of materials and production processes and design for disassembly and recovery. Measures to reduce environmental impacts include: green procurement, minimisation of the amount of materials and a move to the use of lightweight, sustainable materials, the elimination of toxic materials, design for recycling and a reduction in the amount of and type of packaging. Sustainable manufacturing systems such as 'lean and green manufacturing' should be embedded in all industries across the West Region.

A huge amount of primary energy and natural resources is needed for the construction of buildings. In 2008, construction and demolition

SUSTAINABLE MATERIALS

04 A Directory of sustainable 'green' businesses in the West Region should be developed.

05 Increased use of timber in construction and development of forestry and downstream associated industries should be vigorously promoted in the West Region.

06 Design for sustainability should be included in third level engineering courses.

waste in Ireland totalled 16.8 million tonnes, which represents 54.8% of the total waste generated. In Ireland, 26% of the primary energy demand and 27% of CO_2 emissions can be attributed to the residential sector.

About 80% of CO_2 emissions are produced during the use of buildings and 20% from the materials and building process. As the energy used in the operational phase of buildings through energy efficiency measures is decreased and the energy is sourced more and more from sustainable sources, the embodied energy of building materials and components will become an increasingly higher component of the buildings' environmental impact. Implementing material selection that includes the embodied energy of materials as part of a whole building design approach, will support the reduction of the overall energy use of the building over its lifecycle. Since the energy used in transporting materials becomes part of a building's embodied energy, this creates an incentive to use local materials.

Timber is a very versatile construction material with low embodied energy that is available locally, can be reprocessed, recycled and then used to create energy. The West Region should aim to substantially increase the use of timber in construction. The issue of forestry needs to be addressed in order to guarantee supplies of timber into the future. Ireland is the most deforested country in the EU with a forestry estate comprising about 730,000 ha (in 2008), which represents 10.5% of the land area of the country. Significant investment in expanding and maintaining the forest estate is essential to the sustainable development of the country. As the crop rotation in Irish forestry is typically 40 years, it is essential that action is taken immediately to ensure a supply of sustainable materials for construction and renewable energy in the medium to long-term.

While it is desirable that the level of timber usage in buildings should be significantly increased, it will generally be used in conjunction with other materials especially concrete. In recent years, new concrete products have emerged which have a significantly less environmental impact. Where possible, these products should be used in all future concrete works in the West Region.

In order to reduce the waste generated, design for deconstruction or demolition must be included at an early stage of the project planning. The use of construction materials which can be recycled should be maximized. Opportunities to use recycled concrete, asphalt, steel, timber and other materials should be explored in all construction projects.

SUSTAINABLE MATERIALS

INTRODUCTION

The impact of human activity on the environment has been the focus of much attention in recent times. A significant area of concern is the production and use of materials for a range of activities including construction, manufacturing and packaging. The environmental impact can be described in terms of resource use, energy consumption and waste generation.

- Resource Use
  - *Natural resources, both renewable and non-renewable, are essential to economic development. As a result of increasing exploitation of natural resources, Europe is facing an increasing scarcity of raw material supply in various sectors[1].*
- Energy Consumption
  - *The extraction of raw materials and their processing into products can have a significant energy demand. Material selection can also influence the energy required during product life.*
- Waste generation
  - *A significant amount of waste material is generated each year in the construction and manufacturing sectors. Ireland currently is facing some difficulty in achieving EU targets for environmental waste management*

In order to address these issues, it is imperative that we make more efficient use of primary raw materials, and increase the rate of recycling and the use of renewable materials. A balance must be achieved between the rate of resource use and the rate at which renewable materials can regenerate. In order to be sustainable, the impact of material selection and use in products and infrastructure must be evaluated over the lifetime of the product.

LINK WITH OTHER ONE PLANET LIVING PRINCIPLES

There is a significant interdependence between Sustainable Materials and other One Planet Living principles:

- Zero Carbon
  - *The manufacture and use of materials has a significant environmental impact in terms of primary energy use and green house gas emissions.*
  - *Carbon sequestration during tree growth has a positive impact on the environment. The carbon remains in the timber during its lifetime.*
  - *By-products of timber processing and timber from demolition can be used as a biofuel.*
- Sustainable Water
  - *Design process should aim to minimize water use during manufacture of materials and products.*
  - *Extreme care should be taken to prevent water pollution in manufacturing processes.*
- Zero Waste
  - *Design of materials and processes that maximise end-of-life recycling and re-use results in a minimisation of waste.*
  - *Materials used in packaging should be recyclable and the amount of packaging should be minimised to reduce waste.*
- Human Health and Happiness
  - *The development and use of materials which do not produce harmful emissions prevents damage to human health.*
  - *The development of walking and cycling trails in state forests provides an amenity that encourages the community to engage in outdoor activities.*
- Sustainable Transport
  - *The use of lightweight materials in the manufacture of products reduces the transportation energy.*
  - *The use of locally sourced materials reduces the environmental impacts of long-distance transport.*
- Land use and wildlife
  - *The development of forests for timber production requires significant areas of land, which are then not available for other purposes. 15% of state forests are actively managed for nature conservation.*

- Equity and Local Economy
  - *Use of local materials will support the local economy*
  - *Development of the forest resources will result in significant employment opportunities in forestry and downstream processing of timber into products*
  - *Development of wood chip and wood pellet energy production facilities will result in significant employment creation opportunities.*

LIFE CYCLE ASSESSMENT

Life cycle assessment (LCA) tools[2] have been developed in order to assess the environmental burden occurring over a product's lifetime. LCA tools use measures such as embodied energy to define the energy consumption and emissions related to material extraction, manufacture, use and disposal[3,4]. Embodied energy includes all the energy used during extraction of the raw materials and associated transport, manufacturing the raw materials into a product, transporting and installing the product, maintenance of the product, as well as finally removing or recycling the product. This is known as the Cradle-to-Grave embodied energy. As the embodied energy during the operational phase of a product is often difficult to quantify, other boundaries on embodied energy are often used such as Cradle-to-Gate (factory gate) or Cradle-to-Site (site of use). As part of the LCA assessment, the embodied water inherent in building material and products processing may need to be considered. Water consumption overall has an effect on our use of natural resources and energy is required to produce usable water and supply it to a building site or manufacturing facility.

SUSTAINABLE MATERIALS IN MANUFACTURING

Sustainable manufacturing systems such as 'lean and green manufacturing' should be embedded in all industries across the West Region[3]. Many companies already use sustainable approaches to product design, which incorporate life-cycle environmental impact assessment of a product, assessment of environmental performance of materials and production processes and design for disassembly and recovery. Some of this has been driven by environmental legislation such as the Waste Electrical and Electronic Equipment (WEEE)[5] directive, which places the responsibility for waste recovery on the manufacturers. Rising energy costs and the need to reduce emissions has led to design for energy efficiency in the manufacture of products. This practise must become the norm across all sectors.

Measures to reduce environmental impacts include[3]:

- Minimisation of the amount of materials and a move to the use of lightweight materials will reduce transport costs and also reduce the amount of waste going to landfill
- Use of materials which satisfy health and safety standards and the elimination of toxic materials
- Design for recyclability or re-use resulting in end-of-life value and waste reduction
- Reduction in the amount of and type of packaging should be a priority

- Use of packaging that is 100% recyclable with more paper and a reduction in the amount of plastic
- Commitment to ensuring no residue from manufacturing operations goes to landfill through waste recycling, re-use or conversion to energy
- Use of sustainable materials. e.g. use natural fibres to reinforce plastics instead of glass fibres
- Reduction in the amount of water used in a range of manufacturing processes through measures such as water recirculation.

The Baxter Healthcare organisation, with manufacturing plants in Castlebar and Foxford, is an excellent example of a company that is committed to sustainability[3]. The company includes a Product Sustainability Review (PSR) from the start of the product development process. The PSR includes life-cycle impact assessment of the environmental impact of future products, and considers the impact of material selection. The PSR considers both products and packaging and aims to eliminate hazardous substances and maximize product re-use and recycling. In 2007, Baxter launched a waste collection service to collect waste oncology products from patients' homes in Ireland resulting in environmentally responsible waste treatment. This service has been extended to all renal home patients in Ireland.

All industries in the Region should share experiences in the implementation of sustainability initiatives.

Sustainable Construction Materials

A huge amount of primary energy and natural resources is needed for the construction of buildings. In Ireland, 26% of the primary energy demand and 27% of CO_2 emissions can be attributed to the residential sector[6]. About 80% of CO_2 emissions are produced during the use of buildings and 20% from the materials and building process. As the energy used in the operational phase of buildings through energy efficiency measures is decreased and the energy is sourced more and more from sustainable sources, the embodied energy of building materials and components will become an increasingly higher component of the buildings' environmental impact.

Implementing well thought out material selection that includes understanding as much as possible about the embodied energy of materials as part of a whole building design approach will support the reduction of the overall energy use of the building over its lifecycle.

The initial embodied and greenhouse gas emissions of a range of construction materials are given in Table 1. Of these materials, timber has significantly lower initial embodied energy and emissions than any of the other materials. Using timber to displace other construction materials has a very positive environmental impact. At the other end of the scale, aluminium has by far the poorest environmental properties. A building with a high proportion of aluminium, no matter how energy efficient from an

Material	Embodied Energy (GJ/m³)	Environmental Impacts		
		GWP (Kg/m³)	AP (kgm³)	POCP (kg/m³)
Aluminium	497	29975	162	321.3
Steel	200	17840	80	6720
PVC	116	1932	17.9	0.69
Concrete	4.8	156	2.4	0.72
Timber	1.65	64	0.55	0.55

Table 1 Energy and environmental performance of common construction materials[4]

Where GWP is the global warming potential in kg CO2 equivalents, AP is the acidification potential in kg SO2 equivalents and POCP is the photochemical ozone creation potential in kg ethene equivalent.

operational perspective, may not be environmentally friendly when considered from the perspective of total life-cycle costing.

Since the energy used in transporting materials becomes part of a building's embodied energy, this creates an incentive to use local materials. The use of local materials also helps the local economy.

TIMBER

Timber is the only truly sustainable construction material. Through photosynthesis, trees remove CO2 from the atmosphere and release oxygen back into the atmosphere. The carbon is stored in the timber throughout its life and is only released back into the atmosphere when it rots or is burned. The world's forests cover an area of 700 million ha and stores about 60 million tonnes of CO2 in the wood. In addition, all of the timber in structures, furniture and other products store a significant amount of CO2.

Timber is mostly a local material. The bulk of the construction timber produced in Irish sawmills is used in Ireland with the remainder exported mainly to the UK. Irish forests are sustainably managed to reduce environmental impacts. Substantial investment will be required to increase the roundwood output from Irish forests to meet future demand.

Timber manufacturing processes are very efficient with almost no waste. About 60% of the logs convert to sawn timber and the residue, in the form of chips and sawdust, is used in panel products or as a bio-fuel to provide energy for the mill. Grainger Sawmills in Cork uses its residues to power a CHP plant, which provides heat for the drying kilns and power to the cutting machinery. Excess power is sold to the grid.

There have been significant developments in engineered wood products and construction techniques that greatly increase the structural applications of timber. This provides opportunities for timber to displace other non-renewable materials such as steel. In Sweden, the town of Växjö has adopted a sustainable approach to development. All public buildings must be constructed primarily from timber and timber solutions must have been examined for all private developments. In recent years, many

Figure 1 Timber apartment building, Vaxjo, Sweden

multi-storey timber buildings have been constructed (see Figure 1).

Timber is a very versatile construction material with low embodied energy that is available locally, can be reprocessed, recycled and then used to create energy. The West Region should aim to substantially increase the use of timber in construction.

FOREST RESOURCE

The Irish climate is highly conducive to the cultivation of trees, which could provide a significant renewable resource for construction and wood energy. However, Ireland is the most deforested country in the EU. The Irish forestry estate comprises about 730,000 ha (in 2008), which represents 10.5% of the land area of the country[7]. The average throughout the other EU member states is 35%. Just under 20% of the forests are in the West Region. About 46% of Irish forests are privately owned and the remaining 54% are state owned. The private sector forest estate is relatively new, with almost 80% having been planted in the past 20 years. As the crop rotation in Irish forestry is typically 40 years, only a small portion of the national timber harvest is derived from privately owned forests.

The Government strategic plan[8] for the development of the forestry sector was published in 1996 and set target afforestation levels of 25,000 ha per annum to the year 2000 and 20,000 ha per annum from 2001 to 2030. However, for a variety of reasons just over half of the target has been planted. It has been estimated that in order to achieve long-term security of the industry a further 460,000 hectares must be planted over the next few decades. The afforestation programme is capital intensive and is dependent on government funding. The current crisis within public finances may also adversely impact on planting targets. While this will not affect the availability of raw material in the short to medium term, it will do so over the medium to long term. In addition, Ireland will fail to meet our climate change mitigation targets from forestry with resultant penalties.

In the new 2011 programme for government[9], the Government has undertaken that in order 'To accelerate the development of Ireland's forestry and bioenergies, NewERA will merge together Bord na Mona and Coillte to create a new State company called BioEnergy Ireland to become a global leader in the commercialisation of next generation bio-energy technologies,

including an annual 14,700 hectare afforestation programme.'

Current realisable volume output from Irish forests is 3,319,000 m^3, of which 15% or 504,000 m^3 is from West Region forests. This is estimated to grow by over 60% by the year 2020 to 5,393,000 m^3 nationally and 807,000 m^3 in the West Region[9]. Almost all of this growth will be from private growers. The realisation of this potential will require investment in forest roads and training for forest owners.

In 2008, Ireland's first commercial wood pellet facility commenced production in Co. Kilkenny and has the capacity to produce 75,000 tonnes of pellets per annum. BioSpark, a joint venture between Imperative Energy and Sustainable BioPolymers, is developing a €40 million next generation bio-processing research, innovation and manufacturing centre in Claremorris, including a wood pellet production facility with the capacity to produce 60,000 tonnes of pellets per annum. The volume of wood fibre available for energy is currently 1,069,000 m^3, with an energy content of 7.38 GJ. By 2020, this is projected to grow to 1,453,000 m^3, with an energy content of 10.02 GJ[9].

Significant investment in expanding and maintaining Irish forestry is essential to the sustainable development of the Region. This will ensure a supply of sustainable materials for construction, renewable energy, contribute to climate change mitigation through carbon sequestration, provide protection for wildlife habitats and provide recreational benefits for the community.

ECO-FRIENDLY CONCRETE

Concrete remains the most widely used construction material by volume in the Irish building industry. While it is desirable that the level of timber usage in buildings should be significantly increased, it will generally be used in conjunction with other materials especially concrete. In recent years, new concrete products have emerged which have significantly less environmental impact. Where possible, these products should be used in all future concrete works in the West Region.

Concrete's principal components are aggregates, cement and water. Natural aggregate consists of crushed stone and sand, which is created by crushing rock or from naturally occurring gravel and sand deposits. The contribution of aggregate extraction to resource depletion, land-uses, CO_2 emissions and energy use is rather low[4]. There are a number of environmental impacts that need to be considered in site selection including: changes to the landscape; noise, dust and vibration during blasting; and impacts on ground and surface water. These impacts can be minimised by proper design and good management practices. The manufacture of cement is extremely energy intensive and as a result has a very high embodied energy. Cement manufacture accounted for 19% of CO_2 emissions in Ireland in 2008. The overall embodied energy of concrete can be reduced by using cement replacements.

This involves substituting of a proportion of the cement used with materials such as pulverised fly ash (PFA) or ground granulated blast slag (GGBS), which have a low associated embodied energy. PFA is produced when coal is burned at high temperatures in power plants. PFA is available from coal-fired power plants in Ireland. GGBS is a by-product of the steel industry and is imported into Ireland.

Toxic materials

Materials that have damaging effects on the environment should be avoided. For example, substituting a non-toxic chemical for a toxic one inside the building will help improve indoor air quality.

Construction waste and the use of recycled materials

In 2008, construction and demolition waste in Ireland totalled 16.8 million tonnes, which represents 54.8% of the total waste generated. Recovery of stone and soil was at 89% but the recovery rate for the remainder (concrete, steel, wood, plastics, etc) was only 35.8%[10].

In order to reduce the waste generated, design for deconstruction or demolition must be included at an early stage of the project planning. The use of construction materials which can be recycled should be maximised.

Due to increasing constraints on road budgets, increased environmental awareness and the desire to obtain sustainable solutions, the use of recycling of existing pavement materials has become an important option in the maintenance and rehabilitation of road pavements. In recent years, innovative pilot projects incorporating the use of cold in-situ recycling using bituminous stabilisation and cement stabilisation have been carried out in Ireland. The use of in-situ recycling using bituminous stabilisation has been carried out on the N15 National Primary road in Co. Sligo and cement stabilisation has been used on the N71 National Secondary road in Co. Cork. The use of in-situ stabilisation provides significant benefits towards a greener environment and lower carbon emissions through the conservation of virgin materials and reduced transport and production emissions during construction. The use of in-situ recycling provides a cost effective and environmentally friendly solution for the upgrade and improvement of the roads network.

Recycled concrete can be used in low load applications such as base courses and there is potential for use in concrete production. Concrete recycling requires energy use for demolition and crushing and transport costs can be significant. Recycled steel reinforcement is available from the U.K., however, some of the environmental benefits of recycling are offset by the transportation costs. Timber is almost 100% recyclable and can be reused, chipped and used in panel products or used as a bio-fuel.

In addition to recycling materials generated within the construction industry, opportunities arise to use recycled materials from other sectors. An example of this is the use of recycled waste rubber tyres. Tyre rubber particles or granules can be used as a partial replacement for

aggregates for concrete or asphalt mixtures and this has the added benefit of reducing tyre noise and improving grip. Shredded tyres can be used as lightweight construction materials for embankments or backfill for retaining walls.

The use of construction materials which can be recycled should be maximized. Opportunities to use recycled concrete, asphalt, steel, timber and other materials should be explored in all construction projects.

RECOMMENDATIONS

A new way of thinking must be adopted if we are make sustainable use of our natural resources, reduce energy demand and emissions associated with materials and reduce waste through material optimisation and the use of recyclable materials.

Life-cycle costing should be used at the design stage of all buildings and new products.

Sustainable manufacturing systems such as 'lean and green manufacturing' should be embedded in all industries across the West Region. All industries in the Region should share experiences in the implementation of sustainability initiatives.

Green procurement practices are those that take account of the environmental impacts and energy running costs as well as simply purchase price. Green procurement practices should be used by the public sector and all businesses in the West Region.

As part of a whole building design approach, architects and engineers should implement well thought out material selection that includes assessment of the embodied energy of materials. The West Region should aim to substantially increase the use of timber in construction. Aligned with this, the development of forestry and downstream associated industries should be vigorously promoted in the Region. Eco-friendly concrete products should be used.

Design for sustainability should be embedded into all third level engineering courses.

A directory of sustainable 'green' businesses in the West Region should be developed.

BIBLIOGRAPHY

1 European Commission, 2010, 'Energy-efficient building PPP, Multi-annual roadmap and longer-term strategy'.

2 European Committee for Standardisation, 1997, 'ISO 14040:1997 Environmental management - Life cycle assessment- Principles and framework', ISO, Geneva, Switzerland.

3 Fiksel, J., 2009, 'Design for Environment: A guide to sustainable product development', 2nd Ed., McGraw Hill.

4 Khatib, J.M., 'Sustainability of construction materials', Woodhead Publishing, Cambridge, UK.

5 Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE), Official Journal of the European Union.

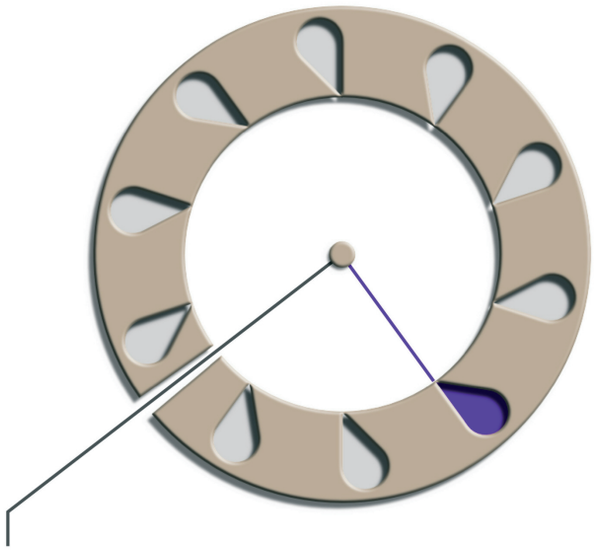
6 SEAI, 'Energy in Ireland. 1990-2009', 2010.

7 DAFF, 2009, Forestry 2020, Deparment of Agriculture, Fisheries and Food, Dublin, http://www.agriculture.gov.ie/media/migration/agri-foodindustry/foodharvest2020/foodharvest2020/2020strategy/2020Forestry.doc

8 Department of Agriculture, Food and Fisheries, 1996, 'Growing for the Future - A Strategic Plan for the Development of the Forestry Sector in Ireland'.

9 Government for National Recovery 2011-2016.

10 EPA, 2008, 'Ireland's Environment 2008, Sustainable resource use, consumption and waste'.



"choosing low impact, local, seasonal and organic diets and reducing food waste"

Section Contents

KEY RECOMMENDATIONS

01 Promote to consumers and producers the 7 principles of sustainable food developed by Sustain, the alliance for better food and farming.

02 Encourage the growth of existing small scale producers of speciality meat, dairy, preserves, fruit drinks and bread products.

03 Encourage the setting up of more small scale producers of speciality products with a mix of start-up incentives and mentoring.

EXECUTIVE SUMMARY

The choices we make in relation to the foods we consume have significant effects not only on our own health and well-being but also on the environment. Agriculture is a significant contributor to greenhouse gas production. While there has been a growing awareness among consumers of the health and taste benefits associated with eating seasonal food, the bulk of the food that is purchased is bought without much regard to its appropriateness to the season. Consumers are more conscious of buying organic foods but often the price premium is the determining factor. At times it is not that the organic food is too expensive, rather it is the case that the non-organic food is too cheap. It is too cheap because it has been produced in an unsustainable fashion. An example of this is cooked chicken; it is hard to understand, at times, how it can be sold so cheaply given the cost of feeding it, processing it, transporting it, cooking it and giving the farmer, processor and supermarket a margin of profit. This is compared then, to the more expensive raw free range chicken or the much more expensive raw organic chicken. The latter two would seem to reflect the costs of production more realistically.

The use of pesticides and artificial fertilisers are of concern because of the energy used in production, the resources used in their manufacture, the waste arising from their manufacture and their impact on the environment in use. It can have implications for the quality of sources for drinking water.

Beef production is barely viable at present. Its production generates significant quantities of methane which is a potent greenhouse gas. We consume too much red meat in any case and not enough fruit, vegetables and wholegrains.

Wild fish stocks are under severe pressure globally due to unsustainable fishing practices. The future lies in land-based aquaculture units producing fish organically where disease can be more easily controlled and the environmental impacts significantly reduced. The challenges facing land based aquaculture have not all been successfully surmounted as yet.

There is a growing awareness of Fairtrade certified products. The purchase of bottled water, in a country where the quality of drinking water is generally good, makes little sense. It makes no sense when that water is transported over hundreds of kilometres from the Southern half of France as much of it is. Consumers don't seem to consider the quality of the water in the bottles but unfortunately, due to some incidents which received great media attention, some consumers are sceptical about the quality of water from our taps. In some ways it is a

04 Encourage the adoption by Farmers' Market of the voluntary Good Practice Standard and raise consumer awareness of the Standard.

05 Use social marketing to bring about change in consumer behaviour in relation to selection, purchase and consumption of foods.

06 Implement the recommendations in Food Harvest 2020.

behavioural issue. Thirty years ago you would not have seen people walking around with bottles of water. Physiologically we needed water just a much back then as we do now!

There is scope for growing the small scale producers of premium speciality meat, dairy, preserves, fruit drinks and bread products. This would be very beneficial to our tourism market. Tourists want to eat local produce, preferably organic food, typical of the area they are visiting. There are farmers' markets already across the Region. Only 20% of them are certified to the voluntary Farmers' Market Good Practice Standard. This should be raised significantly to improve the range of locally produced foods available, and to give consumers confidence about the provenance of the food they are buying.

We want to eat foods that keep us healthy and well. Buying locally produced seasonal food will have economic benefits by substituting local produce for imported products.

Engineers Ireland West Region believes that the adoption by consumers and producers of the 7 principles of sustainable food, as promoted by Sustain, the alliance for better food and farming, Local and Sustainable Food will be achieved. The WWF has also launched a campaign, "Livewell 2020", aimed at getting consumers to eat in a way that supports environmental sustainability.

The Food Harvest 2020 10 year plan puts a great deal of emphasis on sustainability. This document contains more than 200 recommendations. Implementing all of those will be a challenge.

LOCAL AND SUSTAINABLE FOOD

Current Status

Most food bought by consumers in Ireland is bought from supermarkets. While these stock locally grown food fruit and vegetables the bulk of them are imported. We see in our supermarkets food from as far away as New Zealand. While this may make sense if you want Kiwis it makes much less sense if you want to buy lamb. The fruits and vegetables often spoil relatively quickly after purchase because they have been in transport and storage for some time. You can buy virtually any fruit or vegetable at any time of the year, regardless of the season, because they are imported from other parts of the world or because they are produced in artificially created climates. The cost of transporting food over hundreds and thousands of miles, often in chilled environments, is significant in terms of cost and energy consumption and impacts on the environment through the production of greenhouse gases. Creating artificial climates is also costly and energy hungry leading to greenhouse gas production. Growing food out of season often means that additional energy is needed to do so. Growing tomatoes and strawberries in winter, for instance, will require the application of heat. While strawberries can be grown in season in Ireland, if a consumer buys them out of season in a supermarket they may have come from a much warmer climate like the south of Spain. There is the transport cost and the additional cost of refrigeration while in transit from where it was grown until it arrives on the supermarket shelf.

While there has been some move to organic farming practice the bulk of farming in Ireland is dependent on the use of pesticides and artificial fertilisers. This has a triple negative impact on the environment. Firstly, the energy used in production of pesticides, and more especially artificial fertiliser, is significant, secondly, the effluent from production facilities can be harmful for the environment and thirdly, the use of pesticides and artificial fertilisers can harm the environment by contaminating the soil, surface water and ground water.

The use of pesticides in farming can carry risks for the consumer in that pesticides could contaminate the food being produced or get into the food chain and end up being consumed in another food product. Artificial fertiliser can impact negatively on water sources used from which water is extracted for drinking water leading to additional costs in the removal of contaminants.

Production of meat is a significant source of the greenhouse gas, methane. Ireland has one of the highest rates of bovinity in the world. Beef production is now a small margin business. Irish people eat too much meat and not enough fruit, vegetables and wholegrains. There is still a reliance on intensive production of pigs and poultry in particular although there are trends to free range production of both as premium products.

Fish stocks are under pressure due to unsustainable fishing. The aquaculture industry in the West Region has suffered a setback in

recent years while proving to be more successful in Co. Donegal. Consumers are opting for more organic products, including organically grown farmed fish, and fish farmers are now producing organic fish which they are finding is a more sustainable business. The future of aquaculture is probably in land based units using virtually closed recirculated water systems where disease control is easier and the impacts on the environment are much less.

Foods like coffee, tea, cocoa can't be grown in Ireland. Some foods we import from the developing world are produced in exploitative ways. This means the producer does not get a fair return for his/her products. There are Fairtrade certified products available and consumers are becoming more aware and concerned to have assurance that the farmers who produced it have been paid a fair price for their produce rather than being exploited.

Huge quantities of bottled water are consumed in Ireland. If one were told 30 years ago that Irish people would be buying bottled water in supermarkets one would not have believed it. In a country that has, in general, good water resources replenished by more than adequate rainfall and where public water supplies provided by Local Authorities are generally of a good quality, it seems extreme to be purchasing bottled water. Much of that water has travelled long distances from the southern half of France (Volvic water from the town of Volvic in the Auvergne, France for instance). When one considers the materials and the energy that was used to make the bottles, the energy used in transporting the water over hundreds of miles, the energy used in chilling some of that water in supermarkets and shops, and in collecting and recycling the waste bottles, it doesn't make sense. Ireland is obliged to ensure that water supplies meet the requirements of the drinking water directive. There are some issues with quality of water from some group water schemes but the EPA and the local authorities are addressing these issues.

It is recognised that Irish people do not eat enough fruit, vegetables and wholegrain foods eating instead too much red meat and too much processed food. There is concern about the rise in obesity rates and associated disease such as diabetes.

There are already some local producers of speciality meat, dairy (cheese and yogurts), preserves, fruit drinks and bread products who sell to local shops, restaurants and hotels and at farmers' markets.

There are farmers' markets already across the Region where local produce is sold directly to consumers. The Department of Agriculture, Fisheries and Food launched a pilot Good Practice Standard (GPS) for Farmers' Markets in 2009. Farmers' Markets signing up to the GPS will undertake to hold markets regularly; to stock a substantial proportion, ideally 50%, of local produce from the county or neighbouring counties; to accommodate seasonal and local garden/allotment produce, as well as compliance with food safety/labelling rules and criteria on good governance. There are 11

farmers' markets (2 certified GPS) in County Galway, 8 (1 certified GPS) in County Mayo and 2 (1 certified GPS) in Co. Roscommon[1], (see Table 1).

The Government launched an ambitious ten-year plan[2] for the agriculture and fisheries sector in July 2010 aimed at increasing food and beverage exports by more than 40% and boosting the value of primary production by farmers and fishermen by €1.5 billion by 2020. The plan contains the following statement;

"A sustainable agricultural sector requires that the highest-possible returns are secured for the high-quality food produced. To achieve this, Ireland needs to address a number of structural challenges to meet the competitive challenge of the international marketplace. It also must focus particular resources on the opportunity presented by consumers who demand the highest quality in production and environmental standards, expect clear visibility on sustainability issues and, crucially, are willing to pay a premium for this."

Figure 1 Farmers' Market Good Practice Standard Logo

The value of Irish food and drink exports rose by 11% in 2010 to €7.9billion[3].

WHERE DO WE WANT TO GET TO?

We want foods that keep us healthy and well. We want to produce more locally produced, organic foods for reasons of health and wellbeing but this will also have economic benefits in that it will reduce the imports of foods. Consumers are increasingly interested in the provenance of the food they eat. Tourists want to eat food produced in the locality they are visiting. France's food culture puts great emphasis on locally produced food and speciality foods which distinguish one area from another. The food markets in French towns and

County	Market Name	Location	Day
Galway	Moycullen	An Fuaran, Moycullen	Every Friday, 1pm - 7pm
Galway	Kinvara Farmers' Market	Johnstons Yard, Kinvara	Fridays 10am - 2pm
Mayo	Margadh Feirmeoirí Iorrais	The Square, Belmullet	Saturdays 10.30am - 1 pm, May- December (Christmas Market Sat 18th Dec)
Roscommon	Origin Farmers' Market	Grounds of King House, Boyle	Saturday, 10am - 2pm

Table 1 Certified GPS Farmers' Markets in the West Region

cities are a testament to that. Locally produced organic food would be a major benefit to our tourism industry.

HOW ARE WE GOING TO GET THERE?

Sustain, the alliance for better food and farming, in the UK produced a guide[4] for consumers on how to eat greener, healthier and more ethical food. They set down 7 principles of sustainable food for consumers wishing to support a sustainable food system. Ireland could adopt these principles or a variation of them. The 7 principles are;

1. Buy local, seasonally available ingredients as standard, to minimise energy used in food production, transport and storage.
2. Buy food from farming systems that minimise harm to the environment, such as certified organic produce.
3. Reduce the amount of foods of animal origin (meat, dairy products and eggs) eaten, as livestock farming is one of the most significant contributors to climate change, and eat meals rich in fruit, vegetables, pulses, wholegrains and nuts. Ensure that meat, dairy products and eggs are produced to high environmental and animal welfare standards.
4. Stop buying fish species identified as most 'at risk' by the Marine Conservation Society, and buy fish only from sustainable sources - such as those accredited by the Marine Stewardship Council.
5. Choose Fairtrade-certified products for foods and drinks imported from poorer countries, to ensure a fair deal for disadvantaged producers.
6. Avoid bottled water and instead drink plain or filtered tap water, to minimise transport and packaging waste.
7. Protect your and your family's health and well-being by making sure your meals are made up of generous portions of vegetables, fruit and starchy staples like wholegrains, cutting down on salt, fats and oils, and cutting out artificial additives. Consumers can also do their bit by asking for sustainable food to be sold by retailers, restaurants, canteens and in public sector institutions such as schools and hospitals, and supporting organisations and businesses that adopt sustainable food principles. You could also encourage your workplace to adopt a sustainable food policy, and to take practical steps to support a more sustainable food and farming system.

There are already some local producers of speciality meat, dairy (cheese and yogurts), preserves, fruit drinks and bread products who sell to local shops, restaurants and hotels and at farmers markets.

There are many farmers' markets already across the Region where local produce is sold directly to consumers. Only 20% of those are certified to the voluntary Good Practice Standard (GPS).

Figure 2 Galway City Farmers' Market in action

There should be a determined effort made to get most of the farmers' markets to adopt the GPS.

Social marketing would be an appropriate method to bring about the necessary change in consumer behaviour over time to help achieve the above goals. It has already been used successfully as part of the "Food Dudes" Healthy Eating Campaign[5] with the objective of getting children to eat a more healthy diet. If consumers change their buying habits the market will respond. The Government will need to adopt agricultural policies as well to try to change the way in which agriculture is so focused on beef production. Beef production is a very low margin business. Changing production to supply consumer needs based on the 7 principles above may lead to farming that is more sustainable economically.

The World Wide Fund for Nature (WWF) has begun a campaign to get people to eat in a way that supports environmental sustainability. The Livewell 2020[6] diet is both healthy and also helps the environment according to the WWF. It advocates eating less meat and fewer processed foods, while promoting the eating of fruit, vegetables and grains. The following statement is from the Livewell 2020 website;

"Live well… for a healthy planet

You might be shocked to hear that pristine environments around the world are being destroyed to produce the food we eat in the UK. The good news is that just by changing a few of the things you eat, you can have a really positive effect on vulnerable environments, wildlife and people. And as an added bonus, you'll be healthier too! "

The Food Harvest 2020 plan promotes sustainable food production. It contains more than 200 recommendations. The following two recommendations relate specifically to the production of organic food for the Irish market;

- "DAFF should continue to directly support the sector through the Organic Farming Scheme and the Schemes of Grant Aid for the Development of the Organic Sector.
- Bord Bia should continue to build consumer awareness of the availability of Irish organic produce through National Organic Week campaigns and the National Organic Awards."

The Government for National Recovery 2011-2016 plan includes the following commitment;

- Bord Bia will also work in cooperation with producers and small businesses to develop value-added Irish food brands, such an eco brand, and local brands.

BIBLIOGRAPHY

1 http://www.bordbia.ie/aboutfood/farmersmarkets/Pages/default.aspx

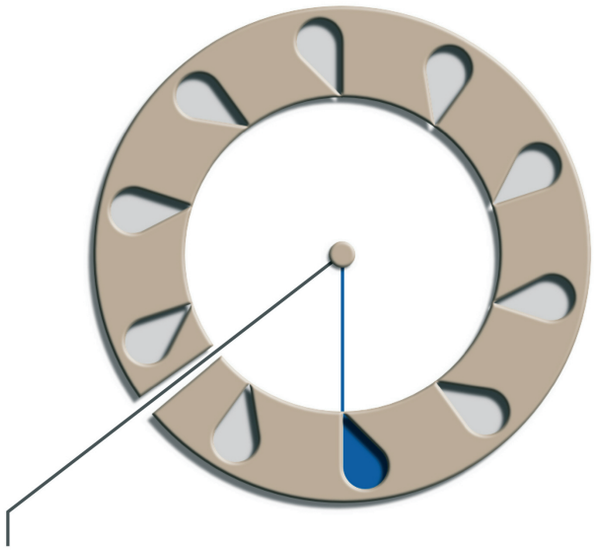
2 Food Harvest 2020 - A Vision for Irish Agri-food and Fisheries, Department of Agriculture and Fisheries, July 2010

3 Press Release 12/01/2011 - Bord Bia: Irish Food & Drink Key Export Driver as Sales Approach â,¬8 billion, www.bordbia.ie/eventsnews/press/pages/IrishFoodDrinkKeyExportDriver.aspx

4 Eat well and save the planet!, by Sustain: the alliance for better food and farming, 2007 (www.sustainweb.org/pdf/SFG_Consumers.pdf)

5 www.fooddudes.ie

6 http://www.wwf.org.uk/what_we_do/campaigning/food_campaign/livewell_2020/



"using water more efficiently in buildings and in the products we buy; tackling local flooding and water course pollution"

Section Contents

KEY RECOMMENDATIONS

01 Public Water Supply - Undertake upgrade works for plants on the EPA Remedial Action List; Plan for long term needs; Progress Water Conservation.

02 Group Water Schemes - Upgrade water treatment plants where required; Progress Water Conservation; Establish a long term framework for rural water supplies.

03 Public Sewerage - Provide/Upgrade secondary wastewater treatment plants where required; Plan and provide wastewater infrastructure for the Galway gateway.

EXECUTIVE SUMMARY

Water resources and how they are managed impact almost all aspects of society and the economy, in particular health, food production and security, domestic water supply and sanitation, energy, industry, and the functioning of ecosystems.

Water is critical to defining our Region, with many high quality waters and protected sites that depend on water, an extensive coastline and many areas of great natural beauty. However, water is a fragile resource that needs to be protected.

Structures and Governance for Water Services Delivery

There are plans to change the structures for the delivery of water services in Ireland and this is likely to be one of the most significant events for water services, nationally and regionally, over the period to 2020. The changes being considered include the introduction of a national water utility and charging for domestic water supplies. The West Region should not be disadvantaged in the prioritisation of projects under any new regime.

Where are we now? Current Status

We face significant issues in our Region in achieving a sustainable water resource.

Drinking Water Quality

While the Region has approximately 9% of the State's public water supplies, over 20% of the Public Water Supply Schemes on the EPAs Remedial Action List are in the Region. Galway has a tarnished image for water following the cryptosporidium outbreak in 2007. 61% of the total number of Private Group Water Schemes contaminated with E. coli during 2009 are in the West Region.

Wastewater

Upgrading is urgently required at a number of wastewater treatment plants, to provide secondary treatment (e.g. Clifden) or deal with overloaded plants (e.g. Oughterard and Foxford). The ECJ judgement in 2009 on the regulation of septic tanks is a major issue for the West Region given the number of septic tanks and the unsuitable ground conditions in many parts of the Region.

Water Quality

The most recent Water Quality Report by the EPA indicates that the karst limestone areas, particularly in the West of Ireland, show the greatest degree of microbiological pollution. This is a particular problem for private water supplies in these areas as the majority of such supplies are untreated. Invasive species in our lakes and rivers are an increasing threat to biodiversity in our water resources.

04 Septic Tanks - Provide and implement a national licensing framework; Adopt a strict planning regime to avoid new dwellings on unsuitable sites.

05 Flooding - Undertake flood alleviation works on the Clare and Dunkellin rivers. Advance the CFRAM Study for Western River Basin District.

06 Western River Basin Management Plan - Implement the Plan; promote active public engagement to make the region an exemplar in catchment management.

Flooding

There was severe flooding in a number of locations in the Region in November, 2009 including, the Shannon, Suck, Clare and Dunkellin Rivers and the karst areas in South Galway.

Where do we want to be?

It is critical that we restore our substantial water resources and provide quality water services for the inhabitants of the Region and support economic development in the Region.

How will we get there?

It is essential that there is an integrated approach to the implementation of key EU Directives relating to water, including the Water Framework Directive, Flooding Directive and the Marine Strategy Framework Directive. The key recommendations for sustainable water in the West Region are as follows:

Public Water Supply

- Undertake upgrade works for plants on the EPA Remedial Action List
- Plan for long term needs
- Progress Water Conservation (Rehabilitation; Leakage Control; Demand Reduction)

Group Water Schemes

- Upgrade water treatment plants with water quality failures
- Progress Water Conservation (Rehabilitation; Leakage Control; Demand Reduction)
- Establish a long term framework for rural water supplies.

Public Sewerage

- Provide secondary wastewater treatment plants where required
- Upgrade overloaded treatment plants
- Plan and provide wastewater infrastructure to support the development of the Galway gateway.

Septic Tanks

- Provide a national licensing framework
- Undertake an inspection programme and determine upgrade works required
- Adopt a strict planning regime to avoid new dwellings on unsuitable sites.

Flooding

- Undertake flood alleviation works on the Clare and Dunkellin rivers
- Advance the CFRAM Study for the Western River Basin District.

Western River Basin Management Plan

- Implement the programme of measures identified in the Plan
- Promote active public engagement and target improvements in local water bodies to make the Region an exemplar in catchment management.

Conclusion

In conclusion, we all have a role to play in improving the status of our water bodies and in the sustainable use of water and should appreciate the precious resource that we are fortunate to enjoy in our Region.

SUSTAINABLE WATER

"Water, is taught by thirst.
Land -- by the Oceans passed.
Transport -- by throe --
Peace -- by its battles told --
Love, by Memorial Mold --
Birds, by the Snow."

Emily Dickenson

INTRODUCTION

Water is essential to human and other land-based life. Access to clean drinking water was and is a major global public health issue.

There are significant threats to water, in particular from anthropogenic activities and climate change. The water crisis is referred to by Mary Robinson, then President of Realizing Rights, at the World Economic Forum Annual Meeting in Davos, 2007

"I come away with an enhanced understanding of how critical the water crisis is, and how fragile the possibility of fulfilling the existing commitments to water as a human right."

LINKS WITH OTHER ONE PLANET LIVING PRINCIPLES

There is a mutually dependent relationship between Sustainable Water and many of the principles of One Planet Living:

Health and Happiness

- *Access to clean drinking water is a major global public health issue.*

Land Use and Wildlife

- *High quality water habitats are are key to supporting a naturally diverse mix of aquatic wildlife. The presence of high status sites along a river system can contribute significantly to the overall species diversity[1]. Limiting pollution through provision and operation of sewerage networks and wastewater treatment facilities plays a positive role in terms of water quality.*
- *On the other hand, water abstractions and treated effluent discharges can have a negative impact on water habitats.*
- *The inflluence of water on land use will be more evident in the years ahead as the Western River Basin Management Plan, implementing the Water Framework Directive, will have a greater impact on land use in Development Plans.*

Local and Sustainable Food

- *Clean water is required to support agriculture, in particular in the case of dairy farming. On the other hand, farming activities have a significant impact on water habitats.*
- *Aquaculture, if not properly controlled, can have significant impacts on water habitats and wild fisheries.*

Equity and Local Economy

- *Water Services, water supply and wastewater collection and treatment, are essential to support economic development and is a critical factor in location decisions for many key industries*
- *Water is essential to tourism in the Region in terms of scenic beauty and water based activities*

Culture and Heritage

Water is a key component in the cultural heritage of the West Region as evidenced by the following examples:

- *Canals in Galway are an important part of our cultural and industrial heritage*
- *Song - Galway Bay*
- *Poetry - Wild Swans of Coole*
- *Festivals - Cruinniú na mBád Festival*
- *Galway as a maritime city. In the Middle Ages, Galway was the principal port in Ireland for trade with Spain and France.*

Zero Carbon

Two aspects of climate change need to be considered when considering water and the Region.

- *Climate Change Mitigation*
  - *The potential of our marine waters for Offshore Renewable engergy (wind, wave and tidal)*
  - *Management of water and wastewater infrastructure so as to minimise carbon footprint; water services is a significant*

component of the carbon footprint of local authorities.

- *Climate Change Adaptation*
  - *Management of water and wastewater infrastructure so as to take account of climate change e.g. impact of change in flows on water abstractions and wastewater discharges*
  - *Changes in rainfall patterns are predicted to impact on the frequency and severity of flood events*

- Zero Waste
  - *Managing waste facilities so as to protect our water resources*
  - *Minimising impact of sludge wastes from water and wastewater treatment plants*

- Sustainable Materials
  - *Avoidance of water pollution in manufacturing processes*
  - *Minimisation of water use in the manufacture of materials*

- Sustainable Transport
  - *Shipping*
  - *Providing links to the various islands off our coast*

SUSTAINABLE WATER - SCOPE

In reviewing sustainable water in a West Region context, there are two key aspects of concern, namely Integrated Water Resources Management and Water Services delivery.

Integrated Water Resources Management (IWRM)[2] is the coordinated development and management of water, land and related resources in order to maximise economic and social welfare without compromising the sustainability of ecosystems and the environment.

The Region includes significant water resources in terms of:

- Groundwater
- Rivers e.g. Moy and the Shannon which marks the eastern boundary of our Region
- Lakes e.g. Corrib, Mask and Conn
- Marine Waters e.g. Clew Bay and Galway Bay

Water Services means the provision of drinking water (storage, treatment or distribution) or waste water collection (including treatment or disposal).

WATER AND THE WEST REGION

Water is critical to defining our Region as evident from the following extract from the Western River Basin Management Plan (RBMP)[1]:

> *The Western River Basin District is a largely rural area with many high quality waters and protected sites that depend on water. The fertile soils of the eastern part of the basin support agriculture whereas further west, the landscape is mountainous with many habitat protected areas. The basin has an extensive coastline and encompasses many offshore islands. The great natural beauty of the basin is a haven for a thriving tourist industry with many popular holiday resorts and with its waters providing major boating and fishing interests. Water is integral to the economy of the Western RBD, generating and sustaining wealth through activities such as agriculture, forestry, aquaculture, industry, services, transport and tourism. However, water is a fragile resource that needs to be protected.*

The Region is noted for its high rates of rainfall; we need to look at this as a positive, particularly in light of predicted global impact of climate change in this century.

If we consider the location of the Region in the context of Ireland's marine territory, the Region is centrally located in the context of the "Real Map of Ireland"

We are fortunate to have such water resources. However, it can be argued that we do not appreciate or respect the value of our precious water resources.

Structures and Governance for Water Services Delivery

There has been little change in the structures for delivery of water services in Ireland over the last 130 years. Engineers Ireland examined the issue in 2004 and the following are extracts from the Report's recommendations:

- IEI is satisfied that the satisfactory delivery of water services in Ireland in the context of National and EU Legislation and policy objectives requires a fundamental re-think of the organisation and financing of these vital services.
- The development of a regional approach can deliver significant benefits in terms of economic efficiency based on scale and strategic planning while facilitating a coherent response to the environmental management of water resources developed on a River Basin District basis[3].

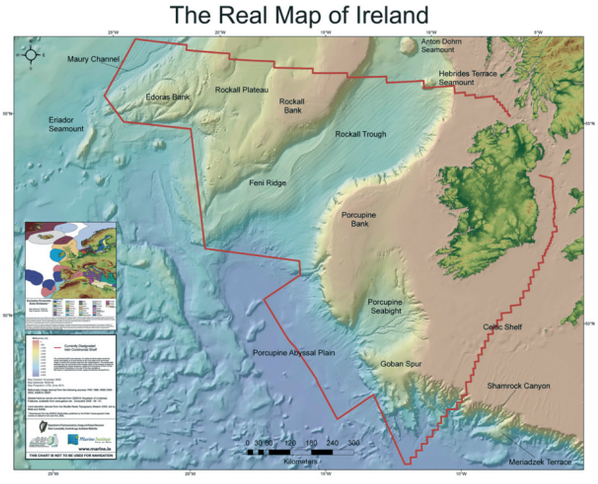


Figure 1 The Real Map of Ireland

There have been proposals from a number of quarters to reform the structures for the delivery of water services as referenced by then Minister for the Environment, Heritage and Local Government in a recent debate in the Seanad[4].

A move to centralising water functions must be backed up by detailed evidence and research. Admittedly, several policy reports and publications have recommended structural reforms for the delivery of water services. The reports of the special group on public service numbers and expenditure programmes and of the high level group on green enterprise recommended the establishment of a national water authority while a regional or river basin approach to water services was recommended by the local government efficiency review group and in the OECD's environmental performance review of Ireland. The Government has not ruled out assessing the need for and role of a national water authority but it will consider this issue on an informed basis.

The IMF Agreement[5] (Page 26) includes the following as an action to be completed by Q4 2011:

> *"In advance of the introduction of water charges the Government will have undertaken an independent assessment of transfer of responsibility for water services provision from local authorities to a water utility, and prepare proposals for*

implementation as appropriate with a view to start charging in 2012/2013."

DoEHLG, in January 2011, published a Tender Notice seeking expressions of interest for the provision of consultancy services on the establishment of a water utility. The following is an extract from the Notice:

The assessment should determine the most effective structure(s) for delivering high quality competitively priced water services to customers (domestic and non-domestic) and for infrastructure provision. In particular, the review will consider whether a national water utility would be more efficient and cost effective than the existing implementation and operation structures across the 34 city and county councils. It is anticipated that this review will cover the legal framework and financial and economic dimensions as well as organisational issues, having regard to international experience and relevant examples of best practice. The appointment will be on a fixed price lump sum basis. The study is to be completed by 30 September 2011.

The restructuring of water services delivery in Ireland is addressed in the new Programme for Government[6] which proposes:

- At Page 15:
  - *A New Water Network: The new Government will create Irish Water, a new State company that will take over the water investment maintenance programmes of the 34 existing local authorities. It will supervise and accelerate the planned investments needed to upgrade the State's inefficient and leaking water network so has proved so unreliable during the recent harsh water conditions.*
- At Page 17:
  - *To achieve better quality water and environment we will introduce a fair funding model to deliver clean and reliable water. We will first establish a new State owned water utility company to take over responsibility from the separate local authorities for Ireland's water infrastructure and to drive new investment. The objective is to install water meters in every household in Ireland and move to a charging system that is based on use above the free allowance;*

It appears that there is now a momentum to change the structures for the delivery of water services in Ireland and this is likely to one of the most significant events for water services, nationally and regionally, over the life of this plan to 2020.

The key objectives, stated in the Engineers Ireland Report of 2004, remain valid and appropriate for any new national water authority:

- Delivering high quality water services, to best international standards;
- Reducing leakage losses (from a 2000 average of 47% average to 20%);
- A major upgrade of the water pipe network, much of which is in very poor condition, and
- Meeting the challenges of climate change.

The changes being considered, the introduction of a national water utility and charging for domestic water supplies, represent a major change in the delivery of water services. It will be critical that the new organisational, financial and legislative framework are fit for purpose. Issues to be considered include the following:

Figure 2 Images of West Region

- The new arrangements should promote the effective and efficient delivery of water services in Ireland
- The standard of political debate on water services needs to improve and in particular to take a more realistic approach on charging for water services. Policies have been advanced to introduce universal metering for domestic consumers, with a free allowance based on family size, with no proper financial assessment of how this will work.
- Water is different to other utilities and it is important that there will be an open and transparent consultation process on proposed changes to the delivery of water services.
- Any change in structure should take a holistic approach and, in addition to the water service provider, should consider also the role of an economic regulator, regulation of drinking water quality and a facility for interaction with consumer group representatives.
- A particular issue for the West Region is to ensure that, in a move to a national water utility, the Region is not disadvantaged in the prioritisation of funding for capital projects to increase water services capacities to facilitate sustainable economic growth in the region.

WHERE ARE WE NOW?

CURRENT STATUS

We face significant issues in our Region in achieving a sustainable water resource under a number of headings:

- Surface water quality
- Groundwater quality

- Drinking water quality
- Septic Tanks
- Flooding
- Existing wastewater capacity limits economic development in the Galway Gateway
- Invasive species in our lakes and rivers, for example in Lough Corrib
- High Unaccounted for Water (UFW) in our water supply networks
- Galway has a tarnished image for water following the cryptosporidium outbreak in 2007.

Drinking Water Quality

The most recent report on Drinking Water Quality was published by the EPA on 18th February, 2011[7]. The Report indicated progress over the previous two years and referred to a 50% reduction in the detection of E.coli in Irish public drinking water. However, the Report was not all positive and in particular for the West Region (Galway, Mayo and Roscommon).

Approximately 9% of the State's public water supplies and 9% of the population served by public water supply reside in the West Region. However, over 20% of the Public Water Supply Schemes on the EPAs Remedial Action List are in the Region, indicating that performance is behind the national average.

There is also a problem with Private Group Water Schemes. 37% of the total number of Private Water Schemes are in the West Region. 61% of the total number of Private Group Water Schemes contaminated with E. coli during 2009 are in the West Region, also indicating that performance is behind the national average.

This dependence on Group Water Schemes in the West Region is also reinforced by a review of data from the 2006 Census[8] as outlined in Table 1.

Wastewater

The role of the EPA in the supervision of local authority waste water discharges changed during the latter half of 2007[9]. The Waste Water Discharge (WWD) (Authorisation) Regulations, 2007 introduced for the first time an authorisation system for all local authority waste water discharges. The EPA is now the competent authority for assessing discharge licence applications and granting authorisations setting out specific conditions to prevent and control water pollution. Authorisations will require appropriate remedial actions within specified timeframes to be undertaken to address each of the discharge locations within the agglomeration. Certificates of Authorisation are required for discharges from agglomerations with a population equivalent (pe) of less than 500 and a Licence for larger agglomerations .

%	Public Mains	Group Scheme	Other Private Source	No Piped Water	Total
West Region	58.4	32.1	9.2	0.3	100
26 Counties	77.3	12.2	10.3	0.2	100

Table 1 % of Private Dwellings Served by Water Supply Facilities

Table 2 shows statistics on Applications to the EPA under the the WWD Regulations and the issues for the Region are as follows:

- 10.16% of the applications for the State are for the West Region and is marginally higher than the Regions proportion of the States population at 9.8%. The proportion of smaller plants (less than 500 pe) is less than the average for the State.
- Progress on authorising Certificates and Licences for Galway County is behind the rest of the Region and the average for the State.

The most recent report by the EPA on Urban Waste Water Discharges is for the years 2006 and 2007[9]. The report provides a review of the treatment of waste water at 482 villages, towns and cities in Ireland and the quality of discharges from 370 secondary waste water treatment plants with a population equivalent of 500 or more. While the Report acknowledges that there has been significant investment in waste water infrastructure in Ireland over the previous decade it determines that the level of infrastructure has to increase and be deployed at a faster rate. The key findings for the West Region are as follows:

- Clifden is 1 of 14 agglomerations in the state for which there is a requirement for Secondary Treatment and construction is yet to commence.
- Clarinbridge in Galway and the Jiggy in Roscommon are 2 of 13 rivers in the State that are seriously polluted by the impact of Municipal Waste Water.
- The Agglomeration load[10] is significantly greater than the plant capacity in a number of instances, Oughterard (1,731pe v 500pe); Ballaghaderreen (4,029 v 2,500); Foxford (4,440 v 1,360); Ballina (35,808 v 25,000); Ballygar (944 v 500) and Mountbellew (1,033 v 700).
- Agglomerations without Secondary Treatment include the following (Agglomeration pe[9] shown in brackets):
  - *Clifden (4,063pe)*
  - *Belmullet (4,005pe)*
  - *Killala (2,400pe)*
  - *Kiltimagh (1,067pe)*
  - *Dunmore (890pe)*
  - *Glenamaddy (738pe)*
  - *Eyrecourt (702pe)*
  - *Ahascragh (560pe)*

The EPA Report on Urban Waste Water Discharges for the years 2008 and 2009 is currently being prepared and is due to be published later in 2011. A review of the preliminary data[9] indicates that the issues have not changed from the previous report published in 2009. On a positive note, upgrade works have been carried out on a small number of plants in

		Galway City	Galway County	Mayo	Roscommon	West Region	26 Counties	West Region as % of
Certificates	Applications		5	12	15	32	464	6.90
Licences	Applications	1	22	33	13	69	530	13.02
Total	**Applications**	**1**	**27**	**45**	**28**	**101**	**994**	**10.16**
Certificates	Certified			10	14	24	125	19.20
Licences	Licensed	1	1	9	3	14	150	9.33
Total		**1**	**1**	**19**	**17**	**38**	**275**	**13.82**
% Authorised		100	3.70	42.22	60.71	37.62	27.67	

Table 2 Statistics on Applications to the EPA under WWD Regulations

the Region identified as overloaded in the 2009 Report.

Individual Waste Water Treatment Systems (including Septic Tanks)

The extent of dwellings in the West Region using individual septic tanks is evident from a review of data from the 2006 Census[11] as outlined in Table 3.

The European Court (ECJ)[12], in a judgement in October, 2009, held that Ireland, with the exception of Cavan, failed to comply with Articles 4 and 8 of Council Directive 75/442/EEC on waste as regards domestic waste waters disposed of in the countryside through individual waste water treatment systems (IWWTS).

There are 3 significant issues raised by this judgement:

- The need for a regulatory system for IWWTS
- The upgrading of existing IWWTS that do not meet current standards. The EPA published revised guidelines for IWWTS in 2009[13].
- The approach to IWWTS for new housing, in particular for areas that are not suitable for IWWTS

Based on data in the 2006 Census, it is estimated that there are approximately 450,000 dwellings in the state with IWWTS and that 17% of these properties are in the West Region.

The issues of the ECJ judgement and the new EPA Guidelines for IWWTS were addressed by an

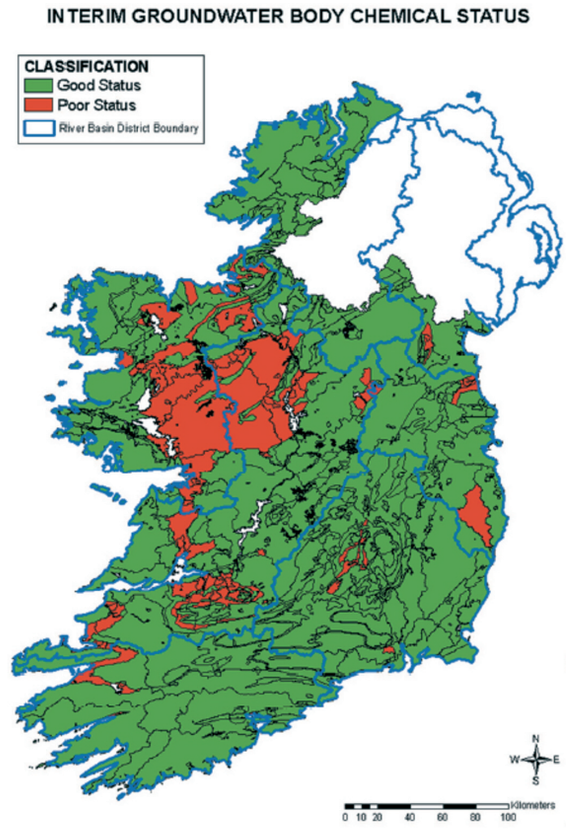


Figure 3 Interim Chemical Status of Groundwater Bodies

Oireachtas Committee[14] in May 2010. The committee was concerned that conditions in some of the western counties present a particular challenge in meeting the site suitability criteria in the new EPA guidelines.

The DEHLG view[15] is that it is not "considered practical for compliance to be pursued through the adoption of bye-laws by the other local authorities" and that "to ensure uniform standards it is proposed to take a national approach to this issue."

%	Public Scheme	Individual Septic Tank	Other Treatment System	No Sewerage Facility	Total
West Region	43.7	53.1	2.9	0.4	100
26 Counties	67.6	29.5	2.6	0.3	100

Table 3 % of Private Dwellings Served by Wastewater Facilities

The previous government proposed to "introduce a scheme for the licensing and inspection of septic tanks and wastewater treatment systems"[16]. It is not clear as to how the new government proposes to deal with this issue as it is not referred to in the Programme for Government[5].

This is a major issue for the West Region given:

- The number of dwellings that rely on IWWTS
- The ground conditions in many parts of the Region are not suitable for IWWTS

Water Quality

The "Water Quality in Ireland Report 2007 - 2009" was published by the EPA on 23rd February, 2011. The Report "has found evidence of improvements in water quality in Ireland, though continued actions across a range of sectors are needed if Ireland is to achieve its European water quality obligations, (Figure 1)."[17]

In general, the Western River Basin District (RBD) performed well, for example, in the case of monitored river water bodies, the ecological status for 71% of the results for the Western RBD are in the High or Good category as against a National average of 52%.

However, in the case of groundwater, the Western RBD does not perform as well. The Western RBD has the highest number of results with a poor status at 34.8% against a national average of 14.4%.

The Report indicates that the karst limestone areas, particularly in the West of Ireland, show the greatest degree of microbiological pollution. This is a particular problem for private water supplies in these areas as the majority of such supplies are untreated.

The Western RBMP identifies the key pressures on water quality in the river basin as follows:

- Agriculture
- Wastewater and Industrial Discharges
- Wastewater from unsewered properties
- Forestry
- Landfills, quarries, mines and contaminated lands
- Physical modifications and damage
- Water Abstractions
- Dangerous Substances
- Aquaculture
- Invasive alien species. The African Curly leaved pondweed and Zebra Mussels have established in the Western District waters and pose a major threat to the diversity of native plants and animals.
- Cruising and boating
- Climate change

Flooding

The November 2009 flood event in the West of Ireland was an exceptional event in terms of long duration rainfall that extended over much of the West, South and Midlands. Analysis of rainfall amounts by Met Eireann indicated extreme rainfall with return periods generally in excess of 200 years.[18] There was severe flooding in a number of locations in the Region:

- River Shannon
- River Suck, impacting on Ballinasloe
- Clare River, impacting on Claregalway
- Dunkellin River
- Karst Areas in South Galway

A Joint Oireachtas Committee investigated the flood events and prepared a report with recommendations for the relevant Government Departments, Agencies and local authorities.[19]

WHERE DO WE WANT TO BE?

It is critical that we restore our substantial water resources and provide quality water services for the inhabitants of the Region and support economic development in the Region. In particular, there are a number of key objectives:

- Meet River Basin Management Plan targets in accordance with the timelines set out in the Plan.
- Provide Drinking Water with appropriate quality and in sufficient quantity to support human health and economic development
- Provide a waste water infrastructure that eliminates pollution of waters and with capacity to support economic development of our Region.
- Achieve better integration of water quality protection and land use planning. It has been suggested that Development Plans need better grounding in water quality related issues.[20]
- Develop a Catchment Flood Risk Assessment and Management Plan for the Region, based on an integrated approach, adopting best international practice, for example, making space for water and balancing the sometimes conflicting land use and stakeholder perspectives.
- Develop appropriate adaptation measures built upon land and water management practices to foster resilience to future climate change.
- Promote the sustainable use of water resources to the benefit of the Region; action is required in order to reduce the significant levels of Unaccounted for Water in our water supply systems.
- Promote an appreciation and respect of our water resources.

HOW WILL WE GET THERE?

It is essential that there is an integrated approach to the implementation of key EU Directives relating to water:

- Water Framework Directive[21]
- Flooding Directive[22]
- Marine Strategy Framework Directive[23]

PUBLIC WATER AND WASTEWATER FACILITIES

The Water Services Investment Programme (WSIP), published by DEHLG, in April, 2010 sets out a programme of investment for the period 2010 to 2012. The development of the Programme involved a number of steps as follows:

- DEHLG Circular setting out the framework of the investment programme and inviting Water Services Authorities to submit details on investment priorities. The Circular set out the criteria for prioritisation of projects as follows:[24]
  - *Water Conservation/leakage reduction*
  - *Environmental objectives*
    - *ECJ Judgements*
    - *Environmental & public health compliance*
  - *Economic objectives - works to support sustainable development of NSS hubs and gateways and strategically located areas & employment creation in line with the Smart Economy Report.*
- Local Authorities review priorities and prepare an "assessment of needs"
- DEHLG review "assessment of needs" submitted by each Water Services Authority against DEHLG policies and relevant River Basin Management Plans. The current WSIP

differs from previous plans in a number of ways, there is a focus on projects rather than schemes, giving greater clarity to works proceeding to construction during the lifetime of the plan. Projects and schemes are categorised by River Basin District.

A section of the WSIP entitled "Key features of the Water Services Investment Programme 2010-2012" highlights a number of projects in the Region:

- Very large scale wastewater projects proposed for the Greater Dublin area and Galway to support future economic development needs.
- Water schemes involving major investment for the supply of water, for example, the Central Regional in County Kerry, Costello in County Galway and Lough Mask Regional in County Mayo.
- Grouped schemes to provide infrastructure in villages/towns in West Cork, and counties Laois, Waterford and Roscommon.

Public Water Supply

In the short term, upgrade works are required for plants on the EPA Remedial Action List. However, these works will typically deal with short to medium term needs and it will be necessary to plan for long term needs also. Water loss from water distribution networks is generally considerably higher than sustainable economic levels and Water Conservation needs to be progressed across all of the Water Services Authorities. This should include watermain rehabilitation; Leakage Control; and Demand Reduction measures.

Public Sewerage

Secondary wastewater treatment plants are required for a number of agglomerations as identified above. There are a number of overloaded wastewater treatment plants that need upgrading in order to increase the level of compliance with the Urban Waste Water Regulations.

The planning of wastewater infrastructure to support the development of the Galway gateway needs to be progressed such that infrastructure can be provided in a phased basis to meet planned development needs. In particular, wastewater infrastructure will be required for the Strategic IDA Sites at Oranmore and Athenry. This infrastructure is included under the category of "Schemes at Planning Stages 2010-2012" for Galway County in the WSIP as the Galway Sewerage Scheme Phase 3 - Vol E (Galway East Infrastructure).

Group Water Schemes

The most recent Drinking Water Quality Report, published by the EPA shows that there are serious water quality issues in group water schemes in the Region. Water treatment plants with water quality failures need to be upgraded as a matter of urgency. It is appreciated that there are a number of schemes being upgraded as part of Design Build Operate (DBO) bundles under the Rural Water Programme and this should improve the water quality results in the next EPA Report. However, there are a number of schemes which have yet to be addressed in terms of eliminating water quality problems.

Typically, watermain network condition in Group Water Schemes is of poor quality, resulting in significant water loss. This has a number of impacts, it wastes a scarce water resource but more importantly can overload upgraded water treatment plants which are designed to cater for leakage levels of approximately 25%. Overloading of plants puts water quality at risk of failing to meet Drinking Water standards with consequent risk to consumers. Accordingly, Water Conservation needs to be progressed in parallel with the upgrading of water treatment plants. This should include watermain rehabilitation; Leakage Control; and Demand Reduction measures.

A long term framework for rural water supplies needs to be established which takes account of the viability of the existing scheme arrangements and any national authority set up to manage public schemes.

Septic Tanks (and other Individual Waste Water Treatment Systems)

As stated earlier, Septic Tanks and other Individual Waste Water Treatment Systems are major issues for the West Region. The first issue that needs to be addressed at a national level is the establishment of a licensing regime for such systems that will include provisions for inspection and monitoring.

It is likely that the inspection process will identify a significant body of work on existing treatment systems in order to achieve appropriate water quality standards. Furthermore, it may be difficult to retrofit solutions in some instances given that there are many areas in the Region where ground conditions are not suitable for disposal of effluent from Individual Waste Water Treatment Systems.

While the existing systems require a reactive approach, a proactive approach is required for proposed development in the Region and a stricter planning regime should be adopted to avoid new dwellings on unsuitable sites and building controls should be in place to ensure that systems that are approved for construction are inspected and properly constructed.

Flooding

Following the Flooding of November, 2009 reports were prepared on flood alleviation measures for the Clare and Dunkellin Rivers in Co. Galway.

The most significant development in terms of flood management in Ireland in recent decades has been the recently adopted strategy of a national programme of Catchment Flood Risk Assessment and Management Studies, CFRAMSs.

The Flood Risk Management Plan for the Lee Catchment is the primary pilot project for the National CFRAMS programme and the following are extracts from a Press Release issued at the launch of the Draft Plan for public consultation:

Flood risk in Ireland has historically been addressed through a reactive approach and the use of structural or engineered solutions. In 2004 the Irish Government adopted a new policy that shifted the emphasis towards a catchment based context for managing flood risk, with

Figure 4 The Western River Basin District

more proactive risk assessment and management, and increased use of non-structural and flood impact mitigation measures.

Catchment Flood Risk Assessment and Management Studies (CFRAMSs) and their product - Catchment Flood Risk Management Plans (CFRMPs) - are at the core of this new national policy for flood risk management and the strategy for its implementation. This policy is in line with international best practice and meets the requirements of the EU Floods Directive on the assessment and management of flood risks.

The appointment of consultants to undertake the catchment-based flood risk assessment and management studies for the Shannon River Basin District was announced in January, 2011. It is expected that work on the CFRAM for the Western RBD will commence later this year and will be the most important initiative for the Region in terms of flood management in the period to 2020.

Western River Basin Management Plan

Implementation of the Western River Basin Management Plan will play a critical role in restoring and protecting water quality in the extensive water resources in the Region. There are three important elements to the implementation process:

- Implementation of the Programme of Measures identified in the Plan e.g. elimination of pollution from wastewater discharges and agricultural activities. There are a number of legislative instruments which give effect to the various measures of the Water Framework Directive, for example, the Good Agricultural Practice for Protection of Waters Regulations (SI 101 of 2009).
- It is important that the River Basin Management Plan is integrated with other plans and in particular with land use and spatial plans.
- There is a need for better engagement with the public:
  - *Use of social marketing as a tool to get public support for the Plan and change behaviour to a sustainable use of our water resources.*
  - *Promote local actions to improve water quality in localised catchments. The "National Source Protection Pilot Project for Source Protection for Group Water Schemes" undertaken at Churchill and Oram GWS, Co. Monaghan is an example of such a local initiative. Key findings from this pilot included: "Ongoing community involvement must underlie all source protection initiatives. Central to this community involvement is the continuing education of all local stakeholders."*[25]

CONCLUSION

In conclusion, this Report highlights a number of the critical actions which must be taken at a national and local level to improve the quality of our extensive water resources in the Region and provide water services meeting the public health needs of residents and visitors to our Region and support commercial and industrial development in our Region. However, we all have a role to play in avoiding pollution of water and in the sustainable use of water and must appreciate that we have to pay for this precious resource.

BIBLIOGRAPHY

1 Final River Basin Management Plan for the Western River Basin District in Ireland (2009-2015); December 2009.

2 Global Water Partnership http://www.gwp.org/en/The-Challenge/What-is-IWRM/

3 The Institution of Engineers of Ireland Delivering Water Services For The 21st Century - Submission To Government, June 2004.

4 Seanad Debate on Water Services on Wednesday, 12 January 2011 http://debates.oireachtas.ie/seanad/2011/01/12/00007.asp

5 EU/IMF Programme of Financial Support for Ireland, 16 December 2010 http://www.finance.gov.ie/documents/publications/reports/2011/euimfrevised.pdf

6 Government for National Recovery 2011 - 2016 published on 6th March, 2011.

7 The Provision and Quality of Drinking Water in Ireland - A Report for the Years 2008 - 2009, Environmental Protection Agency, February, 2010.

8 Census 2006, Volume 6 - Housing, Table 13 Private dwellings in permanent housing units in each Province, County and City, classified by water supply and sewerage facilities.

9 'Urban Waste Water Discharges in Ireland for Population Equivalents Greater than 500 Persons - A Report for the Years 2006 and 2007", published by the EPA, 2009.

10 Based on Draft Urban Waste Water compliance tables for 2009 for Mayo, Galway, Galway City and Roscommon, provided by the EPA.

11 Census 2006, Volume 6 - Housing, Table 13 Private dwellings in permanent housing units in each Province, County and City, classified by water supply and sewerage facilities.

12 Judgment of the Court of Justice of the European Communities on 29 October 2009 in Case C 188/08 brought on 6 May 2008 by the Commission of the European Communities against Ireland.

13 Code Of Practice - Wastewater Treatment and Disposal Systems Serving Single Houses (P.E. < 10), published by the EPA, 2009.

14 Houses of the Oireachtas, Joint Committee on European Scrutiny, EU Scrutiny Report No. 31, EPA Code Of Practice On Single Houses And Wastewater, Report of 30th June, 2010.

15 Presentation by Ivan Grimes, Water Services Policy Section, Department of the Environment, Heritage and Local Government at the Water Services Training Group and National Federation of Group Water Schemes 9th Annual Rural Water Services Conference, "Sustaining Water Quality in Drinking Water Supplies", 16th September 2010.

16 Proposed Renewed Programme for Government, 10th October 2009.

17 "Water Quality in Ireland Report 2007 - 2009", published by the EPA on 23rd February, 2011.

18 "Comment On The November 2009 Flooding In The Shannon And Corrib Systems", Conleth Cunnane, Anthony Cawley, Irish National Hydrology Conference.

19 "The Management of Severe Weather Events in Ireland & Related Matters", Joint Committee on the Environment, Heritage and Local Government, Fourth Report of the Joint Committee, 20th July 2010.

20 "Implications of Ground and Surface Water Regulations for Planning Policy and Practice", Mr. Niall Cussen, Senior Adviser, Department of the Environment Heritage and Local Government, EPA/DEHLG Water Quality Seminar.

21 EU Water Framework Directive (2000/60/EC) transposed into Irish Law by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003).

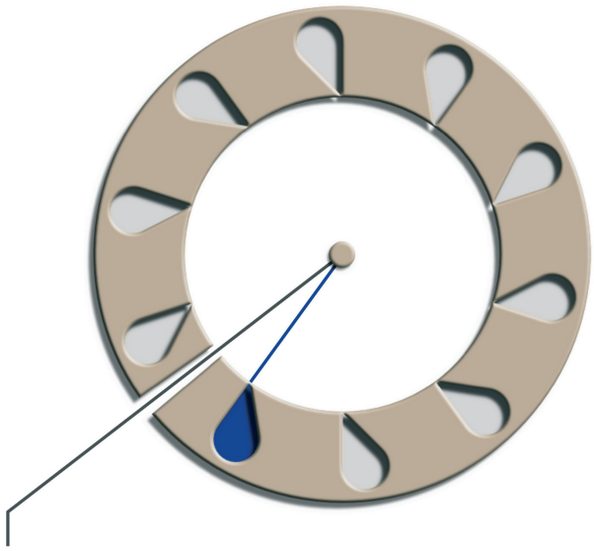
22 EU Floods Directive (2007/60/EC) transposed into Irish Law by the European Communities (Assessment and Management of Flood Risks) Regulations 2010. (S.I. No. 122 of 2010).

23 The Marine Strategy Framework Directive (2008/56/EC) establishes a legally binding framework within which Member States shall take the necessary measures to achieve or maintain good environmental status in the marine environment by the 2020 at the latest. It has not yet been transposed into Irish law.

24 "Water Services Investment Programme 2010-2012", Gerry Galvin, Principal Adviser (Water), Department of the Environment, Heritage and Local Government, Engineers Ireland, 7th March, 2011.

25 Presentation by Dr Suzanne Linnane, National Centre for Freshwater Studies, Dundalk Institute of Technology at the Rural Water Annual Conference, 18th September, 2008.

LAND USE AND WILDLIFE



"protecting and restoring existing biodiversity and natural habitats through appropriate land use and integration into the built environment"

Section Contents

KEY RECOMMENDATIONS

01 Protect and restore natural habitats by promotion of good practice, better integration of spatial planning and implementation of the Green Infrastructure Report.

02 Devise and implement a more strategic and coordinated approach to the development of projects of strategic regional importance in Natura 2000 Sites.

03 Promote a shift from negative stakeholder engagement at project level to positive engagement in the preparation of spatial plans.

EXECUTIVE SUMMARY

Introduction

The West Region is an evolving modern economy and also has a significant and valuable resource in its natural heritage. The extent of biodiversity, flora and fauna in the Region enhances our quality of life; however, it also represents a real challenge in achieving sustainable development.

Land Use Planning plays a fundamental role in achieving a balance between the economic and social development of the Region and the protection of our natural heritage.

Current Status

The West Region constitutes 20.4% of the land area of the state but accounts for only 9.8% of the population. While population growth between 2001 and 2006 was marginally above the national average, there were variations across the Region, with growth in Galway City and County double that for Mayo.

The Regional Planning Guidelines identifies two land use initiatives with the potential to have a significant positive impact on the economy of the Region, the Atlantic Gateways Initiative and the Oranmore to Athenry Strategic Development Area.

While the West Region is fortunate to have extensive and diverse natural habitats, it has suffered from negative anthropogenic impacts e.g. the problems caused by septic tanks in the extensive karst areas in the Region. A stricter planning regime is required to deal with the issue of rural housing for this and other reasons.

Given the extent of the Coillte forest estate in the Region that is located in sensitive habitats, the approach to the management of these lands by Coillte will be important for the protection of habitats and wildlife in the Region. Furthermore, the public forest estate includes significant recreational amenities for inhabitants of the Region and tourists and with significant potential to support healthy lifestyles.

There is a need to strike a balance between nature conservation and the economic and social needs of the Region. For example, we face a challenge in realising the huge renewable energy potential that exists in our Region.

Public engagement in land use planning has typically been negative and focused at individual developments.

Where do we want to be?

We want to develop and implement land use strategies for the West Region that:

- Support our vision for the Region.
- Protect and restore biodiversity and natural habitats.
- Support the sustainable use of our natural resources.
- Provide a more rational approach to dealing with potential conflicts between development and habitat protection.

04 Develop, as a matter of urgency, a Marine Spatial Planning Framework to support the sustainable use of our significant ocean resource.

05 Use spatial planning to promote the Vision for the Region, developing a City Region based on the Galway Gateway and putting people at the heart of urban planning.

06 Devise and implement a "no gain and no pain" policy for landowners where there are changes in zoning or environmental designations.

- Encourage positive stakeholder engagement.

How will we get there?

There are a number of measures that we can take to protect and restore natural habitats in our Region, while at the same time promoting the development of a dynamic and vibrant Region:

- Shift focus from enforcement to promotion of good practice in the protection of habitats.
- Achieve better integration of River Basin Management Plans into spatial planning and control.
- Promote local actions to improve our environment.
- Maximise the sustainable use of the public forest estate.
- Implement the recommendations of the Green Infrastructure Report.

There is a need for a more strategic and coordinated approach to development in Natura 2000 Sites. There would be merit in dealing with this at plan rather than project level. We should learn from experience in other jurisdictions, e.g. the approach taken in the UK with respect to the Severn Tidal Power project.

There is a need for greater stakeholder engagement at the time of preparation of various spatial plans, extending beyond self interest in zoning of lands.

There is an urgent need to develop a Marine Spatial Planning Framework to support the sustainable use of our significant ocean resource. Progress on this is urgently required if Ireland is to benefit from the significant offshore renewable energy resources in our marine waters.

Spatial planning should promote the Vision for the Region; measures to support this would include:

- Developing a City Region based on the Galway Gateway, with a mutual dependency between the city and the Region. There is potential to explore international initiatives on cities, e.g. "Smart Cities" and "Sustainable Cities" to determine the opportunities to position Galway and the Region on the global map.
- Spatial Planning is one of the factors influencing the 'Talent, technology and tolerance' that is key to attracting the creative workers required by our knowledge economy.

Changes in zoning or environmental designations should not result in any gain to landowners. On the other hand, landowners should not be at a loss if traditional practices are being interfered with by changes in environmental designations.

LAND USE AND WILDLIFE

INTRODUCTION

The West Region is an evolving modern economy based on traditional sectors such as agriculture, fisheries and forestry, a vibrant tourism sector and established clusters in the medical device and ICT sectors.

The River Shannon and its system of lakes form the eastern boundary of County Roscommon and of the region for 100 kilometres. County Mayo and County Galway are located on the western seaboard and are part of the Atlantic rim of the European Union. Galway City is a major regional centre and has a significant role for the region in the provision of 3rd level education. The West Region is also home to the largest Gaeltacht areas in the country.

The West Region has a significant and valuable resource in its natural heritage with a wide variety of species and habitats of local, national and international importance. The extent of biodiversity, flora and fauna in the Region enhances our quality of life, however it also represents a real challenge in achieving sustainable development[1].

Land Use Planning plays a fundamental role in achieving a balance between the economic and social development of the region and the protection of our natural heritage.

There is a hierarchy in Land Use Planning and a parallel environmental framework as shown in Tabel 1, which has been extracted from the West Region Planning Guidelines[1].

There are various mechanisms to take account of habitats and wildlife in this land use planning framework:

- In preparing Development Plans, account must be taken of various environmental designations eg. Natura 2000 site

European Spatial Development Perspective 1999	European Directives; Conventions & Agreements
↓↓↓↓↓	
National Spatial Strategy 2002	Other National Strategies/ Plans/ Guidelines (e.g. National Development Plan, Policies and programmes of Government Departments, Capital Programmes, Planning Guidelines, Urban & Village Renewal Programmes, Serviced Land Initiative)
↓↓↓↓	
Regional Planning Guidelines 2010	Other Regional/ Local Level Plans (e.g. Capital Programmes, Regional Waste Management Plan/Strategy, River Basin Management Plan)
↓↓↓	
County, City & Town Development Plans (e.g. Galway City Development Plan, Roscommon County Development Plan)	County Development Board Strategies, Corporate Plans (e.g. Galway County Development Board Strategy)
↓↓	
Local Area Plans (e.g. Tuam Local Area Plan)	
↓	

Table 1 Planning Context & Other Relevant Plans or Strategies

designations and reports such as the Western RBMP

- Plans are assessed under various environmental procedures/processes. For example, a Strategic Environmental Assessment and Habitats Directive Assessment were undertaken in parallel with the preparation of the West Region Planning Guidelines.

CURRENT STATUS

The key demographics for the West Region are shown in Table 2 below. Issues to note are as follows:

- While the West Region constitutes 20.4% of the land area of the state, it accounts for only 9.8% of the population i.e. population density for the region is less than half the national average.
- While population growth between the census of 2001 and 2006 was marginally above the national average, there were variations across the region with an increase of 10.8% in Galway City and County as against an increase of 5.4% for Mayo.

The current status of the key land use plans that are relevant to the West Region are shown in Table 3 below. It can be seen that the various plan periods are not synchronized e.g. 3 of the County Development Plans were published in advance of the current Regional Planning Guidelines.

The Regional Planning Guidelines states that "the settlement structure stems from the National Spatial Strategy 2002 - 2020. It includes the Gateway, Hub, Linked Hub, Key Towns,

	Population				
	2002 Census	2006 Census	Increase (%) 2002 to 2006	Area (km²)	Density (Persons /km²)
Galway County	143,245	159,256	11.18	6,100	26
Galway City	65,832	72,414	10.00	51	1,432
Galway City & County	209,077	231,670	10.81	6,151	38
Mayo	117,446	123,839	5.44	5,588	22
Roscommon	53,774	58,768	9.29	2,548	23
West Region	380,297	414,277	8.94	14,287	29
State	3,917,203	4,239,848	8.24	70,182	60

Table 2 Key Demographics for West Region

Plan	Level	Plan Period	Date
National Spatial Strategy (2010 Update and Outlook)	National	2002 - 2020	4th October, 2010
Regional Planning Guidelines for the West Region	Regional	2010 - 2022	19th October, 2010
Galway County Development Plan	Local Authority	2009 - 2015	3rd May, 2009
Galway City Development Plan		2011 - 2017	21st February, 2011
Mayo County Development Plan		2008 - 2014	6th May, 2008
Roscommon County Development Plan		2008 - 2014	

Table 3 Status of Key Land Use Plans for West Region

County Towns, other settlement centres and rural population distribution". Figure 1 shows the Spatial Settlement in the region.

The Regional Planning Guidelines identifies two land use initiatives with the potential to have a significant positive impact on the economy of the region, the Atlantic Gateways Initiative and the Oranmore to Athenry Strategic Development Area.

Atlantic Gateways Initiative

The Atlantic Gateways Initiative examines how Cork, Limerick, Waterford and Galway can perform as a national investment corridor to rival the most competitive city region corridors and accelerate regional growth in a sustainable manner. The Regional Planning Guidelines support the objectives of the Atlantic Gateways Initiative and in particular the recommendations and objectives set out for the Galway - Limerick/Shannon section of the corridor in the 'Atlantic Gateways Corridor Development Frameworks Overview Report' published by the Department of the Environment, Heritage and Local Government.

Figure 1 The Spatial Settlement in the region

Oranmore to Athenry Strategic Development Area

Economic corridors particularly industrial corridors such as the Oranmore - Athenry Strategic corridor must be developed/promoted and serviced to high international standards to attract further Foreign Direct Investment, building on strategic location and infrastructure. This corridor should be promoted in a sustainable manner as a centre for major national and international enterprises.

Two of the ten sites in the state designated by the IDA as Strategic Sites are located in this Strategic Development Area.

Impacts on our Natural Heritage

Figure 2 shows the environmental designations for the region, as extracted from the Regional Planning Guidelines.

While the West Region is fortunate to have extensive and diverse natural habitats, it has suffered from negative anthropogenic impacts:

- Overgrazing in the Connemara Bog SAC has resulted in peat and soil erosion and consequential impacts on water quality and habitats
- Septic tanks catering for dwellings in karst areas have impacted negatively on ground water quality

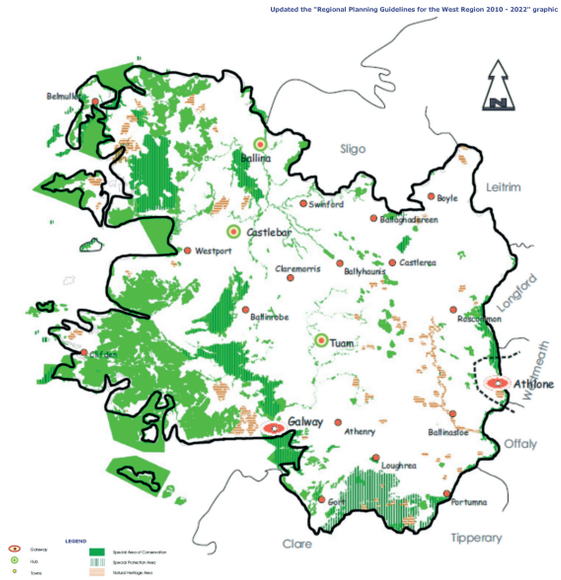


Figure 2 The Environmental Designations for the Region

- Agriculture activities have impacted negatively on water quality and habitats across the region
- Construction of a wind farm at Derrybrien was deemed to be a contributory factor in a significant peat slide in the in the Slieve Aughty Hills of Co. Galway in October, 2003 and resulted in habitat loss and pollution of watercourses.

The Section of this Report on Sustainable Water outlines the problems caused by septic tanks in the extensive karst areas in the region and the negative impact on groundwater and dependent ecosystems. A stricter planning regime is required to deal with this issue of rural housing for a number of reasons:

- To avoid negative impact on ground water quality from septic tanks sited in unsuitable ground conditions.
- To avoid the negative impact of the commuter traffic linked with rural housing in terms of carbon footprint and quality of life.
- To facilitate a more sustainable approach to the provision of services such as water supply, telecommunications, electricity, sustainable transport services, medical services, postal services, shops, schools, community services in settlement centres as against a dispersed rural population.
- To facilitate the delivery of all services in settlement centres and to have community care for the aged in such settlement centres. The current approach to rural housing will have repercussions in 30 years time when we have a large population of aged people who are no longer independently mobile.

THE FOREST ESTATE

The public forest estate, managed by Coillte, comprises 7% of the land area of Ireland.

The entire Coillte estate is divided into a management structure of Districts and Forests. There are 13 districts nationwide and these are sub-divided into a total of 321 Forests. There are 3 districts which are in part or totally included in the West Region.

- W1 Clare / South Galway
- W2 East Galway / Roscommon
- W3 Connemara / Mayo

Coillte has prepared Draft District Strategic Plans (DSPs) for all of the Districts in the country and a consultation process was undertaken over the period 28th February to 4th April 2011. The aim of the DSPs is to set out a vision for each District for the next 20 years and beyond and short-term (5 years) priority objectives to be addressed during the period of the plan (2011 to 2015).

LAND USE AND WILDLIFE

Coillte manages its forests to Forest Stewardship Council's (FSC) International Forestry Standard which has been interpreted for Ireland by the Irish Forest Certification Initiative. Forest certification verifies that sustainable forest management is being practiced.

Sustainability is the key principle on which the DSPs are based and requires meeting four closely related objectives:

- Wise use of natural and cultural resources
- Effective protection of the environment
- Sustainable supply of forest products (wood and non-wood)
- Working with communities

Land use for the forest estate is varied and includes the following:

- Timber production for use in sustainable wood products, as discussed in the section on sustainable materials
- Renewable energy through wind energy generation and through biomass
- Telecommunications
- Recreation facilities - Coillte operates an open access policy for walkers and pedestrian users and has developed a website to provide information to the public www.coillteoutdoors.ie
- Natural habitats, promoting biodiversity. Over 15% of the estate is actively managed for nature conservation. In the Mayo Connemara District 28% of the Coillte estate is designated for biodiversity, involving 130 sites.

Coillte has taken a number of initiatives to support nature conservation that have potential for positive impact on the region:

- Coillte has received approval in late 2010 from the European Commission for the largest raised bog restoration project in Ireland under the EU LIFE+ Programme for the promotion of nature conservation. The project will involve the restoration and conservation of over 630 hectares of raised bog in 7 counties, including Galway and Roscommon.
- The Wild Nephin Project is looking at the feasibility of setting aside an extensive area in the Nephin Beg Mountains in the District for the development as a wilderness area. The concept of setting aside and maintaining wild lands for the protection of natural resources and enjoyment of future generations has been evolving in other developed western countries for decades. In the United States the concept is highly developed in the National Wilderness System established in 1964 to protect wild landscapes[2].

Given the extent of the Coillte forest estate in the region that is located in sensitive habitats, the approach to the management of these lands by Coillte will be important for the protection of habitats and wildlife in the region. Furthermore, the public forest estate includes significant recreational amenities for inhabitants of the region and tourists and with significant potential to support healthy lifestyles.

Balancing Development Needs and Protection of our Natural Heritage

There are extensive areas in the region that are designated as Natura 2000 Sites and a critical issue that needs to be addressed is the land use strategies for such designated sites. There is an argument that no development should occur in such designated sites. However, such a strict

approach would curtail any ambition for Galway as a Gateway for the region, given that its water supply is sourced from Lough Corrib and its wastewater is discharged to Galway Bay, both designated Natura 2000 sites.

Our processes for balancing development objectives and environmental protection objectives are not fit for purpose:

- Outcomes are difficult to predict
- Result in considerable time delays
- Result in significant additional costs

The Galway City Outer Bypass is a critical element in the transport infrastructure for Galway and the region and has stalled at the planning stage because of a failure to balance the development objectives and the environmental protection objectives.

The West Region faces a challenge in realising the huge renewable energy potential that exists in the region on account of the extensive areas that have been zoned as Natura 2000 sites. The potential conflicts between Climate change and renewable energy policies and policies on nature conservation is an issue that has been faced in other jurisdictions also. The text box below highlights how this conflict was considered on the Severn Tidal Power project.

SEVERN TIDAL POWER (STP) PROJECT

The huge 14-metre tidal range of the Severn estuary, one of the highest in the world, represents a renewable, predictable resource with the potential (through a tidal power scheme) to generate up to 5 percent of the UK's electricity needs, and so potentially make an important contribution to the UK's renewable energy targets and wider climate change and energy goals in the future.

Following a 2 year feasibility study on the project, the UK government has decided not to proceed with the project at this time. As part of the feasibility study on the tidal power project in the Severn Estuary, the Sustainable Development Commission lead an investigation[3] into possible approaches to novel habitat compensation. The following is an extract from the Report:

> *A decision to go ahead with one of the larger of the proposed STP schemes, such as the Cardiff Weston barrage or the Fleming lagoon, would represent a stepchange in renewable infrastructure in the UK. It is highly likely that the impacts on the Severn Estuary caused by such a scheme could not be wholly compensated for within the current, non-statutory European Commission guidance on the Habitats and Birds Directives ("the Directives"). This study therefore attempts to answer whether, in principle, additional and novel compensation measures could be put in place which are outside current guidance but would comply with the Directives: by enhancing the overall coherence of the Natura 2000 network and/or the conservation status of species and habitats within it. In other words, a step change in delivering on climate change reduction /increasing energy diversity*

supply /climate change adaptation merits a step change in ambition when thinking about ecological networks.....

We have proposed a set of principles and tests which could begin to form the basis of a new methodology for compensation outside current EU guidance but compliant with the Directives themselves.

Chris Huhne, Secretary of State for Energy and climate change, and Caroline Spelman, Secretary of State for the Department of Environment, Food and Rural Affairs, have written to the EU Energy and Environment Commissioners in the context of the Severn feasibility study, to ask them to consider how to ensure the regulatory and legal clarity which potential investors in large scale renewable energy projects need while meeting EU environmental protection and biodiversity objectives. The following is an extract from these letters:

We should emphasise that environmental legislation was not the reason for recommending against proceeding with a scheme at present. However, there remains the possibility that a Severn tidal power scheme could come forward from either the private or public sector. Against the background of the findings of our feasibility study, we believe that it is now time to consider the practical implications of how it would be possible in practice for a large scale renewable energy scheme to comply with relevant environmental legislation. We are supportive of the tests the regulation sets, including the principles of mitigation and compensation, and the primacy of the national interest test in particular. The key issue is to understand more clearly the requirement for compensation in the Habitats and other directives in circumstances that are not covered in the current regime, in order to reduce investment risk.

In this context, we would very much like to discuss the findings of the feasibility study with the Commission. We would also encourage the Commission to give a considered view - in the context of the European Energy Strategy, the Energy Infrastructure Package and the Smarter Regulation Programme - on the role that you envisage large scale renewable energy projects should take and how to ensure the regulatory and legal clarity which potential investors in large scale renewable energy projects need, while meeting EU environmental protection and biodiversity objectives.

Public Engagement

Public engagement in land use planning has typically been negative and focused at individual developments. Examples from the region include:

- The Mutton Island Wastewater Treatment Plant in the mid 1990's
- The Eyre Square Development in Galway city.
- The Corrib gas development in North Mayo.

WHERE DO WE WANT TO BE?

We want to develop and implement land use strategies for the West Region that:

- Support our vision of "an agile and sustainable West Region, benefiting from world class industrial clusters, a vibrant economy and our rich natural and cultural heritage."
- Protect and restore biodiversity and natural habitats through appropriate land use and integration into the built environment.
- Support the sustainable use of our natural resources for agriculture, forestry, sea fishing, aquaculture and renewable energy generation.
- Provide a more rational approach to dealing with potential conflicts between development and habitat protection that provides transparency, greater certainty and efficiency.
- Encourage positive stakeholder engagement.

HOW WILL WE GET THERE?

There are a number of measures that we can take to protect and restore natural habitats in our region, while at the same time promoting the development of a dynamic and vibrant region:

- The statutory bodies with responsibility for enforcing the law on protection of habitats should have a greater role in promoting and encouraging good practice on habitat protection, and providing information and advice to organisations and individuals.
- There is a need for better integration of River Basin Management Plans into spatial planning and control.
- Promotion of local actions to improve water quality in localised catchments, as suggested in the Sustainable Water section of the report, could have very positive consequences for habitat restoration.
- There is potential to increase the level of engagement between Coillte, local communities and state agencies to maximise the sustainable use of the forest estate in terms of its economic use, nature conservation and enhanced recreational use.
- The recommendations of the Green Infrastructure Report[4] should be implemented in a phased manner and integrated with other spatial planning measures. The Report states that "There is a need to proactively develop Green Infrastructure, and in particular ecological connectivity, which will both enhance biodiversity and human wellbeing, and improve resilience and adaptation to climate change."

There is a need for a more strategic and coordinated approach to development in Natura 2000 Sites. It is beyond the scope of this Report to set out a detailed approach or protocol on this but we include below some of the factors that should be considered:

- Natura 2000 sites are important elements of our natural heritage and any impacts should be minimised and for projects of strategic importance to the region there is a need to achieve a balance between project objectives and nature conservation.
- Any measures to relax requirements for projects of strategic importance should be balanced by compensating positive measures elsewhere.
- There would be merit in dealing with this at plan rather than project level. Firstly, it would be possible to look at the effects of projects in combination. For example, a pumped storage facility would be considered in conjunction with windfarm locations and any grid extension or enhancement. Secondly, it facilitates a more objective and integrated assessment of the proposed developments. Thirdly, it is a more

appropriate scale given the complex procedures involved in Appropriate Assessments under the Habitats Regulations, particularly if it must rely on IROPI qualification, where the project is required for "Imperative Reasons of Over-riding Public Interest".

- We should learn from experience in other juristictions, e.g. the approach taken in the UK with respect to the Severn Tidal Power project, referred to above.

There is a need for greater stakeholder engagement at the time of preparation of various spatial plans, extending beyond self interest in zoning of lands. It is accepted that this is a challenge for authorities preparing plans but there is much that can be learned from international practice in this area. This should lead to positive contribution and input to the creation of plans. This would be a change from current practice where public engagement is by and large negative and focused on specific developments.

There is an urgent need to develop a Marine Spatial Planning Framework to support the sustainable use of our significant ocean resource. It is hoped that the implementation of the EU Marine Strategy Framework Directive[5] will be used as an opportunity to achieve a more coordinated and integrated approach between the various agencies involved in marine spatial planning. Progress on this is urgently required if Ireland is to benefit from the significant offshore renewable energy resources in our marine waters.

Spatial planning should promote the Vision for the Region, "An agile and sustainable West Region, benefiting from world class industrial clusters, a vibrant economy and our rich natural heritage". Measures to support this would include:

- Developing a city region based on the Galway Gateway, with a mutual dependency between the city and the region. There is potential to explore international initiatives on cities, e.g. "Smart Cities" and "Sustainable Cities" to determine the opportunities to position Galway and the region on the global map. It is appreciated that this is a challenge given that the city, with a population less than 100,000, is insignificant in an international context.
- We need to put people at the heart of urban planning and in particular in the design of our public spaces.
- Spatial Planning is one of the factors influencing the 'Talent, technology and tolerance'[6] that is key to attracting the creative workers required by our knowledge economy.

Changes in zoning or environmental designations should not result in any gain to landowners. On the other hand, landowners should not be at a loss if traditional practices are being interfered with by changes in environmental designations. The issue of individuals benefiting from rezoning has been considered on a number of occasions, firstly in the Kenny Report[7] of 1973 and most recently by the All-Party Oireachtas Committee on the Constitution Report[8] of 2004. While, it is unlikely that there would be much political appetite to tackle this issue now given the current property

crisis, it can be argued that it is an opportune time to finally address this contentious issue, given that the level of property transactions is at a low level. In any case, it is suggested that a new framework is required to support an improved approach to land use planning.

BIBLIOGRAPHY

1 Regional Planning Guidelines for the West Region 2010 - 2022, Made by the West Regional Authority on 19 October, 2010.

2 Coillte Mayo Connemara District (W3) District Strategic Plan - Draft Consultation Document, February, 2011.

3 Equal Value - Can a major Severn Tidal Power scheme be compatible with enhancing the Natura 2000 Biodiversity Network? Recommendations to the Severn Tidal Power Project Board as part of the Severn Tidal Power Feasibility Study, the Sustainable Development Commission, December, 2010.

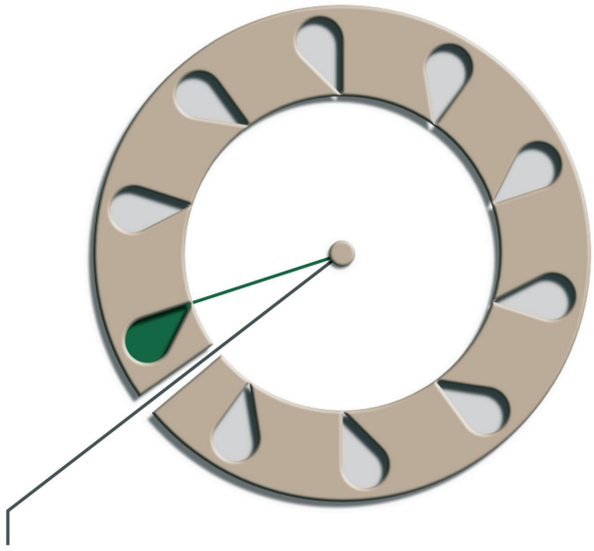
4 "Creating Green Infrastructure for Ireland - Enhancing natural capital for human wellbeing", Comhar Sustainable Development Council, August 2010.

5 The Marine Strategy Framework Directive (2008/56/EC) establishes a legally binding framework within which Member States shall take the necessary measures to achieve or maintain good environmental status in the marine environment by the 2020 at the latest. It has not yet been transposed into Irish law.

6 Talent, Technology and Tolerance in Canadian Regional Development, Working Paper Series: Ontario in the Creative Age, Richard Florida, Charlotta Mellander, and Kevin Stolarick, Martin Prosperity Institute, University of Toronto, March 2009.

7 Kenny Report, Kenny J. (chairman), Committee on the Price of Building Land: Report to the Minister for Local Government (1973), Stationery Office, 1974.

8 The All-Party Oireachtas Committee on the Constitution, Ninth Progress Report, Private Property, 2004.



"reviving local identity and wisdom; supporting and participating in the arts"

Section Contents

KEY RECOMMENDATIONS

01 Continue the financial support for the arts and for the international and local arts festivals throughout the West Region.

02 Construct a state-of-the-art performance venue of appropriate size in Galway city.

03 Provide exhibition space for the arts in the centre of Galway city and in the major towns in the region.

EXECUTIVE SUMMARY

The West Region has been populated for more than 5,000 years, based on the evidence from the Céide Fields, of a highly organised, large and peaceful community of farmers who worked together on clearing hundreds of acres of forestry and dividing the land into regular field systems. Their main economy was cattle rearing but they were skilled craftspeople and builders in both wood and stone and also had strong spiritual beliefs. We must presume that they were preceded by hunter gatherers.

Many consider the Western and North Western part of the Region to be 'remote' and 'inaccessible'. Hundreds of years ago and more this was not the case. The sea, rivers and lakes of the West Region were the 'motorways' of their time. It was the densely forested interior of the country that was remote and 'inaccessible' back then. Those that lived along the West coast were engaged in international trade with places as far away as Spain and probably into the Mediterranean itself. Grainne Ní Mháille was engaged in piracy from Waterford to the Scottish coast. Much of the trade between Galway and Conamara was by sea using Galway Hookers and similarly for trade between the Aran Islands and Clare.

Cromwell forced people from their lands in the other 3 provinces into Connacht and then the West of Ireland suffered worst of all from the famine. This means that the indigenous population of the West Region are descendants of the survivors of those people who survived such hardship making them a resilient, resourceful people.

The West Region is home to the largest Gaeltacht area and population. The language and culture is a unique differentiator. The language is worth over €130m to Galway city and county alone. There is a thriving audio-visual media industry in Conamara. Galway is home to An Taibhdhearc, the National Irish Language Theatre. Riverdance had its genesis in Irish dancing and has been a global phenomenon. Many tourists to the West Region seek out venues where Irish traditional music is played.

The Arts play a vital role in our economy and investment of taxpayers' money in the Arts is repaid, many times. There are about 50,000 people employed in the arts in Ireland, which is also one of the key drivers of tourism. Our artistic heritage and our centuries-long artistic achievements endure and have significantly enhanced the image and reputation of Ireland overseas as an innately creative people. The Western Development Commission have recommended the preservation of the landscape, built environment and natural heritage of the Region to ensure that the West's

CULTURE AND HERITAGE

04 Proceed with the implementation of the 20-Year Strategy for the Irish Language as quickly as possible.

05 Implement the National Biodiversity Plan to secure the preservation of our natural heritage and ensure that creative place strengths are maintained in the West Region.

06 Develop new tourism products incorporating archaeology, natural and cultural heritage to take advantage of the rich resources of the West Region.

creative place strengths are maintained. There are a number of annual International Arts Festivals held in the West Region. The Arts make a significant contribution to the economy of the West Region but not only that, they also make a major contribution to the quality of life of those living and working in the West Region. While Castlebar has a fine, modern performing arts space there is no equivalent in Galway City which is a major disadvantage. There is also a shortage of spaces for exhibiting artists work throughout the Region.

The West Region has a unique natural heritage and landscape. This unique environment supports a fragile biodiversity that must be protected.

Engineers Ireland West Region believes that it is vital to continue the support for the arts and for the arts festivals throughout the Region. It believes that an appropriate performing arts venue of appropriate size should be built in Galway and this would contribute significantly to the attraction of tourists to the West Region. Art exhibitions spaces should be provided in Galway city centre and in the major towns in the Region.

There is an opportunity to design a new tourism product incorporating the extensive archaeology, and unique natural heritage and culture of the West Region to attract tourists.

The Irish Language and Culture is a key element of what makes the West Region unique. It is important that the Government's 20-year strategy for the Irish Language is successfully implemented without delay.

There is the potential for synergies to develop between those engaged in the creative arts, digital gaming, ICT and high end manufacturing. These synergies can contribute to a vibrant, exciting, imaginative environment which fosters creativity and innovation in the Region.

CULTURE AND HERITAGE

Introduction

Arts and culture strategies help to reveal and enhance the underlying identity - the unique meaning, value, and character - of the physical and social form of a community. This identity is reflected through the community's character or sense of place. A community's sense of place is not a static concept; rather, it evolves and develops over time, reflecting the spectrum of social values within and around the community.

Awareness of community identity and character is strengthened by the consideration of all community interests in decision-making processes; the integration of arts and cultural resources with civic visioning programs; and the balancing of the inherent conflicting nature of past, present, and future social values.

Where have we come from?

People have been living in the West Region for thousands of years. Patrick Caulfield from Belderrig, a local schoolteacher, discovered what is now known as the Céide Fields in North West Mayo back in the 1930s. This man's son, Seamus, became an archaeologist and 40 years later he began studying these stones in the bogs, and realised what they were all about. It is now known that these are the remains of a Stone Age landscape of stone walled fields, houses and megalithic tombs over 5,000 years old, preserved beneath the growing blanket bog[1]. Its inhabitants were farming there before the blanket bog that now covers so much of the West Region started to grow and before the Egyptians built the pyramids.

They were a highly organised, large and peaceful community of farmers who worked together on clearing hundreds of acres of forestry and dividing the land into regular field systems. Their main economy was cattle rearing but they were skilled craftspeople and builders in both wood and stone and also had strong spiritual beliefs.

The West Region is now considered to be "remote and "inaccessible" compared to other parts of the country. Thousands of years ago it was the densely forested interior of the country that was remote and inaccessible. The sea, bays and inlets and rivers and lakes of the West Region were the motorways of that time giving access to areas where people could live and farm close to these water "motorways". The Clifden based Archaeologist, Michael Gibbons, has spent many years uncovering the hidden heritage and evidence of communities living by the sea shore and on the banks of rivers in the West Region who were engaged in fishing and farming going back to the Stone Age.

The West Region has a strong maritime heritage. Those that lived along the West coast were engaged in international trade with places as far away as Spain and probably into the Mediterranean itself. The film maker, Bob Quinn, in his book[2] and the documentary series 'Atlantean' has highlighted the many similarities between the Galway Hookers and the Felucca's that ply the River Nile in Egypt and the similarity of sean nós singing in Conamara to singing in

Northern Africa. Galway city had a strong trade with Spain. Fishing has been always been an activity associated with the West Region and still is with the Fishery Harbour at Ros an Mhíl. Much of the trade between Galway City and Conamara was by Currach and Galway hooker until the relatively recent development of roads into Conamara. Turf was shipped from Conamara to Clare by Galway hooker. Trade with the Aran Islands was by sea and sea transport from Ros an Mhíl is still the main means of access to the Aran Islands.

Gráinne Ní Mháille (Gráinne Mhaol/Granuaile /Grace O'Malley) (c.1530 - c.1603) inherited a fleet from her father whose family plied an international sea trade trading with ports as far away as Spain. Gráinne herself engaged in piracy from the Waterford coast to the West Coast of Scotland from her base in Co. Mayo.

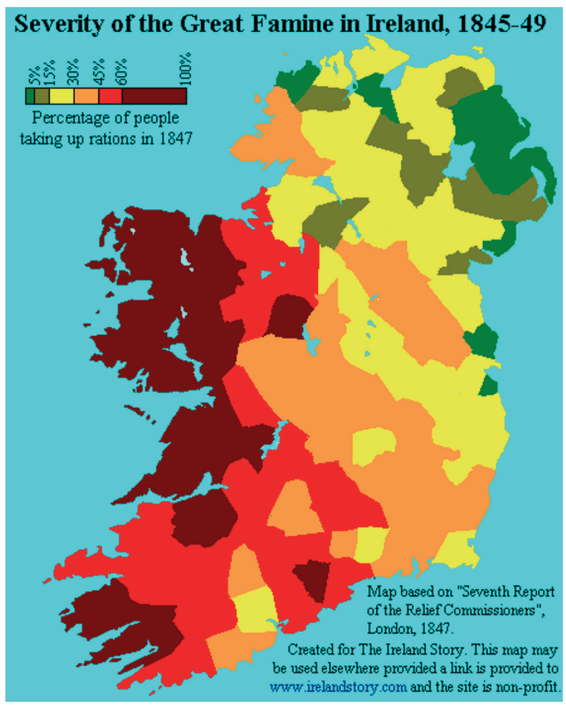


Figure 1 Severity of the Great Famine in Ireland, 1845-49

After the Cromwellian conquest in 1649-1653 the Irish population that had survived death or deportation were driven off the better land east of the Shannon with the cry "To hell or to Connacht" and that land was divided out as spoils among Cromwell's soldiers.

The famine in 1845-1849 hit Connacht the hardest because it was here that the population was most dependent on the potato crop. See Figure 1[3]. The indigenous people of the West Region are descendants of those early Stone-Age people who settled along our coastline, rivers and lakes, they are the people who survived the tyranny of Cromwell and the famine. That heritage has resulted in a strong, resourceful, resilient and adaptable indigenous community who are now the majority of the proud residents of the West Region.

We need to learn more about our past and from our past. The more we learn the more we will appreciate the tremendously rich cultural and natural and built heritage that we have inherited. This will help us to revive our local identity and the wisdom we will gain will enable us to enhance and protect it for future generations.

CURRENT STATUS

THE GAELTACHT AND GAEILGE

The West Region is home to the largest Gaeltacht communities in Conamara and in Tuar Mhic Éadaigh, Acaill and North West of Mayo.

Gaillimh le Gaeilge was established in 1987 with the aim of promoting the Irish language,

particularly as an economic resource, in the Galway area. In 2009 Gaillimh le Gaeilge commissioned an assessment[4] of the economic benefits associated with the Irish Language to Galway City and the Gaeltacht. The assessment found the following;

> *"The Irish language is worth in excess of €136 million annually to the economy of Galway City and County, supports over 5,000 jobs and more than 90% of Galway City businesses believe that it is a unique selling point for Galway's image and cultural identity. These are the key findings of a study into the economic benefits associated with the Irish language which accrue to Galway City and to the Galway Gaeltacht."*

One of the most beneficial effects of a better appreciation of our language will be that we will be able to enjoy the folklore, and heritage that is tied up in place names, of which many of us are ignorant, because of the Anglicisation of the Irish place names. One of the first things an archaeologist will investigate are the Irish versions of a place name before he conducts a survey. The anglicised version of place names tells us nothing whereas the Irish version can contain rich information about culture, folklore and nature. It would help us to have a much greater appreciation of our culture and the environment in which we live.

NUI Galway in its Strategic Plan 2008-2014[5], identified the Irish language as one of its seven strategic priority areas. In the vision statement is declares 'that given our location at the edge of the largest Gaeltacht Region and our statutory responsibility to promote University programmes through the Irish language, we recognise explicitly our particular commitment to Gaeltacht Regions and the Irish language community'. In order to realise this vision, the Plan sets out the following goals and targets:

- 'Continue to develop and deliver full academic programmes in selected areas directly relevant to the developmental needs of the Gaeltacht and Irish speakers nationally'
- 'Provide full academic programmes in selected areas designed to produce graduates to meet the most immediate teacher needs of the Irish-medium second-level sector'
- Develop an exemplary bilingual campus.

There is a thriving audio-visual media industry in Conamara with TG4, the Ros na Rún production facility, Telegael's post-production facility and the Solas Studio. These facilities have attracted in national and international film and TV producers who have produced films and TV series in Conamara.

Galway is the home of the National Irish Language Theatre - Taibhdhearc na Gaillimhe which regularly produces Irish language plays for all age groups.

Riverdance had its genesis in Irish dancing. It featured as a 7 minute interval act in the Eurovision Song Contest in 1994 and has since become a phenomenon, touring the world on a constant basis. It has brought an awareness of Irish music and dance to a global audience and

has greatly enhanced Ireland's international reputation.

Irish music is renowned around the world and many tourists that come to Galway seek out venues where Irish traditional music is played.

Arts and Culture

"The Arts play a vital role in our economy and smart investment of taxpayer's money in the Arts is repaid, many times. The dividends come in the form of high value, creative economy driven by a flexible, educated, innovative work force and in cultural tourism industry worth €2.4 billion directly a year."[6]

The most recent Arts Council Annual Report[7] contains the following statement about employment in the Arts in Ireland:

"50,000 people are employed in the arts, which is also one of the key drivers of tourism. Despite the demise of the Celtic Tiger, the irrefutable fact is that our artistic heritage and our centuries-long artistic achievements endure, and have significantly enhanced the image and reputation of Ireland overseas as an innately creative people."

The Arts Council in their recent strategy document[8] in relation to cultural tourism acknowledge that "there is significant mutual benefit for the arts sector and for tourism in taking strategic actions to increase, improve, and promote the arts elements of the wider cultural tourism 'offer'." The Arts Council goes on to make a commitment that "In the period 2011-2013 we will work closely with Fáilte Ireland and others to support initiatives to make the arts more central to the achievement of Ireland's

Figure 2 From the website for Galway Arts Festival 2011, 11th - 24th July 2011

tourism objectives. The provision and maintenance of high-quality arts infrastructure, festivals, and programmes of work across all arts disciplines will benefit both residents and tourists."

The Western Development Commission (WDC) prepared a report on the Creative West[9] which contained a SWOT Analysis, see Table 1.

The WDC go on to recommend that:

> *"Preserving the landscape, built environment and natural heritage of the Region, bearing in mind its predominantly rural nature, is necessary to ensure that the West's creative place strengths are maintained."*

Galway's Arts Festival has a well-deserved reputation around the world since it first commenced in 1977 and attracts thousands of people to Galway every year during its two week run. Every July it brings together two weeks of the best in Irish and international theatre, dance, music, literature, visual arts, comedy, street spectacle and children's events, see Figure 2[10].

The Galway arts community organised a meeting prior to the 2011 general election to which they invited the election candidates. There follows an extract from an article in the Galway Advertiser[11] written by Kernan Andrews which captures the case made by the Galway Arts Community representatives;

STRENGTHS	WEAKNESSES
◙ *Landscapes, lighting, natural settings, uniqueness* ◙ *Good range of urban and rural settings, from city to remote rural areas* ◙ *Work/life balance, quality of life* ◙ *Cost of living* ◙ *Advantage of small communities* ◙ *Irish language and heritage, and other cultural resources* ◙ *Two international airports and three regional airports*	◙ *Lack of suitable low cost workspaces* ◙ *Surface connectivity between regions, i.e. road network* ◙ *Insufficient broadband capacity and connectivity* ◙ *New built developments not always sensitive to West's uniqueness*
OPPORTUNITIES	**THREATS**
◙ *Relatively unspoiled landscapes* ◙ *Enhancement of the quality of the built environment* ◙ *Widespread recognition of the importance of the creative sector to the region* ◙ *Potential of the character of the Western Region to stimulate creative growth*	◙ *Lack of appropriate creative infrastructure e.g., studios, theatres* ◙ *Risk of over-development or over urban-centred development plans spoiling the area's character* ◙ *Insufficient supply of good, stable employment opportunities for current and new creative workers*

Table 1 SWOT Analysis in relation to Creative Space in the Western Region from Creative West

Figure 3 Royal Theatre and Event Centre, Castlebar

"The need to defend and support the arts in a climate of economic devastation, a political ideology of savage cuts to front line services, and 'socialism for the rich, capitalism for the poor' has never been more pressing.

The arts in Galway are vibrant and healthy and for many, are among the attractions of living in the city and county. It is also vital for the county's economy.

Events such as the Galway Arts Festival, Cúirt, the Galway Film Fleadh, and the other festivals bring in tourists, create opportunities and businesses for hotels, B&Bs, restaurants, and bars, and result in a substantial cash injection into the Galway economy, which in turn sustains jobs for Galway people.

The arts - music gigs, theatre shows, exhibitions, readings, film screenings, and public art projects - also play a role in lifting people's spirits and are hugely important to our quality of life, a factor which questions on economics can often overlook.

In an era where the influx of cash, job protection, and the raising people's spirits is vital, political and financial support for the arts will benefit the social and economic life of Galway and help the city and county through the recession. "

The following are just some of the annual international arts festivals within the West Region:

- Galway Arts Festival,
- Cúirt International Festival of Literature,
- Galway Film Fleadh,
- Baboró International Arts Festival for Children
- Féile Iorrais International Folk Arts Festival,
- Strokestown International Poetry Festival

There are many other annual festivals in towns all across the Region.

The Royal Theatre and Event Centre in Castlebar is the third largest venue in Ireland, capable of accommodating some of the biggest global acts,

the most requested artists and the most spectacular shows available. Capacity is 2,000 people standing and 1,500 people seated.

Galway city on the other hand has only the Town Hall Theatre with a capacity of less than 400, the Black Box which has no proper facilities for those attending events and the very outdated Leisureland in Salthill does not have the facilities required of an arts venue in the 21st century. Galway is home to the Druid Theatre Company of world renown. Druid itself has only a very small theatre in Galway.

The strength of the creative arts has been instrumental in influencing the decision by digital gaming developers such as EA to locate in Galway.

Natural Heritage

The West Region has a unique natural heritage and landscape with its many rivers and lakes, mountains, rugged coastline, extensive blanket bog. Conamara, Galway Bay, Killary Harbour, Loughs Corrib, Mask and Carra and the many salmon rivers throughout the Region have international reputations and attract visitors and anglers from all over the World.

The quality and extent of that is evident from the number of designated Natura 2000 sites in the Region.

This unique environment supports a fragile biodiversity that must be protected given its importance to maintaining the Region's creative space strengths as identified by the WDC.

Built Heritage

Galway city is a medieval city and Athenry is a medieval town with its keep and most of its town wall still intact. Westport has a town centre that was designed by James Wyatt in 1780. It is a popular tourist destination and it won the Tidy Towns competition in 2001, 2006 and 2008.

There are many Norman castles throughout the Region and there are very many megalithic tombs, standing stones, stone circles, etc. distributed throughout the Region.

To mark the end of the second millennium, the Institution of Engineers of Ireland (Engineers Ireland), West Region, prepared an exhibition featuring a range of important engineering projects and activities. These are either projects in the West Region or else projects of national and international significance that were led by engineers from the Region. This exhibition hangs in the Civil Engineering Building in NUI, Galway where it is intended to provide student engineers with a historic context to their engineering studies and to help them to relate their branch of engineering to other disciplines. It is also available to view on www.realizedvision.com.

Among the works featured therein are the waterways in Galway which powered circa 30 mills in Galway in the mid 19th Century.

Museums

Just outside Castlebar the National Museum of Country Life is located where people can go to

see exhibits from times past. Galway City has a relatively new museum.

Maritime Heritage

The West Region has a strong maritime heritage. Galway city had a strong trade with Spain. Fishing has always been an activity associated with the West Region and still is with the Fishery Harbour at Ros an Mhíl. Much of the trade between Galway City and Conamara was by currach and Galway hooker until the relatively recent development of roads into Conamara. Turf was shipped from Conamara to Clare by Galway hooker. Trade with the Aran Islands was by sea and sea transport from Ros an Mhíl is still the main means of access to the Aran Islands.

Gráinne Ní Mháille's maritime exploits in the 16th century have already been referred to (page 153).

The Region's maritime heritage is celebrated every year at festivals such as Cruinniú na mBád, Achill Yawl Festival, Clare Island and Westport Regattas as well as several Currach racing festivals in Conamara.

Galway's maritime heritage was instrumental in Let's "Do It" Galway's success in getting a two week stop over stage on the Volvo Ocean Race in 2009. This event brought 650,000 visitors to Galway and Salthill and Galway gained an economic benefit of €55m. The success of the event is evident from the fact that Galway has been selected as the finishing port for the next Volvo Ocean race in 2011/2012.

A Place of 'Scenius'

"Scenius" is like genius, only embedded in a scene rather than in the genes. The musician Brian Eno suggested the word to convey the extreme creativity that groups, places or "scenes" can occasionally generate. His actual definition is "Scenius stands for the intelligence and the intuition of a whole cultural scene. It is the communal form of the concept of genius." Individuals immersed in a productive scenius will blossom and produce their best work. When buoyed by scenius, you act like genius. Your like-minded peers, and the entire environment inspire you[12].

As is also noted in the Section on "Equity and Local Economy", thus the attractiveness of the West of Ireland as a location for people to live and work is something that cannot be explained or addressed by economic policy alone. Nor can it be explained by its geography which is at once its blessing and its curse. It has been noted for the beauty of its barren landscape and rugged coastline for centuries. Its poor land and its savage seas have blighted returns on investments in agriculture and the marine. However they have tempered and toughed its inhabitants and produced a people who developed and appreciated the currency of persistence, creativity and innovation. It is the latter, the intrinsic character of its people, their social networks and the West's geographic splendour that have been its magnet for generations. Its success in industry and the arts draws heavily from this resilient culture.

The result over the past fifty years has been that when investment has been made in the Region by the state and by foreign investors, it has been welcomed by the people. They have proved to be disproportionately successful in realising a return from the fertile soil of their intrepid culture. The human and social factors on which this culture was founded have thus been what have provided the sustaining component of vitality to the West. The decades of poverty and poor have created a resilient mindset with an unflappable determination. It is from such foundations that an energetic local economy can be grown.

In the Section on "Equity and Local Economy", the contribution of the unique human and social factors in the Region to the development of world class indigenous industries and the attractiveness of the Region to leading edge multinational companies is acknowledged. In the arts there are De Danann, the Hot House Flowers, Sharon Shannon, Mary Coughlan, Ken Bruen in literature, The Druid Theatre Company and the list goes on.

These illustrious examples of globally acknowledged, award winning leaders are not from one single field but span the written word. They are not catalogued from centuries but from the last forty years. This document considers the elements necessary to grow a local economy further. Cultivating this unique locus of scenius will foster further returns into the future, for the Region the nation and the global community at large.

In the West, organisations like Engineers Ireland work to build a network of common values that reflect the desire of the population to better itself and provide the necessary interlocutors and infrastructure to lead and support endeavours by private citizens and corporations.

The equality of status between citizens engaged or employed in the arts and industry, both rich and poor emergent and established is reflected in the equality of esteem that they each hold the other in. The energy and imagination of Macnas is supported and sustained by the likes of Medtronic. The volunteers of one are the staff of the other. Exporting imagination and medical instruments, the hallmark of both is innovation, in the visual and visceral.

The shared human capital and the interdependencies between the different institutions is best illustrated by the University. It provides the academic reservoir of education and research that trains the artists, engineers, clinicians and economists and sustains the currency of innovation. The intellectual workshop that tools up future employees through the cycles of scholarship and discovery to provide inventions that are the local economies engine of growth.

The West Region's most valuable resource is its people. Economic policy has been critical in influencing businesses to locate in the West of Ireland. It has contributed to the growth of businesses and the increase in the Region's wealth over the past four decades. However what is notable is that while similar economic

growth policies have been applied throughout Ireland and Europe, they have rarely been met with the levels of success witnessed in the West of Ireland.

WHERE DO WE WANT TO GET TO?

We want to have a West Region where our arts and culture are nurtured and promoted and made widely available to the community and to visitors, where its built heritage is celebrated, where its unique natural heritage is protected and the community and visitors are facilitated in enjoying it. The tremendous archaeological riches of the West Region need to be promoted to both residents of the Region and visitors to it.

We need more spaces to facilitate artists in their work and appropriate exhibition spaces.

We need to derive more economic benefit from our natural and cultural heritage while still protecting and enhancing it.

All of the above add up to a 'Quality of Life' in the West Region that is second to none and that will attract the best and the brightest in education, in the arts, in business and leading edge industries to set up here and stay here to take advantage of the talent magnet that that 'Quality of Life' has been and will be.

HOW WILL WE GET THERE?

The creative arts must continue to be financially supported to enable them to grow and develop. Investment should be made in a state-of-the-art performance venue in Galway city appropriate for its size and the scale of arts activity that take place in it. This would attract greater international tourist numbers. Given the plans there are for Galway Port to attract cruise liners that would carry upwards of 5,000 passengers there is a tremendous opportunity to make Galway a world class entertainment venue for such visitors. These visitors would then become ambassadors for Ireland, bringing home memories of the wonderful natural and cultural heritage that they experience while in the West, and share these memories with their friends and families.

There should be appropriate exhibition spaces for the Arts developed in the centre of Galway City and the major towns in the Region.

The Government launched a 20-year strategy[13] for the Irish Language in December 2010 which set the headline goal of increasing over 20 years:

- the number of people with a knowledge of Irish from the current 1.66 million to 2 million; and
- the number of daily speakers of Irish from the current level of approximately 83,000 to 250,000.

A National Biodiversity Plan[14] was published in September 2010. The plan states that "a healthy environment is the foundation for the future prosperity and quality of life of Irish people and all of humankind. Biodiversity - the entire variety of life on Earth - is essential to the services that nature provides free of charge to all of human society." It quotes the Secretary General of the United Nations, Ban Ki-moon, who said that:

"... biodiversity underpins the functioning of the ecosystems on which we depend for food and fresh water, health and recreation, and protection from natural disasters. Its loss also affects us culturally and spiritually. This may be more difficult to quantify, but is nonetheless integral to our well-being."

Engineers have a major part to play in protecting that biodiversity. The adoption of a sustainability framework as recommended in this report would be a major step forward in protecting biodiversity.

Comhar, The Sustainable Development Council, published a report[15] on the protection and development of Green Infrastructure in 2010. The working definition adopted for the report was "Green Infrastructure is a strategically planned and managed network featuring areas with high quality biodiversity (uplands, wetlands, peatlands, rivers and coast), farmed and wooded lands and other green spaces that conserve ecosystem values which provide essential services to society."

Tourism into Ireland has changed radically in recent years. Many visitors come for short city breaks and many never get past Dublin City. There is an opportunity to develop a tourism industry that would be more beneficial to the Regions. The West Region's unique landscape and environment should be promoted to attract visitor. The rich archaeology of the West Region would also be very attractive to international visitors. A product including archaeology, natural heritage and cultural heritage would prove attractive if properly packaged and marketed.

There are opportunities to develop synergies between those involved in the creative arts, digital gaming, Information and Communications Technology (ICT) and other high end manufacturing industries. It is no accident that EA and ZeniMax Online Studios, both of whom are involved in digital gaming, have recently announced significant investments in the West Region which are expected to create 200 jobs each. They recognised the innate creativity that exists in the West Region.

RECOMMENDATIONS

Continue the financial support for the creative arts and for the international and local arts festivals throughout the West Region.

Construct a state-of-the-art performance venue of appropriate size in Galway city as showcase for Irish music and dance and to bring international acts to Galway throughout the year catering for visitors and residents alike.

Provide exhibition space for the arts in the centre of Galway city and in the major towns in the Region where artists can display their work and network with other artists which would all add to the sense of 'scenius'.

Proceed with the implementation of the 20-Year Strategy for the Irish Language as quickly as possible. Our language is part of who we are. Galway City has the Conamara Gaeltacht in its

hinterland this differentiates Galway from other cities and parts of the West from other rural areas. One cannot visit Galway, Conamara, Tuar Mhic Éadaigh, Acaill or Béal an Mhuirthead without being aware of the language.

Implement the National Biodiversity Plan to secure the preservation of the Region's natural heritage in order to ensure that the West's creative place strengths are maintained.

Develop new tourism products incorporating archaeology, natural and cultural heritage to take advantage of the rich resources of the West Region.

Identify what measures are necessary to improve access to the Region for tourists, whether that be more air services into the West Region to facilitate tourists to come to the West Region and experience our rich cultural and natural heritage.

BIBLIOGRAPHY

1 http://www.museumsofmayo.com/ceide.htm

2 "The Atlantean Irish: Ireland's Oriental and Maritime Heritage", Bob Quinn.

3 www.irelandstory.com

4 Research Assignment: The economic benefits associated with the Irish language which accrue to Galway City and to the Galway Gaeltacht. For: Gaillimh le Gaeilge By: Bane Mullarkey Ltd. in partnership with Jerome Casey & Co. Ltd, www.gleg.ie

5 Strategic Plan for NUI Galway 2009-2014.

6 Galway Arts Festival, 2010 Programme.

7 Arts Council Annual Report, 2008.

8 Arts Council "Developing the Arts in Ireland Arts Council Strategic Overview 2011 - 2013".

9 "Creative West - The Creative Sector in the West Region", Western Development Commission.

10 www.galwayartsfestival.com

11 Galway Advertiser, February 17, 2011.

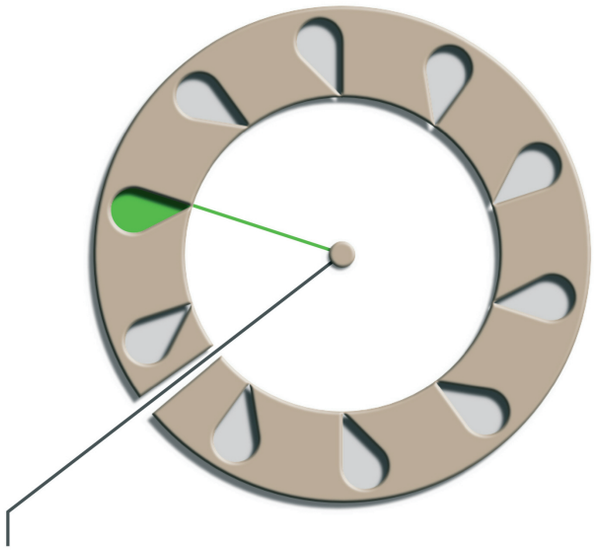
12 http://www.kk.org/thetechnium/archives/2008/06/scenius_or_comm.php

13 20-year Strategy for the Irish Language 2010-2030, Government of Ireland, 21/12/2010.

14 National Biodiversity Plan 2010-2015, 1 September 2010.

15 Creating Green Infrastructure for Ireland - Enhancing Natural Capital for Human Wellbeing, August 2010, Comhar, Sustainable Development Council.

EQUITY AND LOCAL ECONOMY



"creating bioregional economies that support fair employment, inclusive communities and international fair trade"

Section Contents

KEY RECOMMENDATIONS

01 Invest in health, education, transport and communication infrastructure, to enable the development of a world-class environment for local residents and industry.

02 Promote a culture of agility, preparedness and innovation for new opportunities so that the Region can respond rapidly when required.

03 Create networks to support equity and debt capital investment for innovation in export-led businesses, in the absence of a strong domestic VC and banking sector.

EXECUTIVE SUMMARY

The West Region is renowned internationally as a destination for culture and investment capital. Its people are its sustainable base. Their resilience, innovation and creativity have created dynamic clusters in tourism, healthcare, and ICT, and made the West Region a destination of choice for foreign direct investment, international equity capital investment and state funding in these clusters, as well as in emerging innovation-led, high-growth, export sectors.

The West Region's export sectors of Natural Resources, Tourism, ICT, Pharmaceutical and Medical Device Manufacturing and the Creative Arts grew throughout the past decade.

"The West Region is a fantastic location for multinational companies - there is a strong third level sector providing a highly skilled and educated workforce, a growing research community and a great quality of life. These factors are very important for companies making investment decisions and if the region can demonstrate that it is a good place to do business and is competitive with other locations, both within Ireland and across the globe, then it is well positioned to win new investment"

Gerry Kilcommins,

VP Global Vascular Operations & General Manager, Medtronic, Galway

President, American Chamber of Commerce in Ireland.

Sustaining this trend is dependent on fostering employees with world-class engineering skills, to innovate, execute, and export.

Their success is, in turn, dependent on access to world-class education, energy, research, transport and ICT infrastructures. These strategic engineering infrastructures must be prioritised in order to sustain growth and foster the development of employment in companies in the existing and emergent export industries, in what are highly competitive global markets.

Social Equity

The primary focus of this section is employment, on the basis that the largest contribution that can be made to social equity is to ensure employment opportunities are available to all. The underlying premise is that the sustaining engine of a local economy is its people. This is a business reality, and an environment that fosters competitive global businesses is the means to this end.

Quality of life factors are central to a successful society. Whilst 'soft', these reasons are cited as attractions by people relocating to the West Region. Consequently, people and capital must be directed to sustaining the inclusive social behaviours that are observed across the West, in rural and urban areas. High quality amenity, healthcare, transport and communication infrastructure must be

04 Increase investment in technologies for education, and advance syllabi in science, technology, engineering and mathematics at primary and secondary level.

05 Headquarter at least one Technology Research Centre in the West, and link existing strengths in biotech and ICT with international partners, to commercialise outputs.

06 Establish Y-Combinator style 'startup bootcamps', to provide inspiration, funding and practical supports for teams to commercialise technologies.

maintained, as well as social and commercial services in healthcare, banking, and so on.

Skills and scaled investment is necessary. It is clearly critical to manage the issues that are covered in other chapters of this report, and in particular energy, water, production, and waste. These are not only necessary for the environment and employment, but also for facilitating social interdependencies and producing social capital and cohesion.

Sustainable Enterprise Clusters

The prominent feature of enterprise development in the West Region has been its ability to produce a series of successful clusters through the different economic cycles of the past 40 years[1].

Clusters have grown up around traditional sectors in the Marine, Food and Tourism industries, the ICT sector and the Medical Devices cluster. New clusters are emerging in Media and Gaming, Health Informatics, Renewable and Smart Energy and Ocean Resources.

What is needed for further Growth

Our analysis shows that the following key factors are necessary for sustainability and the growth of existing and future economic clusters and employment in the West Region.

- Natural, Cultural and Business Environments: the West Region's international reputation in tourism, the arts and culture is an important feature in attracting talented people and international companies to locate here.
- Physical and information infrastructure: Global business requires ever-increasing internet capacity. High-speed broadband coverage is essential for businesses and consumers of internet-delivered services.
- National and Regional Policy and Supports: Taxation policy, tax incentives, and the actions and energy of agencies such as IDA, Enterprise Ireland, Údarás na Gaeltachta, Western Development Commission and FÁS all have a huge effect in attracting inward investment and growing indigenous industries.
- Competitiveness: Ireland's competitiveness increased between 2008 and 2011[3]. This must be maintained at a regional level to attract more international investment in enterprise and employment.

Recommendations

The recommendations that we propose have the goal of maintaining and cultivating the West Region's progressive, equitable and inclusive culture, and its adaptive and competitive human and infrastructural capability, as well as increasing the access to equity and debt capital for its private and public enterprises. These are crucial to the West Region building a leading regional economy and making it an engine for local, national and global economic growth in this decade.

EQUITY AND LOCAL ECONOMY

Introduction

The West Region's Most Valuable Resource

Economic policy has been important in influencing businesses to locate in the West Region. It has contributed to the growth of businesses and the increase in the Region's wealth over the past four decades. However, it is notable that, while similar economic growth policies have been applied throughout Ireland and other regions of Europe over the same period, rarely have they met with the levels of success witnessed in the West Region. The foundation of this success and its sustainment are its people, their self-confident adaptive culture, resilience, persistence, creativity, and innovation.

Culture of Inclusion

Inclusive social behaviours are observed across the West Region's indigenous and immigrant communities, in rural and urban areas. The Region's culture has attracted people from across Ireland, Europe, Asia, Africa and the Americas, who have integrated with those already in the Region. Its large reserve of social capital is reflected in the various cross-cultural and community initiatives that exist and that continue to be developed within the Region, for example The Galway Arts Festival and Galway 2040. Whilst 'soft', these cultural reasons are the ones cited by people relocating to work and live in the West Region. This inclusive culture has produced a unique social and cultural milieu that sets its priorities in the interests of the broader society, one that draws talented people to study, work and stay.

These quality of life factors are central to sustaining a society. The provision of the social and commercial infrastructure is equally important to achieving this. Consequently, people and capital must be directed to sustaining high quality transport and communication infrastructures, as well as the necessary social and commercial services, from healthcare to banking. Managing the issues covered in the other chapters of this report are clearly critical; in particular energy, water, transport, and waste. These efforts are necessary, not only at a practical service provision, environmental, and employment level, but are vital in attracting people and maintaining a stable society that facilitates social interdependencies, which in turn produce cohesion. Excellence in Engineering is central to this.

A Creative Scenius

The term scenius was coined to convey the extreme creativity that groups, places or scenes can occasionally generate. In Ireland this collective form of genius is evident in the West Region. It has become a sanctuary for traditional Irish culture, a home for the Creative Arts, a base for high technology FDI (foreign direct investment) industries, and a nursery for innovation-led enterprise.

Such observations about the West Region fuel confidence, but for those who would invest, it is its track record in industry and the arts that

impress. Its relatively tiny population of fewer than 500,000 people has produced world-renowned companies and organisations: Élan Pharmaceuticals in Roscommon; Creganna in Galway; Channelle Pharmaceuticals in Loughrea; JFC in Tuam, and others too numerous to mention. However, not only have indigenous companies thrived, but so also have the multinational companies who have located in the Region: Medtronic; Boston Scientific; Beckman Coulter; Cisco; HP; Baxter International, to name but a few. These have provided the backbone for the development of clusters in Pharma, MedTech and IT. It has fostered success in the arts, including music, literature, theatre, and visual arts. Indeed approximately 3% of employment in the West Region is accounted for by the Creative Arts[2].

EQUITY

The primary focus of this section is employment and the economy. The basis for this is that the largest contribution that one can make to social equity is to ensure everyone has the opportunity of employment. The underlying premise is that people are the sustaining and sustainable engine of the West's local economy. In businesses, especially those in innovation-led sectors, this is a reality. People are the critical assets. Consequently, the people of the West Region, indigenous and immigrant, are the cornerstone of its sustaining economic success and maintaining employment. The West Region experienced a growth in employment of 37.2% between 1998 and 2008, which is ahead of the national average of 35.9%[3]. A measurement of economic performance that can be used is Gross Value Added (GVA) per person in a Region. The GVA is a measure of the value of goods and services produced in the Region. In the West Region the GVA per person was approximately 11% more than the EU average. This is mainly attributable to the manufacturing and construction sectors.

The distribution of employment across the counties comprising the West Region is shown in

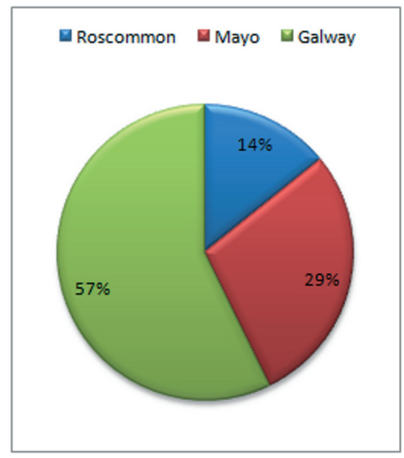


Figure 1 Distribution of employment between counties.

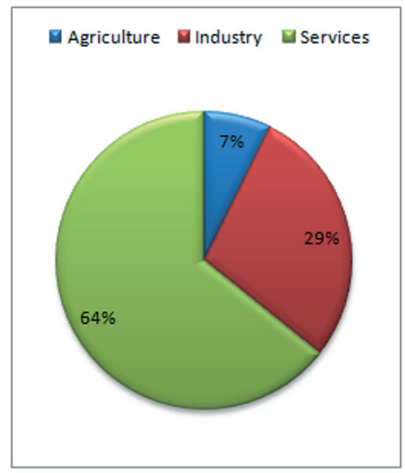


Figure 2 Distribution of employment across sectors.

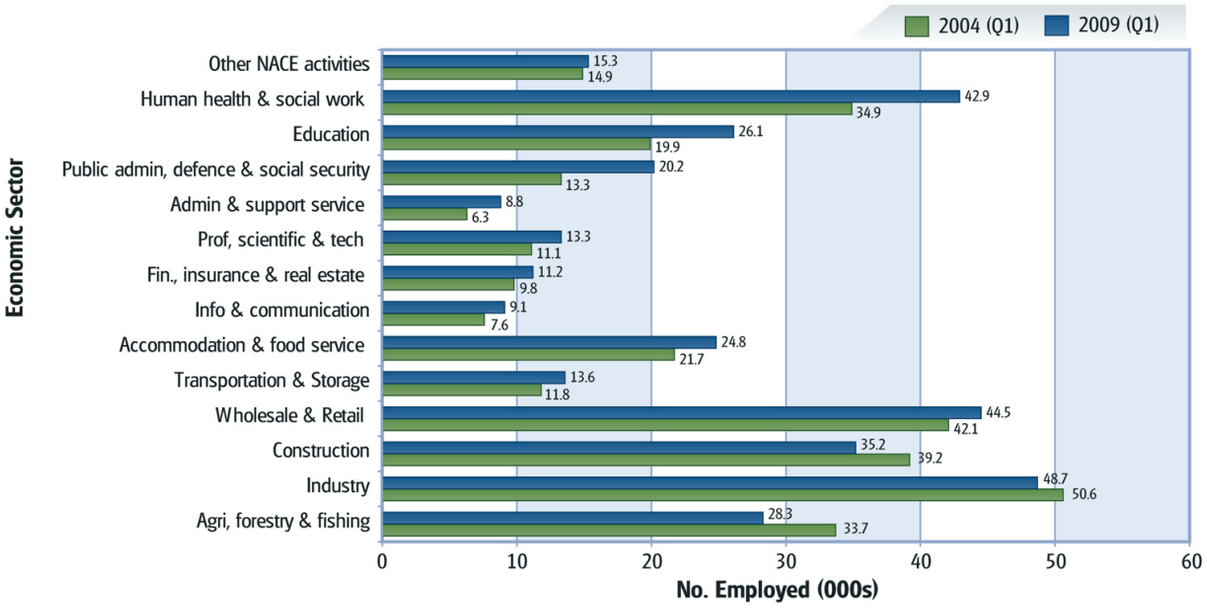


Figure 3 Employment in the West in 2004 & 2009

Source: Western Development Commission[4]. Note: that report defines the Western Region more broadly than we do, covering an area from Donegal to Clare, but the trends are nonetheless relevant

Figure 1, while the distribution of employment across sectors is shown in Figure 2.

The growth in the areas of export industry, which primarily includes Medical Technologies and Information & Communication Technology (ICT), has contributed significantly to the growth of the Region. This is reflected in the changes in employment profiles between 2004 and 2009, as shown in Figure 3[4].

The Medical Technologies and ICT industries provide interesting contrasts. Both are growth areas for the Region and both are large employers. The medical devices industry however, is largely dependent on a small number of large employers, while the ICT sector is more dependent on a large number of smaller scale companies. The West Region is particularly reliant on these two clusters but it is clear that the nature of the clusters is quite different.

Local Economy: Sustainable Enterprise

Clusters: A Strategy for Sustained Growth

The prominent feature of enterprise development in the West Region has been its ability to produce a series of successful clusters [2] through the different economic cycles of the past 40 years. Clusters of industry have also grown up around traditional sectors in the Marine & Agri-Food and Tourism industries, the former linked to the large rural and coastal areas in the Region. These remain vibrant and are increasingly export-focused and innovation-driven, employing R&D based strategies for growth. The latter, tourism, reflects immense national and global interest in the aesthetic of the unique landscape, cultural and artistic heritage of the West Region. This natural environment infrastructure needs to be sustained to contribute to the lives of the people.

The formation of the ICT cluster began in the 1970's, kick-started by the arrival of Digital Equipment Corporation in 1971, while the Medical Devices cluster started with the arrival of CR Bard in 1982. These technology clusters remain vibrant, viable, innovative, and highly influential on a global level. They have been able to adapt quickly to market forces and continue to grow and anchor the position of the West as a Global Centre of Excellence in their relevant segments. Both the medical device and ICT clusters include a large number of start-up companies that compliment the presence of the large and strategic FDI multi-national companies.

The FDI operations are homes of global innovation, building the pools of imaginative and enterprising engineers for the future. At Cisco, for example, over 200 engineers are developing the enterprise communications solutions systems for the future. Boston Scientific and Medtronic boast hundreds of engineers and scientists in their strategic Research and Development activities.

Originally, when multi-national companies (MNCs) located in the Region, they did so based on the low corporate tax rate and the lower costs of labour. Research has found that the sustainability and emergence of clusters in a particular sector is based on the development of external factors such as the creation of a skilled labour pool and growth of specialised suppliers[1]. This appears to be the case in the West Region: as the standard of living in the Region has increased, MNCs have remained, due to the presence of factors outside of a cheap labour force.

Medical Device Cluster

Throughout the first decade of the 21st Century, there was a shift in manufacturing industries towards low cost locations, where high volume manufacturing at a low cost is possible. The one segment of manufacturing industry that did not do so was the medical technology sector. Indeed China, which is responsible for almost 70% of global manufacturing output, still imports approximately 70% of its medical devices from other countries.

The medical device cluster in the West Region grew out of a number of large FDI companies that established operations in the 1980s and 1990s. The first large multi-national from the sector to locate in the West Region was CR Bard in 1982. It was later acquired by Medtronic in 1999. Its development from low-tech manufacturing to high tech R&D represents the arc of development that such companies can grow through. The strength in their capabilities can be seen in the number of patent filings generated out of its Galway facility. The development of indigenous companies in the Region began with the maturing of these Multi-nationals throughout the Region in Galway, Gort, Ballina, Castlebar, Castlerea, and other towns. Contech, one of the first indigenous companies was established 1991, before Boston Scientific arrived.

The development of the industry has continued with indigenous companies such as Creganna

Tactx establishing themselves in the sector, and companies being formed by engineers who had been employed in the multinational sector: examples include Mednova, Aerogen, Zerusa, Brivant, Capella, Halo, Neuravi, as well as others. Today, approximately 10,000 people are employed in this sector in the West Region.

The majority of companies are indigenous, though most of the employment is in multi-national companies. These companies have grown their sales significantly since 2000 with annual growth between 2000 and 2005 of just under 12%. Even so, the rate of employment in indigenously-owned companies is rising faster than in foreign-owned companies.

Another distinction between FDI and Indigenous companies has been that FDI companies have been predominantly involved in producing finished products from either raw materials or from sub-suppliers. The majority of Irish-owned companies have tended to be involved in sub-supply, including:

- Assembly;
- Production of components;
- Production of Packaging;
- Testing;
- Engineering Development Services;
- Consultancy.

Consequently, direct exports from foreign-owned companies account for 96% of their sales while direct exports from Irish-owned companies is significantly lower, at about 65%.

However, in the past five years this trend has been changing, and many start-up companies are now commercialising new medical device products.

ICT Cluster

The West Region has a strong presence of ICT companies located throughout the Region. While there is a presence of large multi-national companies in the Region, as there is in the medical devices sector, in the ICT sector there is a stronger base of indigenous companies. This is indicated by the employment figures in the industry, which show that approximately 3,300 people are employed in the industry in the West Region, and that this is evenly distributed between foreign-owned multi-nationals and indigenous firms.

Table 1, from the IDA[3], lists some of the key companies investing in ICT in Ireland, categorised according to whether they are first-time investors, expansions of existing facilities, or new R&D developments. Many of these companies are located in the West Region.

First Time	Expansions	R&D/Software Development
Electronic Arts (EA)	Microsoft	Intel
Quest Software	HP	HP
Maxim Integrated Products	Dell	IBM
LinkedIn	Google	AOL
Bentley Systems	SAP	Alcatel-Lucent (Bell Labs)
Aspect	eBay (incl PayPal)	Accenture
BSB	Citrix Systems	Analog Devices
Lumension Security	Facebook	Paypal (eBay)
Synchronoss Tech.	McAfee	Alps Electric
Big Fish Games	Activision Blizzard	Sophis Group
Webroot	Salesforce.com	Murex
GENBAND	Telefónica	Sajan

Table 1 Key ICT investors in Ireland, 2009-2011

Within the West Region, some examples of recent ICT investments include:

1. HP, December 2010: Expansion of European Software Centre in Galway will lead to hiring over 105 software engineers
2. Aspect, December 2010: Setting up a customer/technical support, software production/distribution, and shared services operation in Galway
3. Electronic Arts, May 2010: Opening a multilingual European Customer Service and Operations Centre in Galway, to employ 200 multi-lingual personnel
4. Fidelity Investments, Jan 2011: 100 new highly skilled technology positions in Galway and Dublin.
5. ZeniMax Online Studios, March 2011: The Company's new Galway facility will provide support for players of future massively multiplayer online games, with hundreds of jobs.

ICT is an important industry in its own right but it also has a pervasive impact across all sectors. ICT can be used to change the way services are delivered as well as innovating existing industries such as food production and construction. The presence of a strong ICT industry in the Region will be important to the development of new industry in the Region.

There are immediate opportunity for the development of cross-sectoral potential between the existing industries in the Region and to facilitate and encourage the development of new industries in the Region.

Emerging Opportunities

The opportunity for the West Region is to focus on the development and commercialisation of products that possess high added value. Convergence between sectors, such as ICT and Medical Technologies, also presents opportunities. An example of this type of convergence is Crospon, a Galway based company, who licensed technology developed by HP for printer needles in order to develop a patch for drug delivery.

Opportunities exist for growth in the area of medical technologies and ICT as well as in new areas such as gaming and cloud computing. These industries are undergoing significant change at present which is providing both opportunities and challenges.

In Healthcare, Medical Technologies and Life Sciences, stakeholder relationships are particularly complex. This is due to several reasons, but principally the diversity of the stakeholder community including industry, research institutes, clinicians, government departments and regulatory bodies. Despite having the same objective, which is to fulfil the needs of patients, the focus of each stakeholder varies, which can result in conflicting demands within the industry.

Industry Drivers

In the industry there are global drivers affecting trends and the way in which the industry may develop. That is the reason that most strategic plans are flexible and adaptable, to facilitate

changes in trends and threats that may arise. Some of the current trends that are influencing the Life Sciences generally, and are thus presenting opportunities, include:

1. Convergence: Different industries such as ICT and Medical Devices collaborating in the development of products.
2. Research: There is now more investment from private organisations into areas such as personalised healthcare.
3. Commercialisation: There are higher numbers of people commercialising research, resulting in more third level spin-outs.
4. Entrepreneurship: There are increased numbers of start-up companies operating on their own or in partnership with larger multi-nationals.
5. Environment: The environment to commercialise IP is improving.

All of the above activities are changing the way in which the industry operates in Ireland. This presents opportunities for companies that can respond to change to gain a first-mover advantage.

Example: Personalised Healthcare

Current trends in the life sciences indicate that personalised healthcare will become more common in the near future. One definition of personalised healthcare is "research, diagnostics and testing, delivery mechanisms and devices and the concept of 'the appropriate treatment, in the appropriate way, to the appropriate patient, at the appropriate time". What this refers to is the capture of individual genetic behaviour to offer prescriptions for health maintenance, disease prediction and prevention. It is focussed on being proactive in maintaining health rather than reactive to illness.

This emerging market has implications not only for the design and production of medical devices and diagnostics but also the fundamental business model. The opportunities are becoming increasingly complex and require multi-disciplinary skill-sets. It is also integral to the shift towards remote healthcare, facilitating the treatment of patients away from hospitals, and providing a basis for distributed health informatics. The device is only part of the solution.

A key opportunity is in the area of patient information systems. Interest shown by Microsoft, Google, Siemens and others reflects the central significance of the ICT convergence in this area. Other technologies that will develop with this will be Clinical Information Management and Digital Patient Records.

Key Emerging Sectors

Our consultation process has identified the following opportunities for further growth over the period to 2020:

- Media and Gaming
- Renewable Energy
- Ocean Resources
- Smart Grid.

Key Factors Influencing Equity & Employment Growth in the West

The Third Level Education

In order to be able to adapt to changes in the global markets in technology-led industries, world-class education and skills in Science, Technology, Engineering and Medicine (referred to as the STEM subjects) are required to lead and to adapt to change, as well as to take on new challenges and exploit new technologies and trends.

Providing excellent education is therefore central, not only as a right of individuals and a requirement for equity. It also offers a recipe for excellence in all social and commercial endeavours. NUI Galway has excelled in its delivery of education and research, in fostering a culture of academic excellence and social responsibility. It responds to both the people and the industries in the Region, in developing courses and research to meet the needs of those in its catchment. It has built alliances throughout the West Region, the Northwest, Midlands and the Midwest, to produce a coherent critical mass that can be marketed beyond the Region.

The development of the medical device industry in the Region, with both the FDI and indigenous companies, led to the development of new third level courses in Biomedical Engineering and Science. In 2000, NUI Galway introduced a full time Biomedical Engineering degree. This focus also enabled the University and local colleges to improve the quality and quantity of research output. The research and educational infrastructure within the Region is accelerating the formation of new indigenous start-ups focusing on finished devices.

The sharing of human capital and capitalisation of the interdependencies between the different institutions in the Region is best illustrated by the University. It has provided an academic reservoir to supply education, research training, and support for artists, engineers, clinicians and economists, so as to sustain innovation.

Culture and Business Environment

The West Region's international reputation in the arts and culture is an important feature in attracting international companies to locate here, as illustrated by the quotations in this chapter from companies that have recently made significant investments in the West Region.

"The new Irish location for BioWare will help us get closer to our fans in Europe,"

said Dr. Ray Muzyka,

Senior Vice President, EA & Group General Manager, BioWare.

"Galway gives us the right mix of solid technology infrastructure and international recruitment opportunities as we continue to focus on bringing the highest quality gaming experiences to market."

March 2011:

"Galway has world-class educational facilities, is a beautiful place to work and live, and offers a wide variety of benefits for our employees. Our ability to provide superior customer service for our future products is firmly on track",

said Matt Firor, President of ZeniMax Online Studios.

Martin Murphy, Managing Director HP Ireland, Dec 2010, speaking at the announcement of 105 new high-tech ICT jobs in Galway:

"These jobs ... speak hugely to the esteem in which the Irish skill set and capability is regarded within the HP community."

Dec 2010:

"Ireland's breadth of high-quality, skilled human resources made Galway an ideal setting for our expansion, particularly when combined with the region's competitive cost structure and leadership as a telecommunications corridor,"

commented Genband's President and chief executive Charlie Vogt.

Dec 2010:

President Takehito Yogo of Goodman Co., Ltd., said

"We are excited to announce our expansion plans to meet anticipated long-term demand for our products worldwide. We chose the Galway operation for our future growth and development due to our dedicated and proactive workforce, the support of IDA Ireland, our strong supplier network and the positive experiences we have had of doing business in Ireland since 2004."

"The West Region is simply a great place to do business in the Medical Device Industry. It is a vibrant developing global hub that possesses all of the necessary ancillary service capabilities and providers, including a highly responsive and supportive University and third level sector. Most importantly it has a deep pool of experienced specialist people in engineering, regulatory and quality to develop, produce and market innovative products."

Ian Quinn, Founder and Chairman Creganna Tactx Medical.

We believe that the West's culture and business environment will continue to grow in importance as a reason for inward investment, particularly with the growth in creative media industries.

Physical and Information Infrastructure

There is no doubt that demand for internet communications infrastructure is ever-growing: companies in the West Region are currently using VOIP phones, online backups, virtual desktops, cloud apps, video training, remote support and other communications-intensive applications every day, as well as more traditional uses of email and web access.

The demand for high-quality and high-capacity communications infrastructure is evident when one considers large organisations of 500+ employees using services like these, where it must be ensured that the phones keep working when a group use a telepresence system on the network for a remote meeting.

We cannot of course anticipate what the next use case will be, except to note that demands for network capacity always grow. While we have a reasonably good metropolitan area network forming a network backbone for the country, we have very poor overall coverage.

Although the Government announced in 2010 that 99% broadband coverage had been achieved across Ireland, some of this was achieved using mobile 3G networks, which provide less than 2 Mbit/sec down and 200 kbit/sec up, and are therefore not full broadband, and are certainly not of sufficient quality and capacity to meet future growth in demand. Broad coverage of high-speed broadband is

essential for home offices, small business, teleworkers, and of course for consumers of internet-delivered services in their homes.

Research and Development Centres

Over the past decade a number of research centres have been developed in NUI, Galway and GMIT focussing on medical technology, healthcare, informatics and computational sciences, high end computing and semantic web.

The Region hosts the National Centre for Biomedical Engineering Science (NCBES), the Regenerative Medicine Institute (REMEDI) and the Network of Excellence in Functional Biomaterials who are engaged in world-level fundamental and translational research. These centres of research excellence complement the Region's Medical Devices/Technologies industry cluster with research activity in: medical technologies; medical devices; genomics; biotechnology; advanced materials; modelling and analytics; data management and data mining; instrumentation.

The Digital Enterprise Research Institute (DERI) conducts research activities to sustain advances in ICT that provide a basis for businesses into the future.

The University is also home to a broad range of ICT research that includes:

- Analytics: artificial intelligence, data mining, agent-based systems, simulation
- Smart Devices: smart medical devices, camera technologies, smart grid technologies, product engineering
- Digital Media: Games, visualisation, virtual learning environments, digital image processing.
- Electronics: biomedical electronics, smart ambient assisted learning, consumer electronics, biometrics.

Regional Enterprise Supports

Regional responsibility and accountability is required for the administration of a local economy. The Western Development Commission and Údarás na Gaeltachta have sought to address the imbalance between communities by promoting the development of businesses in the West Region's less-served areas, and targeting investment in employment in businesses in marginal rural areas. These efforts need to be sustained, not only because it is the right thing to do, but also because it is shown that it is the development in towns outside of the main conurbations that provide the greatest engines for growth in manufacturing.

Some key elements of national policy that will influence the growth of sustainable employment in the West Region include:

- Taxation policy
- Incentives supporting particular forms of industry

- Access to venture capital and debt capital
- Broadband

At a Regional level, growth will be influenced by the policies, funding and actions of:

- Relevant agencies such as Úadarás, FÁS, Enterprise Ireland
- The research and innovation activities of the National University of Ireland Galway and the Galway-Mayo Institute of Technology.

Equity Capital

The efforts of organisations such as Údarás na Gaeltachta underlines the need for more than people and economic equity. An economy cannot develop without the necessary risk and debt capital investment. Investment creates a virtuous cycle: the investment is necessary to first create the dynamic, to produce the returns, from which future investment can be made. Debt equity needs an underlying base of wealth or some medium that can act as a guarantor to enable the transfer of wealth through some risk capital.

The Region itself can act as a magnet to attract ventures from outside to reside in the Region and provide a hub for local economic development and investment. The attraction of foreign direct investment companies such as Howmedica, Harmac, FortWayne and others by the IDA into the West Region has provided for a base to the economy to develop a supplier base of companies such as Creganna, Vistamed and others, most often indigenous companies who can then establish channels for global exports.

The most valuable component is that of risk capital that can be placed in emergent companies who lie on the cusp of future success. Though success in the market is never guaranteed, having the market knowledge, resources and investment has allowed indigenous companies (for example JFC) establish businesses in other countries around the globe.

The success of the companies that are often identified as the exemplars of successful start-ups, such as Creganna, Mednova, Crospon, Aerogen, in securing risk capital from private venture capital sources from outside the state, underlines the importance of having strong access and availability of risk capital to secure sustained success of indigenous enterprises in the West.

These companies, by creating products for the local base, have grown wealth which has been transferred and shared within the Region and also spurred the growth of entrepreneurship and start-up enterprises in the Region. The wealth of experience in global best practice has been an immense boon to the businesses and an example for the way in which FDI can tune the human resource base in the economy with the appropriate skills in management and leadership.

Competitiveness

As noted by the IDA[5], Ireland's competitiveness has improved significantly between 2008 and 2011, with reductions in salaries and rental costs. For example, the cost of hiring new personnel in the ICT sector reduced by up to 20% between 2008 and 2011. According to the EU Commission, Irish unit wage costs are projected to improve by 13% relative to the EU average between 2008 and 2012. These will make Ireland a more attractive location for inward investment within Europe.

Relevant Policies

Europe 2020 - Strategy for Smart, Sustainable and Inclusive Growth

This strategy document[6] was published in March 2010. Its purpose is to recognise the recent economic difficulties that have been experienced throughout Europe and to provide a strategy for sustainable growth into the future. The strategy targets three priority areas: (1) smart growth; (2) sustainable growth; (3) inclusive growth. Each of these areas is further defined as:

- Smart Growth: Developing an economy based on knowledge and innovation.
- Sustainable Growth: Promoting a more resource efficient, greener and more competitive economy.
- Inclusive Growth: Fostering a high-employment economy delivering social and territorial cohesion.

In order to achieve this vision for Europe, the European Commission has outlined headline targets to be achieved by 2020. These include:

- 75% of the population aged 20-64 in employment
- 3% of GDP invested in R&D
- The 20/20/20 climate/energy targets[7] should be met
- Early school leavers below 10% and 40% of younger generation to have a tertiary degree
- 20 million fewer people at risk of poverty

The strategy document is designed to provide a vision for the EU to aim towards. It is the duty of each of the member states to attempt to achieve the vision by implementing policies that are in line with goals set out in the strategy.

It is clear from the targets set out that much of the focus of the strategy is development of people through education and skills training, and as a result providing a well-educated and innovative work force that can compete globally, particularly with the US and Asia.

EU Research and Innovation Policy

The aim of this policy[8] is to increase funding in the EU for research and innovation. This policy is aligned with the Europe 2020 strategy as it shares the common goal of combining growth with more and better jobs. The aim of this strategy is to increase and improve funding for research and innovation within member states. This is part of the Lisbon strategy and the subsequent Europe 2020 strategy of achieving 3% of GDP investment in R&D.

The result of this policy for Ireland and the West Region should be the availability of further funding to encourage and promote research and innovation. This is evidenced in the National

Development Plan 2007-2013 in which €6.1bn[9] is allocated for Science, Technology & Innovation. This is in contrast to the previous plan where €2.54bn[10] was allocated over the period 2000-2006. This policy has also driven the development of the National Action Plan, "Building Ireland's Knowledge Economy".

National Development Plan 2007-2013

The National Development Plan 2007-2013[8] (NDP) is a €184bn investment framework that aims to address the infrastructural deficits in the country and support the development of human capital. Traditionally, NDPs have received large funding from the EU; however, this plan was intended to be funded mainly out of exchequer finances. The NDP anticipated some €3bn from EU rural development and structural funding. The plan was developed before the current economic crisis and envisaged continued growth in the country, including an increase in population to approximately 4.4 million people by 2020.

The NDP 2007-2013 outlines the spending in different sub-programmes including economic infrastructure, science & innovation, human capital and social inclusion. It can be shown how each of these areas have been driven by higher level EU policy and most of the NDP is well aligned with EU policy and strategy.

BUILDING IRELAND'S SMART ECONOMY 2009-2014

In response to the EU Lisbon and Europe 2020 strategies, and the challenging economic circumstances, the government prepared a 5 year framework to develop the economy based on enterprise, high quality employment, secure energy supplies, an attractive environment and first-class infrastructure[11]. The framework sets out 5 action areas that require development and investment to realise the vision for a "Smart Economy". The action areas outlined in the plan include:

- Meeting the Challenge - Securing the Enterprise Economy and Restoring Competitiveness
- Building the Ideas Economy - Creating the "Innovation Island"
- Enhancing the Environment and Securing Energy Supplies
- Investing in Critical Infrastructure
- Efficient and Effective Public Services and Smart Regulation.

The plan targets a range of areas to develop high quality jobs. One of the main areas that is targeted under the plan is the area of Energy and the opportunities that exist in this area. It is also aligned with energy policy in Ireland and the EU with particular reference to the security of supply and reduction of dependence on imported fossil fuels. This framework will drive investment in areas particularly related to the action areas outlined such as the development of the electricity grid.

FOOD HARVEST 2020 - A VISION FOR AGRI-FOOD AND FISHERIES

Agri-food and fisheries is Ireland's largest indigenous industry. In total, it employs some 150,000 people with an annual output of over €24 billion, including large amounts of activity in rural and coastal communities such as those in the West Region[12].

This strategy report promotes research & development, creativity & entrepreneurship, and adoption of best practice across the agri-food and fisheries industry, while prioritising environmental protection and capitalising on natural advantages and resources. The key targets specified in the report for the period 2010-2020 are[11]:

- Increasing the value of primary output in the agriculture, fisheries and forestry sector by €1.5 billion; this represents a 33% increase compared to the 2007-2009 average.
- Increasing the value added in the agri-food, fisheries and wood products sector by €3 billion, which represents a 40% increase compared to 2008.
- Achieving an export target of €12 billion for the sector. This represents a 42% increase compared to the 2007-2009 average.

RECOMMENDATIONS

This section presents more detailed discussions of our key recommendations.

INFRASTRUCTURE INVESTMENTS

As noted earlier, it is essential for businesses and consumers in the West Region to have to high-quality, low-latency, high-speed internet access.

Accordingly, we recommend increasing investment in broadband infrastructure. On this point, we welcome the commitment in the Government for National Recovery 2011-2016 programme to delivering fibre to 90% of homes and businesses in Ireland. We recommend that the remaining 10% could be served more effectively through next generation wireless technologies (WiMAX or LTE) rather than mobile or satellite broadband.

AGILITY

Although we have set out here the likely drivers of growth in employment in the Region, we must acknowledge that it is impossible to predict accurately what will be the 'next big thing'. (For example, mobile apps were not anticipated 5 years ago, and cloud computing had barely emerged.) What is needed is for all agencies and authorities to work hand in hand towards a common vision. To take the example of a establishing a wind farm, the Planning Authority, An Bord Pleanála, the NPWS, the EPA, EIRGRID, SEAI, CER, etc. should all first be committed to the development of wind energy and then should streamline their procedures to ensure that the project can go through the consent process quickly to a decision point, whether positive or negative.

Accordingly, we recommend:

1. Rather than placing bets on a small number of emerging trends, we believe that policy makers in the West Region should focus on creating a culture of agility and preparedness for whatever new opportunities come along, so that the Region can pivot rapidly when required.
2. Enterprise and research funding agencies should not be overly constrained by specific topics, but should facilitate those individuals and organisations who wish to develop new technologies in which they have particular expertise and that have employment potential.

3. Within Research Institutes and Higher Education Institutes in the Region, we believe it is vital to ensure we foster research and advancement of underlying technologies as well as application domain expertise, since basic techniques can be applied across many domains
4. Likewise, degree programmes should always have as their primary focus to impart fundamental knowledge and life-long learning skills, rather than becoming unduly focused on near-term technical skills.

International Capital

We recommend the establishment of new supports for export-led businesses, including access to international equity and debt capital in the absence of a strong domestic banking sector.

It is proposed that international network of venture capital companies be created to provide syndicated risk capital to fund West Region high potential startup companies, through different funding stages to revenue trade sale or public share offering.

Primary & Secondary Education Investments

We welcome the Government's commitments in Government for National Recovery 2011-2016 on the topics of 21st Century Schools and Building Schools for the Future. We believe it is vital to invest in technology to support teaching and learning, not for its own sake but where such technology has been proven to add value. We further call for the development of advanced syllabi at secondary level in Science, Technology, Engineering and Mathematics subjects.

Technology Research Centres

As has been noted in this report, the West Region has very successfully developed industry clusters in ICT, Medical Devices and Pharmaceuticals, and the research institutes in the Region complement this industry activity.

In the Government for National Recovery 2011-2016, it is proposed to initially establish three Technology Research Centres, focused on applied technological research and translational research, in the areas of Biotechnology, Nanotechnology, and High Value Manufacturing.

Accordingly, we recommend that the Biotechnology Research Centre be headquartered in NUI Galway and anchored in the research and industry activity in the West Region.

We further recommend that there be strong participation in the other Technology Research Centres by NUI Galway, GMIT, and the industry clusters in the West Region, drawing on the Region's unique strengths.

Entrepreneurship Training

We recognise the two Higher Education Institutes in the Region, the National University of Ireland Galway and the Galway Mayo Institute of Technology, are one of the engines of growth in the Smart Economy, producing skilled graduates, intellectual property, new technologies and spin-out companies.

The HEIs are acutely aware of the significance of how they contribute to growing the West Region's economy, and they recognise the

importance of embedding entrepreneurship (including social entrepreneurship) in undergraduate degree programmes in Engineering & Science. This is important because new technologies and high-technology companies are created primarily by engineers and scientists, who are the people with a technical ability to solve a problem, rather than people who have studied business.

In the Medical Device area, we note the recent establishment of BioInnovate Ireland[13], a specialist training Fellowship programme on medical device innovation and product design, based on the extremely successful and long-running Biodesign programme at Stanford, involving NUI Galway and 4 other universities (UL, RCSI, UCC and DCU), as well as the academic and industry members of the Irish Medical Devices Association. We believe that this provides an excellent model for innovation that could be replicated for the other industry clusters that we have identified as being of strategic importance to the West Region.

Accordingly, we recommend that the HEIs in the Region take the following steps to further expand their role as creator of exploited intellectual property, start-up businesses, and high-value employment opportunities:

1. Provide additional mechanisms to facilitate university researchers to switch between academic work and commercialisation of research.
2. Create extra-curricular structures to empower individuals to commercialise technologies: examine the Y Combinator model of 'startup bootcamp' and apply it in the West, informed also by the success of BioInnovate Ireland.
3. To ensure that HEI ownership of IP will not de-motivate individuals from taking risks, examine and adopt the University of Glasgow initiative in releasing university IP for commercialisation[14].

The New Engineering Building at NUI, Galway

Note: The New Engineering Building at NUI, Galway is the largest 3rd level engineering building in Ireland, bringing together all Engineering disciplines under one roof.

BIBLIOGRAPHY

1 Giblin, M: "Local Clusters & Global Entrepreneurship: The Significance of Spatial and Relational Propinquity in New Firm Formation." CISC Working Paper #36, National University of Ireland Galway, Oct 2010.

2 Western Development Commission: "Creative West: The Creative Sector in the Western Region", 2009.

3 Western Development Commission: "The Western Region: Key Statistics", February 2008.

4 Western Development Commission: "Work in the West: The West Region's Employment & Unemployment Challenge." December 2009.

5 IDA Ireland: "Information & Communications Technologies Newsletter", Spring 2011.

6 European Commission: "Europe 2020, A European strategy for smart, sustainable and inclusive growth." March 2010.

7 European Union, 2009: Directive 2009/28/ec on the promotion of the use of energy from renewable sources.

8 European Commission: "Research and innovation in support of the competitiveness of the European regions." 2008.

9 National Development Plan 2007-2013.

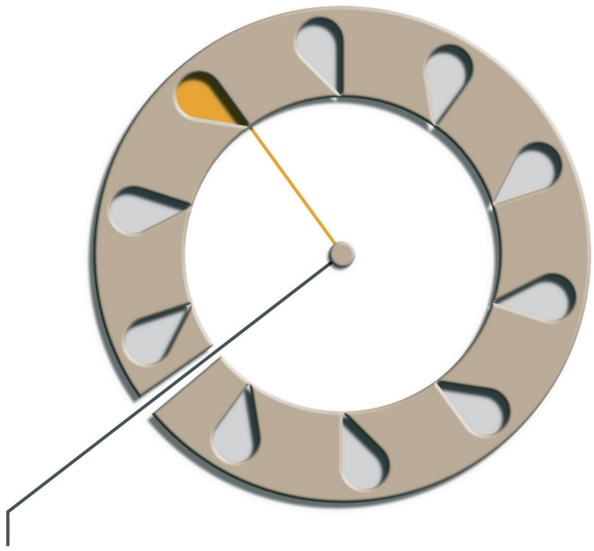
10 http://cordis.europa.eu/erawatch/index.cfm ?fuseaction=policy.document&uuid=29E25808-040B-6BF4-D63621A3225DE345

11 "Building Ireland's Smart Economy" 2009-2014

12 Department of Agriculture, Fisheries and Food: "Food Harvest 2020 - a Vision for Agri-Food and Fisheries." June 2010.

13 http://www.nuigalway.ie/bioinnovate/about.html

14 http://www.gla.ac.uk/news/headline_181588_en.html



"encouraging active, sociable, meaningful lives for good health and well-being"

Section Contents

KEY RECOMMENDATIONS

01 Prepare Water Safety Plans for all public water supplies in the Region.

02 Develop the biomedical cluster in the Region through deeper interaction between the biomedical companies, third level institutions and hospitals.

03 Exploit opportunities for convergence in medical device and ICT technologies and the medical support services they will enable.

EXECUTIVE SUMMARY

Introduction

The World Health Organisation (WHO) defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." A healthy region is therefore not only about minimizing the adverse health factors such as pollution or social problems. It is about actively creating conditions that promote health, safety and well-being of people in the Region.

Where are we now?

Engineers have played an important role in improving health, initially through public health measures but more recently in advances in medical technologies.

The convergence between medical device and ICT technologies represents an exciting opportunity for the Region. In addition to the opportunities that exist for research, development and manufacturing of such technologies in the Region, there are also possibilities in the development of innovative services that will be enabled by these technologies.

It is now accepted that there is a significant issue with preventable illness in the developed world. It accounts for approximately 20% of illness and is a growing problem.

There is a growing awareness of the role of lifestyle choice in promoting good health and some initiatives are being taken to focus on prevention rather than cure. There are significant benefits in this approach, firstly, economic as a measure to reduce soaring health costs and secondly, societal to reduce impacts of diseases such as cancer, diabetes, heart disease and stroke on families and the broader society.

The design of the built environment also has a role in promoting active lifestyles and this is recognised in the Active Design Guidelines developed for New York city.

Sports provide a significant benefit to the health and well-being of the inhabitants of our Region. The use of our natural assets to promote outdoor recreational activities has not been fully exploited.

There is a challenge as to how we measure wealth and develop our value system.

Former US president Bill Clinton, in a speech in March 2011, urged a return to core values in Ireland's journey to economic recovery. The speech highlighted that Mr. Clinton has a great empathy for Ireland and a deep understanding of our current circumstances.

HEALTH AND HAPPINESS

04 Support healthy lifestyles through design of our built environment, promotion of sport and recreation activities.

05 Develop the Region as a test bed for the deployment of the health and well-being initiatives proposed in this Report.

06 Happiness for the inhabitants in our Region is the ultimate objective and desired outcome from the implementation of the recommendations of this Report.

Where do we want to be?

The West Region should have as a primary objective to be a healthy region, with the infrastructure, facilities and programmes to support a proactive approach to health and the infrastructure and services for those in need of health care. The Region has an opportunity to be a leader in addressing the various elements of a proactive approach to health, including healthy eating, healthy lifestyles through exercise and sport.

The Region should continue and enhance its role in providing health care products and services internationally and thereby positively impacting on global health.

How will we get there?

Water Safety Plans should be prepared for all public water supplies as a proactive measure to ensure that Drinking Water does not constitute a potential danger to human health.

There is potential to further develop the biomedical cluster in the Region through interaction between the biomedical companies, third level institutions and hospitals. We need to explore how this interaction can be used to enhance the health care services provided in the Region.

There is the potential for significant benefits to the Region in exploiting opportunities for convergence in medical device and ICT technologies. Allied to this, there is the possibility of building on the existing clusters to provide a variety of medical support services.

The area where we can have the greatest impact on health and well-being is in the support of healthy lifestyles through our physical environment. Sport has an important role to play. A Sports Infrastructure Plan should be prepared for the Region.

Our built environment should be designed with greater attention to measures to encourage cycling and walking.

There is a need for an integrated approach to outdoor recreation management and improving opportunities and facilities for outdoor recreation.

Given the different opportunities that we have to promote new initiatives to promote health and well-being, the Region has the additional opportunity of developing as a test bed for the deployment of these initiatives.

Happiness for the inhabitants in our Region is the ultimate objective and outcome from addressing the other principles of One Planet Living. The challenge is to deliver on these principles, return to core values, appreciating what is important in life and how privileged we are to enjoy the natural assets of the West Region.

HEALTH AND HAPPINESS

INTRODUCTION

WHO defines health[1] as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." A healthy region is therefore not only about minimizing the adverse health factors such as pollution or social problems. It is about actively creating conditions that promote health, safety and well-being of people in the Region.

Engineers have, over the years, made a significant contribution to improved health on a global basis. This role commenced with their role in public health improvements in the 19th Century. While engineering has great capacity to do good, we must also acknowledge its power to do harm. Accordingly, the slogan "Do No Evil" is one that should be a core value for all engineers.

CURRENT STATUS

Engineers have played a significant role in public health through the provision of drinking water and wastewater infrastructure and services from the mid 19th Century. While this role is now largely taken for granted, the outbreak of cryptosporidiosis in Galway during 2007 where 242 cases of the disease were reported to the Health Protection Surveillance Centre emphasises the importance of this role.

Engineers have played an important role in advances in medicine in the last 20 years:

- Diagnostic Equipment
- Treatment Equipment
- Medical Devices

The report section on Equity and Local Economy examines the opportunities for convergence between medical device and ICT technologies and gives some regional examples. This represents an exciting opportunity for the Region given the ICT and Medical Device Clusters that have developed in the Region.

SyncroPhi Systems is a medical device company based in Galway, Ireland, and originally founded at NUI Galway. SyncroPhi Systems is making it possible to extend patient monitoring using wireless patient monitoring system.

Telemetry based implantable medical devices are being increasingly used for patient monitoring in hospitals and homes. Applications include heart rate sensors, pacemakers and drug delivery systems.

In addition to the opportunities that exist for research, development and manufacturing of such technology in the Region, there are also possibilities in the development of innovative services that will be enabled by these technologies. This formed the basis for a proposal entitled "The International Healthcare Services Centre"[2] to the Your Country, Your Call competition by Joseph Dalton.

It is now accepted that there is a significant issue with preventable illness in the developed world. It accounts for approximately 20% of illness and is a growing problem.

Life expectancy is rising in much of the world. But doctors are seeing another trend that is

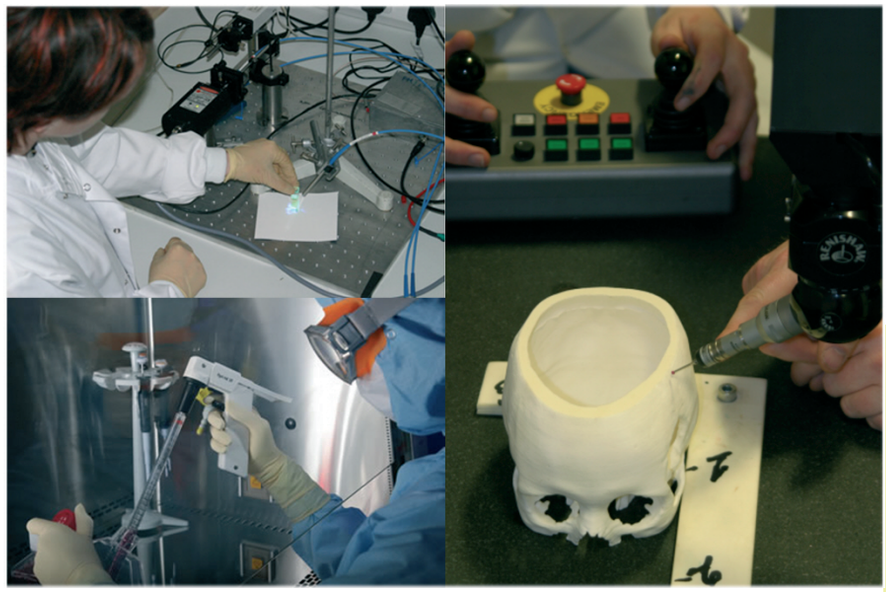


Figure 1 Engineers engaged in the advancement of Medical Device Design

disturbing. Some people are choosing lifestyles that contribute to early death.

A recent U.S. study[3] looks at four lifestyle choices that prevent people from staying healthy and living longer

- Eating too much
- Eating too much junk food
- Exercising too little
- Smoking cigarettes.

These habits increase the risk for cancer, diabetes, heart disease and stroke.

There is a growing awareness of the role of lifestyle choice in promoting good health and some initiatives are being taken to focus on prevention rather than cure. There are significant benefits in this approach, firstly, economic as a measure to reduce soaring health costs and secondly, societal to reduce impacts of diseases such as cancer, diabetes, heart disease and stroke on families and the broader society.

The following shows the steps being taken in Australia at local government level on cancer prevention and support[4]:

Cancer Council NSW has developed a systematic framework for working with Local Government in NSW. It includes formal partnerships, one to one relationship management, an awards and recognition program, and incentive grants funding. The focus is on the intersection between council functions, community aspirations and cancer control. Councils are supported to adopt policies and practices that lead to workplaces and communities that are well-nourished, active, sun smart and smoke-free, and that have access to vital health services. Councils can integrate cancer prevention and cancer support into broader community strategic planning objectives related to health protection and health promotion. Examples include improving transport links, access to recreation, adopting healthy policies, running healthy community programs, providing safer playgrounds and public spaces, and through workplace health and well-being programs.

Councils can have a significant impact on cancer in their community. They can shape the environments and infrastructure to reduce exposure to cancer risk and reduce the impact of a cancer diagnosis. About 30 per cent of cancers can be prevented through living healthier lifestyles - and this can only be achieved with all levels of government creating healthier living environments for everyone.

The design of the built environment also has a role in promoting active lifestyles and this is recognised in the Active Design Guidelines[5] developed for New York city.

The Active Design Guidelines provide architects and urban designers with a manual of strategies for creating healthier buildings, streets, and urban spaces, based on the latest academic research and best practices in the field. The Guidelines includes:

- Urban design strategies for creating neighbourhoods, streets, and outdoor spaces that encourage walking, bicycling, and active transportation and recreation.
- Building design strategies for promoting active living where we work and live and play-for example, through the placement and design of stairs, elevators, and indoor and outdoor spaces.
- Discussion of synergies between active design and sustainable design initiatives such as LEED and PlaNYC.

Sports

Sports, competitive and recreational, provide a significant benefit to the health and well-being of the inhabitants of our Region in a number of ways:

- Improving general fitness with positive benefits to physical and psychological health.
- Promoting personal development and teamwork.
- Developing social engagement, firstly among team members and secondly, among the greater community of each sporting organisation.
- Providing uplift in a community when a team is successful. This may be at the local community level when the local club performs well or extend to the nation and the greater diaspora when a national team performs well e.g. the euphoria associated with the Irish soccer team in Italia 90 without winning any competition.
- Promoting social inclusion. A good example is the Titans basketball club in Galway. It is

Figure 2 Marathons Rural & Urban

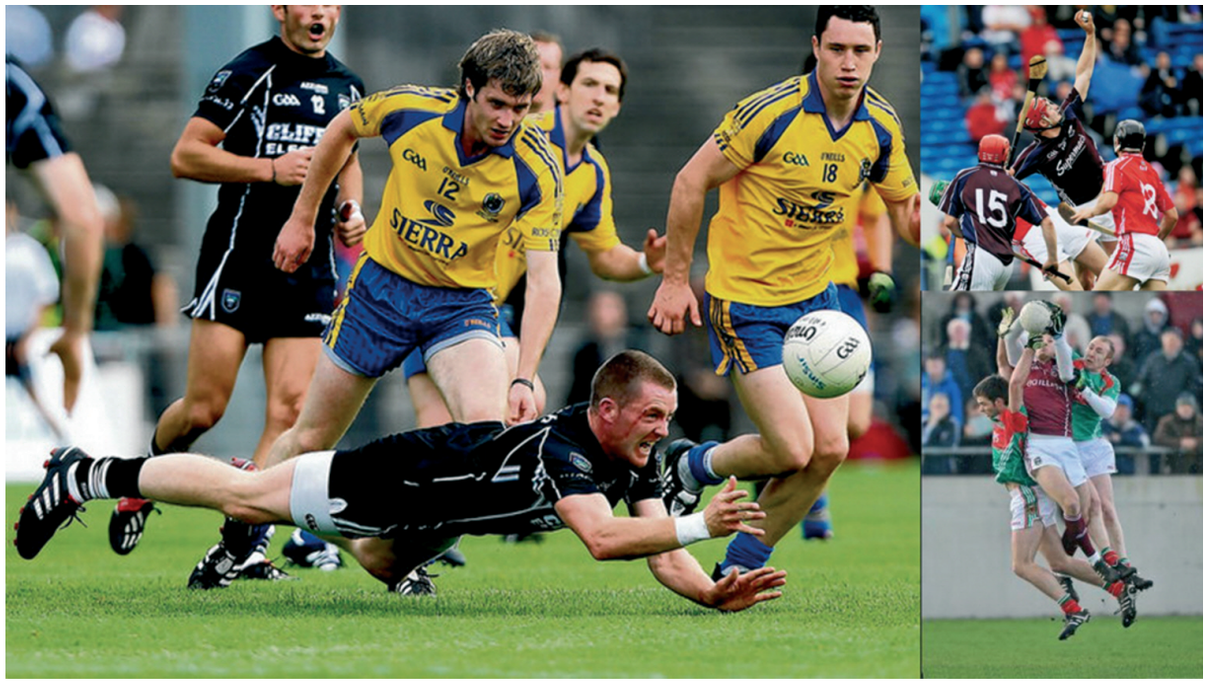


Figure 3 Our National Sports

the only team in Ireland where wheelchair basketball is provided as part of a mainstream basketball club. The club also encourages children from disadvantaged areas and immigrant communities to participate in the club.

There are some interesting examples of collaboration between local authorities and health authorities to produce physical activity and sports strategies. For example, the following is an extract from a strategy prepared for Sutton[6] in the UK.

> *It can contribute to the achievement of wider policy objectives such as improving health and addressing health inequalities, reducing crime and anti-social behaviour, enhancing educational outcomes, assisting economic development, creating a sense of self-worth and encouraging greater social inclusion. In a sense therefore, this*

Figure 4 Water Sports

document is not just a physical activity and sport strategy - it is also a health strategy, an education strategy, an anti crime strategy and an economic development strategy.

There have been a number of recent initiatives to promote outdoor recreational activities at regional and national level:

- National Countryside Recreation Strategy[7]
- Galway City Recreation and Amenity Needs Study[8]. The report sets out a strategy for the development of passive and active recreation within the city.
- Mayo County Walking Strategy & Strategic Action Plan[9]. It promotes an interagency approach to the development of the county as Ireland's premier walking destination and the Walking Capital of Ireland.
- A website has been developed to promote walking and cycling in County Mayo (www.mayowalks.ie). The Great Western Greenway, developed along the famous Newport / Mulranny Railway, is the longest off-road cycling trail in Ireland and is the first portion of the National Cycle Network to be developed.
- "Creating Green Infrastructure for Ireland - Enhancing natural capital for human wellbeing"[10]. While the primary objective of the strategy is to halt biodiversity loss, implementation of the proposals would have ancillary benefits in supporting outdoor recreational activities.
- The section of this report on Land Use and Wildlife included a review of the public forest estate, which also provides significant opportunities for outdoor recreational activities.
- The County Wicklow Outdoor Recreation Strategy 2009-2013[11] includes some interesting proposals and could provide a useful template for use in our Region.

New Measures of Wealth

British Prime Minister David Cameron, referring to plans to measure the UK's happiness, said that economic growth remained the most "urgent priority" but he wanted a better measure of how the country was doing than GDP. Quoting former US senator Robert Kennedy, who said GDP measured everything "except that which makes life worthwhile", he said the information gathered would help Britain re-evaluate its priorities in life[12].

The UK Office for National Statistics is currently carrying out consultation on the proposal to develop new measures of national well-being[13]. The aim is that these new measures will cover the quality of life of people in the UK, environmental and sustainability issues, as well as the economic performance of the country.

To develop better measures of the nation's well-being it wants to ask what matters most in people's lives and what is important for measuring the nation's well-being.

Sustainable Seattle are developing objective indicators for the Seattle Area Happiness Initiative under 9 separate domains as follows[14]:

1. Material Well-being
2. Environmental Quality
3. Governance
4. Education
5. Community Vitality
6. Cultural Vitality
7. Psychological Health
8. Human Health
9. Time Balance

Figure 5 The Tradition of Croagh Patrick

Figure 6 Traditional Music sessions

Figure 7 Galway Film Fleadh & Arts Festival

The Canadian Index of Well-being[15] (CIW) was launched in 2009 and includes 8 domains as follows:

1. Community Vitality
2. Democratic Engagement
3. Education
4. Environment
5. Healthy Populations
6. Leisure & Culture
7. Living Standards
8. Time Use

HEALTH AND HAPPINESS

The CIW Network is viewed as a global pioneer in developing a holistic, integrated approach to measuring well-being.

The 2010 edition of the Gallup-Healthways Well-Being Index[16] was published in March, 2011. The Index score is an average of six sub-indexes, which individually examine

1. Life evaluation,
2. Emotional health,
3. Work environment,
4. Physical health,
5. Healthy behaviours,
6. Access to basic necessities.

Boulder, Colorado, had the highest Well-Being Index score in the U.S. across the 188 metropolitan areas that Gallup and Healthways surveyed in 2010.

Richard Florida[17] reviewed the findings of the index in the context of earlier studies and analysis and made the following observations:

- There is a significant negative correlation between unemployment and happiness ("subjective well-being") across U.S. metros.
- There is a close association between human capital (measured as the percentage of adults with a college degree or higher) and city happiness, considerably stronger than that for income.
- There is a substantial positive correlation between city happiness and the share of creative class jobs and a significant negative one between well-being and the share of working class jobs.
- Cities with more knowledge, professional and creative jobs have less unemployment and higher levels of income. Creative work is intrinsically satisfying; it makes better use of our social and cognitive skills. Having creative and purposeful work to do is in itself a key factor in happiness.
- Conversely, cities with more blue-collar economies have been among the hardest hit by the economic crisis. Unemployment is high, incomes are lower.
- Analysis points only to associations between variables; it does not specify causation.

Former US president Bill Clinton, speaking at a lunch on 15th March, 2011 at the New York Yacht Club, urged a return to core values in Ireland's journey to economic recovery[18].

Mr Clinton said Ireland's economic difficulties were not the end of the world, adding that the Republic was beginning another chapter in its history.

> *"Somehow, we need to help our friends there not just to recover but to keep their heads on straight while they are recovering."*

It should never be assumed again, he said, that any given level of prosperity was permanent, that any economic arrangement could not be improved, and that any clever thing done might not be tinged with a little arrogance carrying the seeds of its destruction.

> *"We should remember that what we loved about Ireland was how green and beautiful it was . . . how beautiful the poetry and prose were . . . and how wonderful the music and the dance are."*

Mr Clinton said he was convinced if everybody had "30 lucid minutes" before passing away,

almost nobody would use them to think "how cool it was when we got rich". Mr Clinton said the thing people loved about Ireland had almost nothing to do about whether it was financially successful or not.

> *"It was what it was at the core. Ireland will be great and prosperous and wonderful again, simply by recovering what it is at the core. So it is for us not only to give advice, investment and support, but to scrape away the barnacles which have clouded the vision of the place we love."*

An excerpt from the speech, broadcast by RTE on the John Murray show, conveyed the emotion in the delivery and an empathy for Ireland that is not captured in the words quoted above.

WHERE DO WE WANT TO BE?

The West Region should have as a primary objective to be a healthy region, with the infrastructure, facilities and programmes to support a proactive approach to health and the infrastructure and services for those in need of health care. The Region has an opportunity to be a leader in addressing the various elements of a proactive approach to health, including healthy eating, healthy lifestyles through exercise and sport.

The Region should continue and enhance its role in providing health care products and services internationally and thereby positively impacting on global health.

We can not create happiness; however, we can create the environment that will improve quality of life and lead to happiness for inhabitants of our Region. While this is a primary benefit, there is a secondary benefit in that will help to attract the creative and talented people that will help our Region to prosper.

HOW WILL WE GET THERE?

Engineers should continue to have an important public health role, for example in pollution prevention and drinking water provision. Water Safety Plans are an important link between water supply provision and public health protection. Water Safety Plans should be prepared for all public water supplies as a proactive measure to ensure that Drinking Water does not constitute a potential danger to human health.

There is potential to further develop the biomedical cluster in the Region, as discussed elsewhere in this report. An important aspect of the development of this cluster is the interaction between the biomedical companies, third level institutions and hospitals. We need to explore how this interaction can be used to enhance the health care services provided in the Region.

There is the potential for significant benefits to the Region in exploiting opportunities for convergence in medical device and ICT technologies. Allied to these technology developments, there is the possibility of building on the existing clusters to provide a variety of

medical support services that will evolve in parallel with these technology developments.

The area where we can have the greatest impact on health and well being is in the support of healthy lifestyles through our physical environment. Sport, both recreational and competitive, has an important role to play. A Sports Infrastructure Plan should be prepared for the Region that prepares an inventory of the outdoor and indoor sports facilities and addresses the following:

- Identifies priorities for new infrastructure and infrastructure upgrades.
- Maximises the use of existing facilities through sharing of facilities. It is not sustainable that schools can close sports halls at 5:30pm weekdays and all day at weekends and not make the facilities available to local communities.
- Achieve better integration of sports infrastructure strategies and land use planning to promote accessibility and reduce carbon footprint in travelling to sports facilities.

Our built environment should be designed with greater attention to measures to encourage cycling and walking. We should learn from international best practice, for example, the Active Design Guidelines for New York city. We will look at the opportunities to collaborate with the Galway Healthy Cities project[19].

There is a need to build on a number of recent initiatives to promote the use of the excellent natural amenities in the Region for recreation activities. This requires an integrated approach to outdoor recreation management and improving opportunities and facilities for outdoor recreation.

Given the different opportunities that we have to promote innovative initiatives to promote health and well-being, the West Region has the additional opportunity of developing as a test bed for the deployment of these initiatives.

Happiness for the inhabitants in our Region is the ultimate objective and outcome from addressing the other principles of One Planet Living. The challenge is to deliver on these principles, return to core values, appreciating what is important in life and how privileged we are to enjoy the natural assets of the West Region.

BIBLIOGRAPHY

1 Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.

2 The International Healthcare Services Centre (IHSC) proposes the building of a 'Healthcare Cloud' in Ireland that will provide services to sectors including Healthcare IT, Telehealthcare, Independent Living, Supply Chain and Logistics and Insurance and payments. (www.ihsc.ie).

3 "The Preventable Causes of Death in the United States: Comparative Risk Assessment of Dietary, Lifestyle, and Metabolic Risk Factors," Goodarz Danaei, Eric L. Ding, Dariush Mozaffarian, Ben Taylor, Jurgen Rehm, Christopher J.L. Murray, Majid Ezzati, PLoS Medicine, April 28, 2009, Volume 6, Issue 4.

4 http://healthycities.wordpress.com/2011/03/21/cancer-and-local-government-%E2%80%93-a-potent-combination/

5 The Active Design Guidelines was developed by a partnership of the New York City departments of Design and Construction, Health and Mental Hygiene, Transportation, City Planning, and Office of Management and Budget, working with leading architectural and planning academics, and with help from the American Institute of Architects New York Chapter.

6 A Physical Activity and Sport Strategy for Sutton 2006 - 2009 published by Sutton Council and Sutton and Merton Primary Care Trust.

7 National Countryside Recreation Strategy, Department of for Community, Rural & Gaeltacht Affairs and Comhairle na Tuaithe, September, 2006.

8 Galway City Recreation and Amenity Needs Study, prepared as a joint initiative by the Planning & Economic Development and Parks & Culture Departments of Galway City Council, with the support of consultants Cunnane Stratton Reynolds. The Report was adopted by Members of Galway City Council on the 28th January 2008.

9 Mayo County Walking Strategy & Strategic Action Plan, prepared by the Mayo Walking Partnership, a Sub Committee of Mayo County Development Board, April 2007.

10 "Creating Green Infrastructure for Ireland - Enhancing natural capital for human wellbeing", Comhar Sustainable Development Council, August 2010.

11 The County Wicklow Outdoor Recreation Strategy 2009-2013, County Wicklow Partnership and Wicklow County Council and Ruth Pritchard, t/a, RSP Consulting, April 2009.

12 http://www.bbc.co.uk/news/uk-11833241

13 http://www.ons.gov.uk/well-being

14 http://www.sustainableseattle.org/sahi/gnh-objective-indicators

15 Canadian Index of Wellbeing - Measuring what Matters: http://www.ciw.ca/en/Home.aspx

16 http://www.gallup.com/poll/146645/Boulder-Colo-Leads-Metro-Areas-Wellbeing.aspx

17 http://www.creativeclass.com/creative_class/2011/03/23/why-are-some-cities-happier-than-others/

18 Irish Times, 18 March, 2011 http://www.irishtimes.com/newspaper/ireland/2011/0318/1224292507873.html

19 The Galway Healthy Cities project is part of the WHO European Healthy Cities Network, comprising of more than 90 cities and towns from 30 countries. (www.galwayhealthycities.ie)

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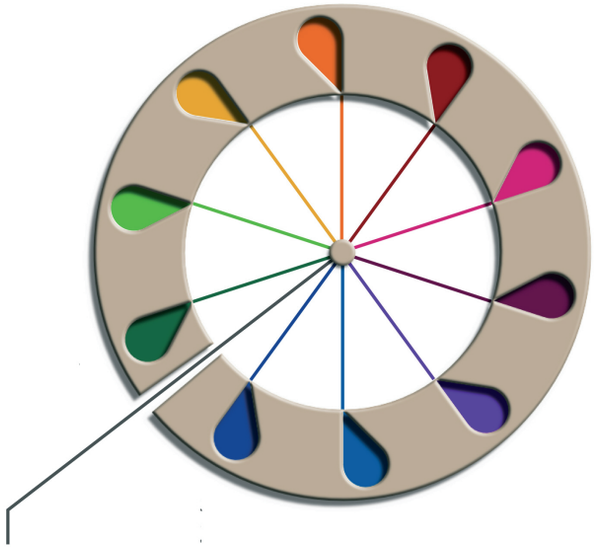
KEY RECOMMENDATIONS & NEXT STEPS



"An agile and sustainable West Region, benefiting from world class industrial clusters, a vibrant economy and our rich natural and cultural heritage"

Section Contents

KEY RECOMMENDATIONS & NEXT STEPS

INTRODUCTION

This report outlines a very detailed assessment of the West Region with the focus on identifying opportunities for the region to grow in an integrated and sustainable manner. A number of important conclusions may be made in relation to the region:

- The region is an area of enormous potential both in terms of its people, its heritage and its resources.
- Integrated and sustainable policies are key drivers of economic growth.
- While the current economic difficulties cannot be underestimated, significant opportunities still exist and decisions that are taken now will have significant impacts in the years to come.
- Engineers and the broad engineering community have a very important role to play in the development of the region.

The report brings together an extensive series of recommendations under the One Planet Living concept and its ten guiding principles. The key recommendations associated with each of these principles are summarised in the next section.

KEY RECOMMENDATIONS

TENET: ZERO CARBON

Ethos: making buildings more energy efficient and delivering all energy with renewable technologies

Key Recommendations

1. Develop a Regional Energy Efficiency Action Plan by mid 2012 incorporating ambitious targets for energy efficiency in buildings, public lighting and water services.
2. Setup a Regional resource to share experience and knowledge, provide advice on design for energy efficiency in buildings and promote responsible energy use.
3. Explore option of EU funding for the up-front costs of energy retrofit measures, in the light of the current scarcity of credit.
4. Develop an overall national vision for Renewable Energy in Ireland and communicate this to the general public with a view to developing a "Team Ireland" approach.
5. Adopt a national, integrated and coordinated approach to the planning and development of Renewable Energy including all stakeholders.
6. Develop Regional Plans for Renewable Energy development taking the particular characteristics and natural resources of each region into account.

TENET: ZERO WASTE

Ethos: reducing waste, reusing where possible, and ultimately sending zero waste to landfill

Key Recommendations

1. Bring forward a strategy as a matter of urgency to meet the 2013 and 2016 targets for diversion of Biodegradable Municipal Waste from landfill.
2. Expand the availability of 3 bin collections to as many households as economically possible taking advantage of the public willingness to segregate waste at source.
3. Have an informed, rational public debate, about the most suitable waste management technologies for the West Region.

4. Provide for co-ordination of the activities of the various Waste Management Regions at National Level.
5. Adopt 'community-based social marketing' to bring about behavioural change in the community in relation to waste prevention and recycling.
6. Encourage sustainable manufacturing ensuring resource use efficiency and incorporation of recycled materials into manufacturing.

TENET: SUSTAINABLE TRANSPORT

Ethos: encouraging low carbon modes of transport to reduce emissions, reducing the need to travel

Key Recommendations

1. Complete the M17/M18 Gort to Claremorris section of the Atlantic Road Corridor.
2. Construct the N6 Galway City Outer Bypass to relieve traffic congestion in Galway city and facilitate the implementation of sustainable transport measures.
3. Prioritise investment to upgrade N5 route: Westport to Roscommon/Longford borders. Upgrade National Secondary and Regional roads of strategic importance.
4. Continue to pursue with urgency and determination, within the West Region, the 5 key goals on which the "Smarter Travel" policy is based.
5. All new developments, industrial, commercial and housing, must be located and designed so as to facilitate public transport services.
6. Develop a state-of-the-art integrated transport hub at Ceannt Station including both a rail terminus and a Bus Éireann terminus.

TENET: SUSTAINABLE MATERIALS

Ethos: using sustainable and healthy products, such as those with low embodied energy, sourced locally, made from renewable or waste resources

Key Recommendations

1. Life-cycle costing should be used at the design stage of all buildings and new products.
2. Sustainable manufacturing systems such as 'lean and green manufacturing' should be embedded in all industries across the West Region.
3. Green Procurement Policies should be used by the public sector and all businesses in the West Region.
4. A Directory of sustainable 'green' businesses in the West Region should be developed.
5. Increased use of timber in construction and development of forestry and downstream associated industries should be vigorously promoted in the West Region.
6. Design for sustainability should be included in third level engineering courses.

TENET: LOCAL AND SUSTAINABLE FOOD

Ethos: choosing low impact, local, seasonal and organic diets and reducing food waste

Key Recommendations

1. Promote to consumers and producers the 7 principles of sustainable food developed by Sustain, the alliance for better food and farming.
2. Encourage the growth of existing small scale producers of speciality meat, dairy, preserves, fruit drinks and bread products.

3. Encourage the setting up of more small scale producers of speciality products with a mix of start-up incentives and mentoring.
4. Encourage the adoption by Farmers' Market of the voluntary Good Practice Standard and raise consumer awareness of the Standard.
5. Use social marketing to bring about change in consumer behaviour in relation to selection, purchase and consumption of foods.
6. Implement the recommendations in Food Harvest 2020.

TENET: SUSTAINABLE WATER

Ethos: using water more efficiently in buildings and in the products we buy; tackling local flooding and water course pollution

Key Recommendations

1. Public Water Supply - Undertake upgrade works for plants on the EPA Remedial Action List; Plan for long term needs; Progress Water Conservation.
2. Group Water Schemes - Upgrade water treatment plants where required; Progress Water Conservation; Establish a long term framework for rural water supplies.
3. Public Sewerage - Provide/Upgrade secondary wastewater treatment plants where required; Plan and provide wastewater infrastructure for the Galway gateway.
4. Septic Tanks - Provide and implement a national licensing framework; Adopt a strict planning regime to avoid new dwellings on unsuitable sites.
5. Flooding - Undertake flood alleviation works on the Clare and Dunkellin rivers. Advance the CFRAM Study for Western River Basin District.
6. Western River Basin Management Plan - Implement the Plan; promote active public engagement to make the region an exemplar in catchment management.

TENET: LAND USE AND WILDLIFE

Ethos: protecting and restoring existing biodiversity and natural habitats through appropriate land use and integration into the built environment.

Key Recommendations

1. Protect and restore natural habitats by promotion of good practice, better integration of spatial planning and implementation of the Green Infrastructure Report.
2. Devise and implement a more strategic and coordinated approach to the development of projects of strategic regional importance in Natura 2000 Sites.
3. Promote a shift from negative stakeholder engagement at project level to positive engagement in the preparation of spatial plans.
4. Develop, as a matter of urgency, a Marine Spatial Planning Framework to support the sustainable use of our significant ocean resource.
5. Use spatial planning to promote the Vision for the Region, developing a City Region based on the Galway Gateway and putting people at the heart of urban planning.
6. Devise and implement a "no gain and no pain" policy for landowners where there are changes in zoning or environmental designations.

TENET: CULTURE AND HERITAGE

Ethos: reviving local identity and wisdom; supporting and participating in the arts.

Key Recommendations

1. Continue the financial support for the arts and for the international and local arts festivals throughout the West Region.
2. Construct a state-of-the-art performance venue of appropriate size in Galway city.
3. Provide exhibition space for the arts in the centre of Galway city and in the major towns in the region.
4. Proceed with the implementation of the 20-Year Strategy for the Irish Language as quickly as possible.
5. Implement the National Biodiversity Plan to secure the preservation of our natural heritage and ensure that creative place strengths are maintained in the West Region.
6. Develop new tourism products incorporating archaeology, natural and cultural heritage to take advantage of the rich resources of the West Region.

TENET: EQUITY AND LOCAL ECONOMY

Ethos: creating bioregional economies that support fair employment, inclusive communities and international fair trade

Key Recommendations

1. Invest in health, education, transport and communication infrastructure, to enable the development of a world-class environment for local residents and industry.
2. Promote a culture of agility, preparedness and innovation for new opportunities so that the Region can respond rapidly when required.
3. Create networks to support equity and debt capital investment for innovation in export-led businesses, in the absence of a strong domestic VC and banking sector.
4. Increase investment in technologies for education, and advance syllabi in science, technology, engineering and mathematics at primary and secondary level.
5. Headquarter at least one Technology Research Centre in the West, and link existing strengths in biotech and ICT with international partners, to commercialise outputs.
6. Establish Y-Combinator style 'startup bootcamps', to provide inspiration, funding and practical supports for teams to commercialise technologies.

TENET: HEALTH AND HAPPINESS

Ethos: encouraging active, sociable, meaningful lives for good health and well-being

Key Recommendations

1. Prepare Water Safety Plans for all public water supplies in the Region.
2. Develop the biomedical cluster in the Region through deeper interaction between the biomedical companies, third level institutions and hospitals.
3. Exploit opportunities for convergence in medical device and ICT technologies and the medical support services they will enable.
4. Support healthy lifestyles through design of our built environment, promotion of sport and recreation activities.
5. Develop the Region as a test bed for the deployment of the health and well-being initiatives proposed in this Report.

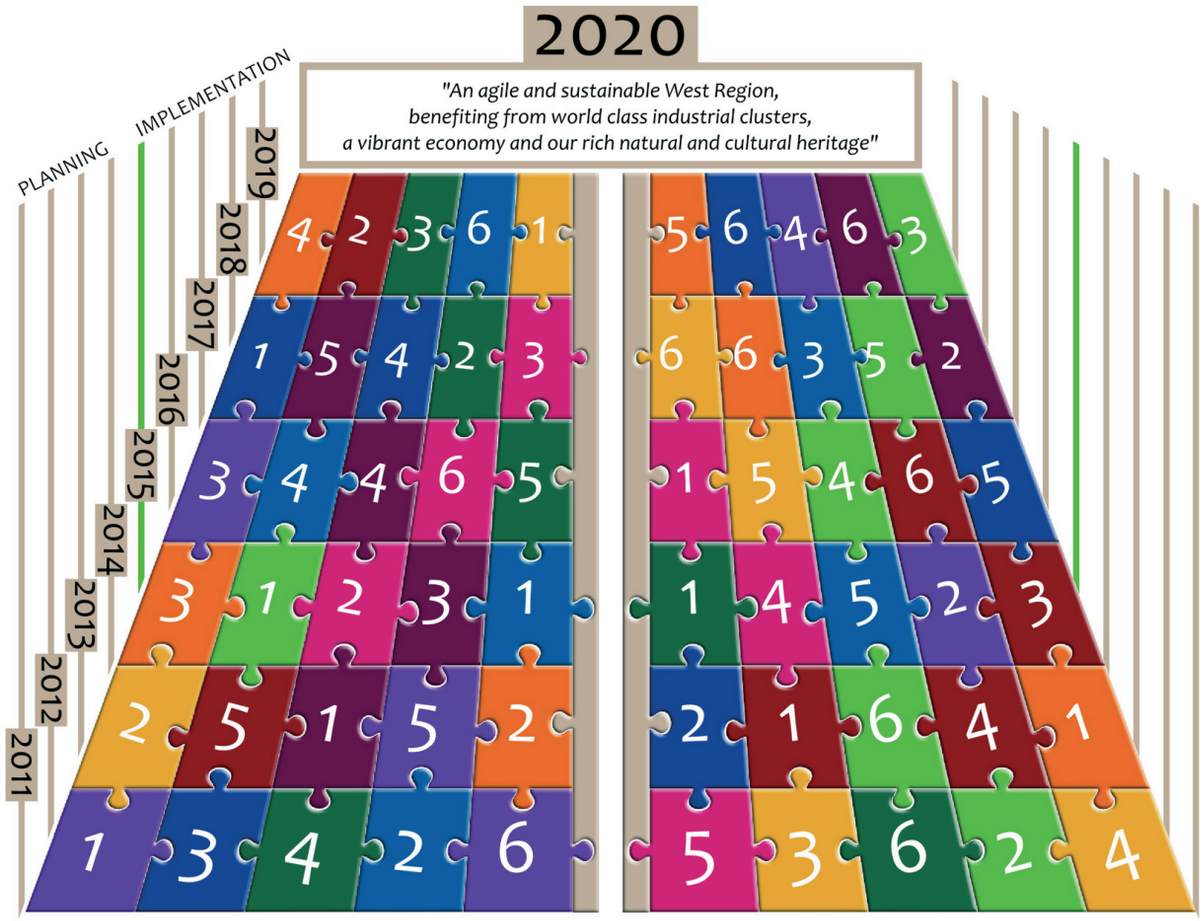


Figure 1 The Roadmap ahead

6. Happiness for the inhabitants in our Region is the ultimate objective and desired outcome from the implementation of the recommendations of this Report.

NEXT STEPS

The recommendations above are not made lightly and it is critically important that an implementation plan is developed around these proposals. While Engineers Ireland West Region is not in a decision making role in relation to these recommendations, nevertheless, it is committed to the future growth of the region and is firmly of the belief as to the necessity of their implementation.

The new programme for government represents a critical turning point for Ireland and, by extension, the West Region. As much of the detail in relation to this programme remains to be fully developed, the opportunity exists to include many of the ideas that have been outlined here, particularly as they relate to the West Region. Thus, engagement with relevant political and other decision makers will be integral to delivery of our strategy.

The first step will be to communicate our ideas and vision in relation to the sustainable development of the West Region to the key decision makers and to invite them to contribute to the achievement of this vision. This includes government departments and agencies, and

regional and local authorities. In particular, we will push for adoption of a sustainable framework such as the One Planet Living concept that we have outlined in this report.

During the background research work that was carried out in support of this report, there was extensive consultation with key regional stakeholders from both the public and private sectors. As part of the planned communication process, we will re-engage with these individuals in relation to the findings in the report. Another important grouping is the Engineers Ireland membership, particularly those living and working within the West Region. The report recommendations will be of direct relevance to many of these and we will communicate the findings to them at a local level. The wider membership can also play an important role in ensuring that the vision is achieved.

Within the next twelve months, we will organise a seminar in the West Region on Sustainable Development based on the "One Planet Living" concept and include speakers from cities/towns/regions that have successfully adopted a sustainability framework. This forum will be an opportunity to share ideas with government departments and agencies, local authorities and other stakeholders in addition to the broader Engineers Ireland membership.

We will seek out and support where we can initiatives by others, such as the group that produced "A Blueprint for Ireland's Recovery", where we think that the ideas and proposals therein can assist the sustainable development of the West Region. We will work with other groups such as "Galway 2040" who are developing their own vision for future development with a view to influencing them to adopt a sustainability framework. We will work with industry associations such as Galway Chamber, Information Technology Association of Galway (ITAG) and the American Chamber to promote the sustainable development of the West Region.

As the largest professional organisation in the West Region, Engineers Ireland is frequently consulted on policy issues by local authorities and other government agencies. With this report in place, we will be in a much better position to make informed submissions when required.

Thus, over the coming years, Engineers Ireland West Region will engage in a programme of work (see Figure 1) that is focused on ensuring that the recommendations developed here are delivered on. Thus, this report does not represent the end but it must be viewed as a necessary first step in a journey to achieving a broader vision for the region.

"Ní neart go cur le chéile!"

GLOSSARY

Appropriate Assessment
Assessment process under the Habitat's Directive

AD
Anaerobic Digestion

BMW
Biodegradable Municipal Waste

CAPEX
Capital Expenditure

CBI
Confederation of British Industry

CCBB
Competence Centre for Biorefining and Bioenergy

CFRAMS
Catchment Flood Risk Assessment and Management Studies

CISC
Centre for Innovation & Structural Change, NUI Galway

CIW
Canadian Index of Wellbeing

C&D Waste
Construction and Demolition Waste

CWM
Connacht Waste Management

ECJ
European Court of Justice

Ecological Footprint
The ecological footprint is a measure of human demand on the Earth's ecosystems. It represents the amount of biologically productive land and sea area needed to regenerate the resources a human population consumes and to absorb and render harmless the corresponding waste.

EfW
Energy from Waste

EPA
Environmental Protection Agency

ESCOs
Energy Service Companies

ESRI
Economic and Social Research Institute

EU
European Union

EV
Electric Vehicle

FDI
Foreign Direct Investment

FSC
Forest Stewardship Council

GHG
Green House Gases

GLUAS
LUAS-type light rail system for Galway

ICT
Information and communications technology

Industrial Clusters
Industry clusters are geographic areas where there is a concentration of industrial activity supported by government, regional and national actors such as universities and development agencies.

IWRM
Integrated Water Resources Management

IWWTS
Individual Waste Water Treatment Systems

LCA
Life Cycle Assessment

LEED
Leadership in Energy & Environmental Design is an internationally recognized green building certification system, providing third-party verification that a building or community was designed and built using strategies intended to improve performance in metrics such as energy savings, water efficiency, CO_2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts. Developed by the U.S. Green Building Council (USGBC)

MBT
Mechanical Biological Treatment

MNCs
Foreign-owned multinational corporations

MSW
Municipal Solid Waste

Mtoe
million tonnes of oil equivalent

Natura 2000 Site
Sites designated as Special Areas of Conservation (SACs) under the "Habitats Directive" or Special Protection Areas (SPAs) under the "Birds Directive".

NEEAP
National Energy Efficiency Action Plan

NPWS
National Parks and Wildlife Service

NSS
National Spatial Strategy

NTA
National Transport Authority

OECD
Organisation for Economic Co-operation and Development

One Planet Living (OPL)
One Planet Living is a global initiative based on 10 principles of sustainability developed by Bioregional and WWF.

OPEX

Operational expenditure

OREDP

Offshore Renewable Energy Development Plan

PlaNYC

On Earth Day 2007, Mayor Michael R. Bloomberg, released PlaNYC, a comprehensive sustainability plan for the City's future. PlaNYC puts forth a strategy to reduce the City's greenhouse gas footprint, while also accommodating a population growth of nearly one million, and improving our infrastructure and environment.

PSO

Public Sector Obligation

REFIT

Renewable Energy Feed-In Tariff

River Basin District

Main unit for management of river basins under the Water Framework Directive

RBMP

River Basin Management Plan under the Water Framework Directive

SEAI

Sustainable Energy Authority of Ireland

RDF

Refuse Derived Fuel

SPTVs

Small Public Transportation Vehicles

Sustainable Development

"Humanity has the ability to make development sustainable - to ensure that it meets the needs of the present without compromising the ability of future generations to meet their needs"

UFW

Unaccounted for Water, primarily leakage

VFM

Value for Money

WDC

Western Development Commission

WEEE

Directive 2002/96/EC on waste electrical and electronic equipment

WFD

Water Framework Directive (2000/60/EC)

WHO

World Health Organisation

WSIP

Water Services Investment Programme

WtE

Waste to Energy

WWD

Waste Water Discharge

WWF

World Wide Fund for Nature

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We are using the One Planet Living® framework to inform our sustainability programme.

One Planet Living® is an initiative based on 10 guiding principles of sustainability developed by BioRegional and WWF.