Irish Academy of Engineering

Ireland 2040 Our Plan – Issues and Choices:

Submission by the Irish Academy of Engineering

March 15, 2017
Ref: 02/07.1/03.17

The Irish Academy of Engineering

The Irish Academy of Engineering is an all-Ireland body, concerned with long-term issues where the engineering profession can make a unique contribution to economic, social and technological development.

Its members are Irish Engineers of distinction, drawn from a wide range of disciplines, and membership currently stands at approximately 145.

Drawing on the experience and knowledge of its distinguished members, the Academy works to facilitate communication and dialogue on engineering-related matters. It regularly publishes reports and analyses, some jointly with other learned and professional bodies.

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Section 1: Introduction

The Irish Academy of Engineering strongly supports long-term planning as the most rational way of ensuring that the range of developments required by demographic, economic and social growth over the next 20 years will be provided, in the right places and at the right time. The Academy endorses the basic argument put forward in the Issues Paper that as a society, we cannot continue with the 'business as usual' scenario, and that some hard choices will be required. Current regional growth patterns are sub-optimal, with increasing development pressures in Dublin and below-average population growth in most of our Atlantic cities. Our existing settlement and travel-to-work patterns have caused significant social, economic and environmental problems, which demand effective policy responses. Moreover, the reality of climate change is increasingly evident, and we need to factor this in moving towards a low-carbon society and in designing critical infrastructure.

The Academy welcomes this opportunity to participate in planning for Ireland up to 2040. It established a number of Working Groups comprising engineers who are working, or have worked, at senior management levels in the public and private sectors on the island of Ireland, to prepare Discussion Papers on the spatial planning and infrastructural investment issues which the National Planning Framework (NPF) will need to address. Six Discussion Papers were presented at a major conference held in Dublin Castle in May 2016, and the key findings of most relevance to the NPF are contained in a Summary Report attached to this submission. The complete Papers are available for downloading from the Academy's website http://www.iae.ie/publications. The Academy also arranged a conference in Cork in February 2017 to discuss the Atlantic City Regions paper; this conference was attended by representatives from the private and public sectors in Galway, Limerick, Cork and Waterford.

The purpose of this submission is to draw on those Discussion Papers, together with other relevant Academy reports, in responding to specific critical policy issues identified in the NPF consultation paper. Members of the Academy have particular expertise over many years in the design, planning and delivery of major infrastructural projects in both parts of the island, and can offer advice in relation to strategic planning for the future based on their experience. The Academy would welcome an opportunity to expand on this submission at a meeting with the NPF team, should that be considered helpful.

Section 2: Ireland's national planning challenges

The Academy fully agrees with the Issues Paper (1.1.6) that the most important question that needs to be asked at the outset of the NPF process is:

What sort of place should Ireland be in 2040 and what do we need to do to achieve this?

The Academy's vision for Ireland in 2040 is a country which has:

- Planned successfully for an increase over 2011 levels of 0.75 million+ extra inhabitants, in terms of new housing, places of work, education, health and other facilities
- Focused population growth in the Atlantic cities and larger towns, such that the Greater Dublin Area is not required to absorb an ever-increasing share of the national total, thus reducing pressure on the capital, and that those cities and larger towns become more vibrant and competitive places

- Fostered greater connectivity, both physical and digital, between our Atlantic city regions, and between those cities and their hinterlands
- Encouraged new housing to locate as close as possible to the heart of our cities and towns, while providing a range of affordable house types and sizes to meet the different needs of our population (including an increasing number of older people), thus reducing our dependence on car usage and enabling the economic provision of other infrastructure such as water supply, sewage treatment, broadband etc.
- Re-invigorated the central areas of cities and larger towns which have been adversely impacted by the economic downturn and the proliferation of out-of-town shopping centres
- Revitalised our smaller towns and villages, which have been hardest hit by population decline and loss of economic functions
- Protected our environmental resources and biodiversity (especially our water resources) and implemented comprehensive climate change policies
- Reduced our reliance on imported energy supply
- Developed an all-island approach to spatial planning, such as the Dublin-Belfast economic corridor, to enable the Island to compete on an international scale with similar sized conurbations
- Established more effective ways of prioritising and delivering national infrastructural projects.

The Academy considers that there are a number of essential game-changers that will set the NPF apart from previous similar processes:

- Effective implementation at regional and local level of national planning policies, articulated in both the NPF and the new Regional Spatial and Economic Strategies (RSESs), which prioritise development of Gateway city regions and which require more sustainable settlement patterns within those city regions.
- Supported and enabled by appropriate legislation.
- Neither the NPF or the RSESs will succeed unless they are accompanied by national and regional infrastructural investment plans which ensure that adequate funding is maintained over the medium- to long-term for projects which necessarily involve long lead-in and delivery times.
- Sustainable transport and broadband are critical investment priorities in enabling connectivity and competitiveness, for both FDI and indigenous enterprises. Both transport links and broadband can also help cities to drive economic and social development within their regions.
- National leadership is essential to ensure allocation of the required resources and that counter-productive interference does not hinder full and sustained implementation of the NPF over the long term.
- Local leadership from both the public and private sectors is vital within city regions – improved governance should come through directly elected regional authorities and city mayors, and through more autonomous local funding.
- North-south collaboration is even more important post-Brexit.

These will be elaborated on in more detail below.

Section 3: People's health and well-being

The Issues and Choices paper has presented a clear but stark picture of the settlement pattern which has emerged over recent decades, notwithstanding the objectives of the former National Spatial Strategy (NSS). In particular, more than 60% of all national population growth occurred in areas accessible to the Dublin, Cork and Galway hinterlands, but not in the cities themselves. The trend has been towards an overall pattern of suburbanisation, that may be described as 'sprawl' (para. 2.2.4). This has resulted in people travelling longer distances, often by car, which has contributed to car dependence and traffic congestion as well as wasteful time and energy spent commuting (para. 2.3.1). It is striking that not one of the twenty-two fastest growing towns in Ireland between 2002 and 2016 was an NSS gateway or hub settlement (para. 2.4.4). The consequences of some of the lifestyle choices that we are accustomed to are impacting on our own personal health and wellbeing as well as the overall health and wellbeing of places throughout Ireland (para. 3.1.3).

Sustainable transport investment improves the environment and reduces pollution by encouraging a modal shift to public transport, through facilitating higher density development, walking, cycling, and low-emission vehicles.

Widespread availability of high speed broadband contributes significantly to people's health and wellbeing by facilitating working from home, reducing commuting and increasing 'family available time'; increases the third level options available to young people; connects families and especially older people with friends and the wider community both at home and abroad; and provides a diversity of entertainment, information and education options for people not otherwise available to them in their local community.

The Academy proposes an effective policy response which would create more sustainable and healthier outcomes for individuals and for society as a whole:

- The provision of a range of affordable housing closer to where the majority of jobs are located, i.e. within larger cities and towns
- Increased urban densities which make public transport services viable, coupled with investment in public transport infrastructure, and in cycling and walking routes
- Extending high-speed broadband to dispersed communities, enabling at least some workers to work from home on either a full- or part-time basis, and generating new business opportunities for SMEs.

Section 4: More balanced regional development

Research carried out by the Academy, particularly in relation to the Atlantic City Regions, supports the analysis set out in chapters 2 and 4 of the Issues and Choices paper. In short, population growth in the Cork built-up area (28,300 or 16%), Limerick (15,600 or 20%) and Waterford (8,800 or 20%) has been significantly below the national average over the past 20 years, despite recent increases apparent in these three cities and particularly in Cork, since 2011 (para. 4.1.10). On the other hand, current trends would indicate that the Greater Dublin Area (GDA) will further increase its share of the national population over the next 20 years (CSO Regional Population Projections 2016-2031). The Issues Paper itself acknowledges that Dublin is under strain, and the Academy therefore strongly supports the argument set out at para. 4.1.12 of the consultation paper:

'Given the scale and important regional roles played by the four [Atlantic] cities, all have significant potential to complement Dublin, to absorb some of the strain that the Capital has been subject to in terms of accommodating growth in employment, housing need and infrastructural requirements and drive their wider regions, which may also require cities to work in collaboration with each other and/or in conjunction with other towns, to borrow and share strengths.'

It is important to emphasise that the Academy wishes to see Dublin flourish economically, and to accommodate its natural population increase; what it does not want is that the Greater Dublin Area should continue to absorb a growing share of the national population. This will involve a twin-track approach:

1) As indicated in our paper on the Dublin-Belfast economic corridor, the corridor has a population of almost half the total population of the island, and has a population density five times greater than the rest of the island. This gives it the potential to compete with larger urban zones such as Hamburg, Manchester and Milan, which rank in the top ten urban zones in Europe, and will make it a magnet for larger-scale inward investment projects that would otherwise not come to the island. The enhanced development of the Dublin-Belfast economic corridor will enable each urban centre along the corridor to benefit from enhanced economies of scale; increased economic growth and employment; more contiguous customers for indigenous industry; and more inward investment. But, to optimise its potential, it will also require better broadband, transport, energy, waste and water infrastructure, as well as enhanced education, research and health services.

2) The Academy considers that the NPF needs to contain specific pro-active measures to promote the Atlantic City Regions to ensure more balanced regional development. There is an increasing consensus among public policy makers, shared by the Academy, that cities play a critical role in driving economic development and innovation, especially in terms of the knowledge economy. However, given the relatively small scale of Irish cities by European standards, the Academy considers that the best way to achieve more balanced regional development is to establish an increasingly connected network of co-operating and complementary city regions[1]. The issue therefore is how connectivity both within and between the Atlantic city regions could be improved; transport infrastructure and broadband play a key role not only in facilitating such connectivity, but also in improving the competitiveness of our city regions.

The Academy welcomes the analysis of the structure of Irish cities in section 4.1 of the Issues and Choices paper, and particularly the recognition of the fact that Ireland is characterised by very strong growth of Dublin and an absence of comparative growth in any other urban centre. A key difference between Ireland and the selected other small developed countries and our nearest neighbour the UK, is the comparative weakness of the 'next tier' of cities and their associated regions[2]. It is proposed that the RSESs should include an audit of the key assets in the Atlantic City regions which could provide the building-blocks of regional development strategies.

[1] The Discussion Paper on the Atlantic City Regions cited the UK's Northern Powerhouse as an example of such co-operation and connectivity between cities. The Academy welcomes the recognition of this example in the Issues and Choices paper (para. 4.1.13).

[2] This issue was the subject of a presentation by Dr William Brady at the Academy's conference in Cork in February 2017: some of the main points from his presentation are summarised in Appendix A, below.

One of the game-changers listed above is local initiative and leadership. While the role of the Atlantic Cities should be clearly flagged in the NPF, each city region should be responsible for identifying its own development priorities, supported by updated metropolitan-wide land use and transport planning strategies. City regions should also identify areas of potential co-operation with adjacent regions which would optimise overall economic and social growth, reduce costs and improve service outcomes. It is important that each city should have an autonomous source of funding which will ensure that local priority projects will be implemented in line with those strategies. The Academy also recommends that regional assemblies and city mayors should be directly elected, so that regional and metropolitan policies and plans have broad democratic support and are driven by local democratic processes.

The Academy acknowledges that there are no comparable cities in the State north of a line from Dublin to Galway, but there are many county towns which should be re-invigorated and which are capable of providing a sub-regional role. The RSESs should examine the potential strengths and assets of each of these towns, and devise developmental strategies accordingly, including cross-border collaboration where appropriate.

Section 5: Sustainability – Climate change and energy

The Academy endorses the argument set out at para. 5.2.6 of the Issues and Choices paper:

> *If Ireland is to make up for lost ground in relation to carbon reduction targets and move towards the objective of a low carbon and climate resilient Ireland by 2050, it is necessary to make choices about how we plan for future growth. A key role for the National Planning Framework will be to assist in reinforcing the structural changes required to transition to a low carbon sustainable economy and society.*

The Academy wishes to comment in relation to both climate and energy policies over the period to 2040.

Climate change adaptation:
The impact of climate change, with increased rainfall intensity and frequency at times of the year and potential drought at others; sea level rise; more severe storms; increase in wave height and storm surges, poses potential significant risks for all of the essential services on which our modern society depends. Critical infrastructure such as water supply, sewage treatment, electricity and gas supply, communications services, transport, health and education facilities, are all at risk if we do not adapt to the reality which is climate change.

Now that the national climate change framework and legislation are in place, there is need to focus on implementation. The cost of delay in terms of risks to critical infrastructure, essential services and private property continues to increase, and the sooner the adaptation challenge is addressed head on the better. Climate change adaptation needs to be built into every aspect of the National Planning Framework and into national and regional infrastructure plans.

Energy supply:
The Academy is concerned about Ireland's over-reliance on limited sources of imported energy supply, particularly in a post-Brexit context where the UK will no longer be bound by EU energy directives.

Ireland has for some years been importing over 90% of its natural gas requirements through Britain. The Corrib field will initially supply approximately 50% of the island's needs. Within 3 or 4 years this will decline to less than 20% and if there are no further finds, the island will once more be hugely dependent on imports via the UK.

Greater security and competitiveness of energy supply is important for the future of the economy and society. The Academy therefore recommends specifically that

a) An electricity inter-connector to France should be constructed; and
b) Ireland should develop its own liquid natural gas (LNG) terminal. The proposed Shannon LNG Terminal at Ballylongford would be a positive development given Ireland's position at the end of the European Gas Grid, the decline in North Sea production and the limited lifespan of the Corrib gas field.

Section 6: Planning, funding and delivery of nationally-important infrastructure

Based on plausible demographic projections to 2040, the scale of population growth is clear, as is the demand for at least 500,000 new homes. There will be a concomitant need for new places of work, education, health, shopping, etc. If the NPF follows through on the policy guidance in the consultation paper, we also know that the majority of new population growth should be accommodated in our five major cities. We therefore are well-placed to plan the infrastructure which will underpin the required quantum and location of new development over the next 20 years. We equally know that most major infrastructural projects (such as an additional water supply for Dublin, or new electricity inter-connectors) take many years to go through the design, public consultation and option selection, planning, procurement and construction phases, so the challenge is firstly to identify those projects, and then to prioritise and fund them (over their design-to-completion lifetime). The NPF should facilitate timely and cost effective delivery of major infrastructure by promoting early action on relevant land zoning, outline design, route selection, environmental impact assessments, public consultation, planning applications and land acquisition, prior to final decisions to proceed with and commit significant funding to particular projects.

The Academy recommends that the following be considered as nationally-important infrastructural projects within the context of the NPF and the RSESs:

Roads:

- M20 Cork – Limerick Motorway
- Upgrading of N25 Cork – Waterford and N24 Limerick – Waterford roads to remove blockages and improve journey times
- Galway City Ring Road project
- M28 Cork – Ringaskiddy Port: This project now is a higher priority post Brexit decision with Cork Port having direct access to European markets in France etc.
- M7 upgrade to three lanes from Naas to M9 junction

- Implement a range of congestion relief projects for the M50[3]
  Note: With the use of autonomous cars gaining momentum over the next decade, the quality of our road network will play a key role in the efficient use of this mode of transport.

Rail:

- Metro North
- Improving journey times on radial routes out of Dublin including the Dublin – Belfast line with electrification of the routes planned over time to tie in with renewal of fleet etc.

Airports:

- Construction of 2nd runway at Dublin Airport and increased terminal capacity to accommodate the projected growth in passenger traffic

Water:

- Shannon – Dublin water supply project with the potential to connect with a further pipeline from Lough Neagh to Dublin to improve security of water supply on the wider Dublin-Belfast Economic Corridor.

Power:

- Electricity interconnector to France : Direct connectivity with mainland Europe post Brexit will be strategically important for Ireland.

Gas:

- LNG Import Terminal connected to the Natural Gas Grid – again strategically important post Brexit.

Broadband:

- Urgent implementation of the Government's National Broadband Plan.

The Academy shares the conclusion set out at para. 6.1.6 of the consultation paper:

It has been a particular issue that the relationship between infrastructure and land-use in Ireland is such that the spatial pattern of development has served to reinforce the predominant status quo. This is largely because infrastructural investment has followed development and population, in the context of constrained public expenditure and a market-driven, development-led environment.

It is for this reason that the Academy attaches so much importance to the need for an Infrastructural Investment Plan to accompany the NPF; otherwise, there is a real risk that essential projects will be delayed, or not provided at all. The Investment Plan should:

- Be co-ordinated with the infrastructure priorities of the NPF and the RSESs, and the Capital Investment Plan;
- Provide for multi-annual funding of such projects, to give certainty that they will proceed once development consent has been granted. Some of the funding should be ring-fenced for inter-city regional projects; and
- Be reviewed and updated annually in a report to the Oireachtas.

The Academy recognises the need to achieve agreement and alignment of policies in a number of Departments to ensure cohesive application of the NPF. It therefore further recommends the establishment of a National Infrastructure Commission which would bring together all the current infrastructure providers. The purpose of the Commission is not to duplicate the work of such providers, but to prioritise and co-ordinate major projects, to monitor implementation, and

[3] As detailed in the Academy's 2016 report, *Sustainable Transport Infrastructure 2035* (http://www.iae.ie/publications)

to share relevant expertise (such as procurement procedures). A key role would be to ensure consistency between the infrastructural investment plan and the NPF and RSESs.

Section 7: Successful implementation of the National Planning Framework

The NPF and the NSS share many high-level spatial development goals. However, as the Issues and Choices paper accepts, it is important to learn from the experience of the NSS, and especially from its relatively weak level of implementation.

The Academy has identified the following barriers to successful implementation of the NSS:

- Lack of political leadership support at national level, and counter-productive political interference at national, regional and local levels
- Insufficient resources committed to infrastructure development
- Lack of leadership from Regional Authorities which were too numerous and lacking in resources
- Absence of robust monitoring of implementation.

As a starting point, the Academy believes that implementation of the NPF should be across all Departments and State agencies, and it would therefore be appropriate that implementation should be led by, and have the authority of, the Taoiseach of the day. This could be done by means of a Cabinet sub-committee, supported by a high-level group at Assistant Secretary level, which would receive regular progress reports. In this regard, it is important that NPF targets should be set at the outset, particularly in relation to (i) population and employment growth in each of the city regions; and (ii) oversight of major infrastructural projects. Day-to-day supervision of implementation should be assigned to the Minister for Housing, Planning, Community and Local Government and to the three Regional Assemblies.

In section 4 above, the importance of initiative and leadership at regional and local level was highlighted, particularly in relation to the five cities as drivers of their regional economies.

While NPF governance is essential, it is not sufficient. The Academy's central argument is that the development required to support population growth will not happen, or at least not happen in time, without adequate funding and political leadership. Given the long lead-in time for major projects, these need to be prioritised from the outset and certainty created in relation to their delivery. As the Exchequer is the primary source of capital funding, the State can exercise considerable influence over the location and timing of such infrastructure, and thus facilitate development in accordance with NPF spatial priorities. Given the significant costs to the exchequer, other methodologies for delivery of infrastructure projects such as PPPs, may in the present economic climate prove viable and will need to be examined by the NTMA, to ensure timely construction of the required infrastructure and its importance for the growth of the economy.

Finally, achieving the maximum possible level of ongoing political support for the NPF and for Regional Spatial and Economic Strategies (RSESs) will be a fundamental key success factor in ensuring optimum implementation over the long term.

Appendix A:

Key points from Dr William Brady's presentation 'Ireland's second-tier city regions' to the Academy's conference on the NPF: Opportunities for the Atlantic City Regions? Cork, Feb. 2017

- Second-tier cities may be defined as cities outside the capital whose economic and social performance is sufficiently important to affect the potential performance of the national economy.
- City regions tend to be more reflective of everyday economic and social realities than administrative cities / regions / counties.
- Cities compete with cities. City governance therefore matters, because it reflects the way in which cities react to the challenges of globalisation. Governance often includes place-based strategies aimed at securing urban success in a fragmented and complex economic and political arena.
- 80% of Europe's urban population live in the 124 second-tier cities. While 23% of Europe's GDP is generated in capital cities, 33% is generated in second-tier cities.
- 'Successful capitals are crucially important to their national economies, but the risk is that they dominate the rest of the urban system so that the national economy becomes spatially and structurally unbalanced.' [John Moores University / ESPON, '*Second Tier Cities in Europe: In an Age of Austerity Why Invest Beyond the Capitals?*' 2012]
- Over-investment in capital cities and under-investment in second-tier cities leads to economic under-performance. Capital city dominance increases regional inequality within countries.
- Countries which de-concentrate investment and resources and decentralise powers and responsibilities have more high-performing cities and better national economic performance.
- Local authorities and city regions need powers.
- The National Planning Framework offers the only real prospect of achieving more balanced territorial development. Rural policy won't address regional development – there is a need for a strong urban hierarchy.
- Connected Atlantic City Regions provide a strong alternative spatial development model using cities as anchors.
- International examples of inter-urban co-operation (albeit at different scales) include the Northern Powerhouse in the UK and the Randstad in the Netherlands.

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Spatial and Infrastructural Planning in Ireland: Summary Report

Submission to the Department of Housing, Planning, Community and Local Government in relation to the National Planning Framework

March 15, 2017
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Contents

FOREWORD

The Irish Academy of Engineering established a number of Working Groups to prepare a series of complementary Policy Discussion Papers to assist policy makers in both jurisdictions on the island in the ongoing development of spatial planning policy, and to inform decision-making on associated major infrastructure development over the coming decades:

- Spatial Planning on the island of Ireland – Context and Challenges
- Dublin – Belfast Economic Corridor
- Atlantic City Regions - Development and Connectivity
- Sustainable Transport Infrastructure 2035
- National Broadband Plan Ireland – Policy Advisory
- Critical Infrastructure – Adaptation for Climate Change: A Progress Report.

These Policy Discussion Papers were prepared following research and wide ranging discussions with senior executives from the public and private sectors in both Ireland and Northern Ireland. They are available on the Academy's website http://www.iae.ie/publications/, together with all previously completed reports. The Academy's approach has been to focus its attention on economic and balanced regional development and on the "connectivity" infrastructure - transport and broadband - required to support such development.

The six Papers were presented at a conference in Dublin Castle on 17 May 2016, attended by over 80 representatives from public and private sector bodies, trade unions, professional institutes, and the European Commission. There was broad support for the Academy's policy recommendations, particularly in relation to the role of infrastructural investment in supporting economic development at national and regional levels.

The Academy has prepared this single summary report as an input to the Department of Housing, Planning, Community and Local Government in the context of the preparation of the National Planning Framework and the Regional Spatial and Economic Strategies. While some of the Discussion Papers adopted an all-island perspective, this report concentrates on issues within the jurisdiction of the Department and of the Regional Assemblies, including cross-border co-ordination. A similar report will be made to the Department for Regional Development in Northern Ireland in relation to any future review of its current Regional Development Strategy 2035.

This report does not purport to be an executive summary of the six Discussion Papers. Instead, its focus is on the challenges facing spatial planners over the next few decades, and how enhanced investment in the provision of suitably-located infrastructure can achieve significant economic and environmental benefits. A fuller discussion of the issues involved, together with a series of detailed policy recommendations, can be found in each of the individual Papers.

EXECUTIVE SUMMARY

Background:

For the past few years, Working Groups set up by the Irish Academy of Engineering prepared six Discussion Papers on spatial planning and infrastructural provision on the island of Ireland. These Papers were intended to be the Academy's contribution towards the preparation of the forthcoming National Planning Framework (NPF) in the Republic (and the accompanying Regional Spatial and Economic Strategies[1]), and to any future review of Northern Ireland's Regional Development Strategy. The Papers were presented to, and debated at, a major conference held in Dublin Castle in May 2016, attended by over 80 participants from a wide variety of public and civic organisations.

This Summary Report focuses on spatial planning within the Republic. It begins with an overview of the issues faced by those charged with preparing the national and regional spatial strategies, notably significant population increase over the next 20 years, relatively strong economic growth, extensive technological changes across many sectors, and the overarching challenge of dealing with climate change.

Key issues:

1. **Flexibility:** It is essential that the NPF should have inbuilt flexibility to cope with inevitable change and uncertainty, particularly in relation to different economic scenarios (such as the impact of Brexit or new US trade and tax policies), or changing patterns of population growth and migration. The NPF should therefore be subject to periodic reviews over its 20-year horizon.
2. **Demography:** It is highly probable that the population of the Republic will witness significant population growth (0.75m to 1m+) over the next 20 years. The NPF must factor such growth in the planning and delivery of essential infrastructure – housing, transport, energy, communications, water services, health and education.
3. **Potential of cities:** The NPF should recognise that the best way of ensuring economic and social development at both national and regional levels is to harness the potential of our main cities.
4. **Infrastructure development:** The NPF should (a) recognise the important role played by infrastructure in promoting economic and social development, and (b) cater for the long lead-in time needed to plan, design, and deliver major projects.
5. **Connectivity:** The NPF should highlight the importance of both transport and digital connectivity between cities, and between cities and their hinterlands, in facilitating more balanced regional development.
6. **Climate change:** The NPF has the potential to play a key role in influencing a reduction in greenhouse gas emissions (e.g. through more sustainable settlement patterns), and in the adaptation of critical infrastructure to respond to climate change (such as more flood events).
7. **Long-term implementation:** The NPF will be largely ineffective unless it is accompanied by a National Infrastructure Development Plan for key national projects, whose implementation would be overseen by a National Infrastructure Authority.

Recommendations:

The Academy makes two types of recommendations:

a) Spatial policy recommendations, set out at the end of chapters or sections within chapters; and
b) National infrastructural priorities, derived from the six Discussion Papers, set out in chapter 6.

The Academy recommends that both administrations on the island should endorse the concept of the Dublin-Belfast Economic Corridor as a means of attracting certain types of foreign direct investment which might otherwise not locate here. The Academy also recommends building up the capacity of the four Atlantic City Regions – the catchment areas of Cork, Limerick / Shannon, Galway and Waterford – to enable them to act more effectively as economic drivers, and to avoid the Greater Dublin Area (which is already experiencing development pressures) from expanding too rapidly relative to the other regions.

There is a wealth of detailed research contained in each of the Papers which cannot be adequately summarised in a short report such as this, and the Academy recommends that relevant Departments and agencies should consult

[1] See map showing the three Regional Assembly areas at Appendix A, below.

those Papers of particular relevance to their areas of responsibility. In particular, the Regional Assemblies will find several of the Papers (notably on the Atlantic City Regions and Sustainable Transport Infrastructure) of considerable assistance in preparing their Regional Spatial and Economic Strategies.

CHAPTER 1: CONTEXT

The following background factors will need to be considered in the development of spatial planning frameworks and associated infrastructure development programmes in Ireland:

A. Demographics

Recent projections suggest that the population of the island could reach 8 million in the mid-2030s. For Ireland, Central Statistics Office projections forecast a population of 5.99m by 2036 under the M1F1 strong growth scenario, and 5.34m under the more moderate M2F2 growth scenario[2]. These projections indicate a population increase between 2011 and 2036 of 1.40m under the M1F1 scenario and of 0.75m under the M2F2 scenario. The UK Office of National Statistics and the Northern Ireland Statistics and Research Agency are projecting a population of 2m for Northern Ireland by 2036, an increase of 0.18m over 2014.

Most of this population will live in the eight main coastal city regions - Belfast, Dublin, Waterford, Cork, Limerick, Galway, Sligo and Derry/Londonderry. It is expected that about half of the island's population will live within the Dublin- Belfast corridor, and almost 1.5m within the hinterland of the Atlantic Cities – Waterford, Cork, Limerick and Galway.

This projected increase in population will put a significant strain on essential services and associated infrastructure over the next 20 years – housing, transportation, energy, health, education, water services etc., much of which has suffered from under-investment not only during the downturn in the economy, but in some cases for years previously.

The shortage of affordable housing and associated services infrastructure poses a particular problem for spatial planners in Ireland. Not alone is there need to provide additional housing and services to accommodate an additional 0.75m to 1.41m people between 2011 and 2036, but there is also need to address the backlog of people now seeking housing who could not purchase or rent during the recession.

B. Economic Development

The Irish economy has recovered dramatically since the downturn and has proved more robust than many economists forecast. While there are certainly future potential risks to be taken into account (Brexit, slowdown in China, political uncertainty in the US, fears of deflation in Europe, etc.), on balance the international economic outlook is reasonably benign. Ireland's multi-national sector and foreign direct investment, particularly from the US, have been resilient during the downturn and are continuing to grow, with growth forecast to continue for the foreseeable future. The indigenous SME sector is also growing.

Notwithstanding potential risks materialising and economic or population growth being lower than anticipated, long-term planning strategy, and associated investment in essential infrastructure, must accommodate current economic and population growth projections. A growing economy will further sustain an already growing population. There is need to plan not only to meet the service needs of such population growth, but also plan to support and facilitate economic growth itself.

C. Advances in Technology

Technological developments are emerging at an ever-increasing rate and impact on every aspect of social, economic and infrastructure development. Increasingly sophisticated technology is being built into everyday domestic, commercial and industrial processes, appliances and machinery.

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[2] Central Statistics Office, *Population and Labour Force Projections 2016-2046* (April 2013), Table O, Projected population 2026-2046.

The Academy highlights below two areas of potential technological change in particular, related to the crucial issue of connectivity, which must be considered in carrying out long-term spatial planning. It will be important to build in flexibility to decision making to accommodate potential "game-changing" technological developments over the coming decades, while ensuring this does not prevent decisions on necessary infrastructure development being made in a timely manner.

Transport

Transport is on the cusp of potentially fundamental change over the next two decades, perhaps more so than other infrastructure sectors. Rapid and non-linear developments in the transportation sector include:

- Traffic management systems, such as smart signalling and real time congestion charging, are becoming ever more sophisticated.
- Vehicles connected to the internet – radar based adaptive cruise control, city-safe braking, camera-based lane-keeping, radar-based lane-change warning, self-parking technology.
- Smart-city developments, which can promote public and shared transport, reduce congestion, improve safety and deliver a sustainable transport system.

Broadband

Ongoing advances in technology within the industrial and services sectors, and associated IT-based operations, provide increasing opportunities for individuals using broadband services to work from home or from satellite locations remote from the central location of an enterprise. Improved broadband service can also contribute to reduction in greenhouse gases by reducing the amount of work-related travel.

Cloud computing is redefining how individuals, SMEs, large corporations and public bodies do business. Cloud-based services have lowered the barriers for start-ups, reduced costs and extended reach for SMEs and truly globalised large corporations. Without ubiquitous, high-speed fibre broadband providing the advantages of speed, security and bandwidth, Ireland will continue to be in 'catch-up mode' and at a significant disadvantage, particularly the rural areas and those areas not served by such infrastructure and services.

The Internet of Things (IOT) has the potential to stimulate innovation and radically change the cost base in the delivery of many products and services. Ireland, if it has a first-class telecommunications infrastructure, has the opportunity to lead in many areas of IOT including energy, manufacturing, medicine, education and public services. However, there is a need to develop a public infrastructure for IOT and this should be led by the State, seeing this as a public good.

D. Climate Change

The COP 21 climate change deal adopted in Paris in December 2015 by 195 countries, including Ireland, confirmed that climate change is already with us and poses significant ongoing challenges for planners into the future. Even if we could successfully cap greenhouse gas (GHG) emissions, we will not stop the effects of climate change over the coming decades. The impact of climate change must be taken into account in preparing spatial planning strategy and in planning and designing essential infrastructure:

- The island's critical infrastructure and in particular its coastal cities are at risk as a result of changes to rainfall patterns, rising sea levels and more severe storms.
- The need to reduce GHG emissions has led to mandatory EU targets for renewable energy generation.
- There is a need to reduce transport-based GHG emissions by building more compact cities and towns and by promoting a modal shift from cars to public transport.

E. Investment in Infrastructure

The Academy believes that having good quality infrastructure and associated services available across the island is a priority objective in preparing long term planning strategies. We believe this view is reflected in public sentiment amongst the majority of the population on the island regarding the importance of public services.

There is widespread international agreement on the economic and social benefits of investment in essential infrastructure across transport, broadband, electricity, gas, water services and waste management. The European Commission's *Country Report on Ireland 2016*[3] commented on the benefits of infrastructure investment stating:

> "*Public investment in infrastructure typically has a potent short-term stimulus effect, but its main benefits are to be gauged in terms of the impact on long-term growth potential*".

However, the same report found that Ireland has a substantial infrastructure deficit:

> *"As in other EU countries, general government capital expenditure was one of the first items to be cut in order to reduce the budget deficit. Following a peak of 5.2% of GDP in 2008, public investment fell to a low of 1.8% of GDP in 2013 before slightly recovering in 2014. It was still well below the EU average. In addition, the crisis appears to have led to a structural shift in the composition of general government expenditure away from investment towards current spending. In 2010-2013, capital expenditure averaged only 4.8% of the total, less than half the long-term average during 1995-2008*." [4]

[3] *European Commission Staff Working Document: Country Report – Ireland 2016,* page 66.

[4] Ditto, page 61.

CHAPTER 2: KEY SPATIAL PLANNING CONCEPTS

The Academy recommends that the proposed national and regional spatial planning frameworks should be based on the following concepts:

A. An appropriate long-term spatial planning approach

The National Planning Framework (NPF) should require that long-term spatial plans be accompanied by associated detailed long-term infrastructure action plans, to be prepared by relevant government sectors and agencies and at regional and local authority level. These plans should detail the main infrastructure projects planned over the long term, with indicative budgets and timescales. The NPF and associated sectoral, regional and local plans should have a particular focus on promoting economic growth and balanced regional development.

Major nationally important infrastructure development, and significant infrastructure development which crosses local authority and regional boundaries, should be included in a National Infrastructure Development Programme to be managed and budgeted for on a national basis.

A central body should take charge of managing delivery of such major infrastructure projects. The Academy in its 2011 report *"The Cost-Effective Delivery of Essential Infrastructure"* [5] called for the establishment of a National Infrastructure Authority charged specifically with the delivery of strategic infrastructure. The establishment of Transport Infrastructure Ireland in 2015 is a significant step in this direction. The implementation of the NPF will most likely highlight other strategic infrastructure besides transport which needs to be delivered. The NPF should clarify how delivery of such nationally-important infrastructure will be managed centrally, with delivery monitored and reported on to government and the public. The NPF should also allow for the fact that overall planning lead times for major infrastructure (involving preliminary and detailed design, environmental assessment, public consultation, planning activities and procurement) can take many years prior to construction activity commencing.

There is need to ensure that funding for infrastructure development is maintained at a consistent and appropriate level over the long term and not subject to disruption due to temporary downturns in the economic cycle. It would be folly to allow proper medium- and long-term planning be compromised by short-term financial constraints.

B. Cities supporting balanced regional development

It is generally recognised that larger cities, by virtue of their population, services and infrastructure, are attractive locations for multinational and indeed for many indigenous companies to locate their activities. These cities also attract many of the skilled staff, both Irish and international, which such companies require. However, lack of adequate investment in essential infrastructure has led to further pressure on already overloaded services in cities. In particular, a shortage of housing supply in our larger cities[6] and appropriate urban and commuter transport systems, pushes up accommodation costs and acts as a disincentive for skilled staff to live in or adjacent to these cities and thus for large employers dependent on a ready supply of such staff to locate there.

The Academy believes that balanced regional development can best be achieved by focussing on the potential of the main cities to revitalise towns and villages within their hinterland - cities should not be seen in isolation from their regions. It is estimated that for every ten jobs created by foreign direct investment firms, up to seven additional jobs are created in the rest of the economy. Many of these spin-off jobs can be located in more rural areas, provided that the appropriate level of connectivity exists in terms of broadband and transport infrastructure.

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[5] Irish Academy of Engineering, *The Cost-Effective Delivery of Essential Infrastructure* (2011).

[6] The Government's Housing Action Plan, *Rebuilding Ireland,* published in July 2016, stated that although there is permission for approximately 27,000 housing units in Dublin, only 4,800 were under construction at that time (page 60).

C. The importance of connectivity

Connectivity, primarily broadband and transport infrastructure, will play a dynamic and essential role in maximising the potential for economic growth in the island's cities and in spreading the benefits of such growth across the regions. Good transport infrastructure between our cities and between cities and their hinterland and outlying towns, is essential in improving the efficiency and reducing the cost of transporting people and goods. Of equal importance is the need to ensure best possible digital connectivity across all areas on the island. A country-wide quality broadband service is now an essential economic necessity in an increasingly competitive international market. Employers require a high quality broadband service not only at the locations where their operations are centred but also to enable their employees connect from home to their Irish and international operations, customers and suppliers.

D. Implementing the NPF over the long-term

The National Planning Framework should include simple and accepted structures and processes which ensure adherence to and implementation of the framework over the long term, by all relevant public bodies and private organisations.

The NPF should clearly set out the responsibilities of all parties involved, including clarity on who is ultimately responsible for overall implementation nationally. It should include the requirement for sectoral and local spatial plans to be produced with associated infrastructure development plans, budgetary requirements and implementation programmes. The NPF should also include a requirement to prepare multi-annual financial plans and to establish ring-fenced budgets for infrastructure investment, in particular for priority infrastructure projects.

The preparation of a National Infrastructure Development Programme and the establishment of a National Infrastructure Authority as proposed above should be included in the NPF and also a structured process for monitoring implementation and reporting to Dáil Eireann on an annual basis.

E. Cross-border consultation and co-ordination of spatial planning

There is free movement of people and goods between both jurisdictions on the island of Ireland, and cross-border trade and commerce is significant. Many people live in one jurisdiction and work in the other, and many elements of the island's essential infrastructure are all-island or cross-border in nature. Indeed, both jurisdictions are closely linked both economically and culturally. Lack of co-operation in spatial planning would result in sub-optimal plans being prepared, with resulting potential reduction in economic growth and development, increase in infrastructure costs and reduction in services to the public. It is therefore essential that long-term spatial planning in both jurisdictions is carried out with close consultation, co-operation and co-ordination of plans.

CHAPTER 3: CONNECTIVITY BETWEEN OUR CITIES

3.1 INTRODUCTION

This chapter focuses on the connectivity of the main coastal city regions on the island, and on the crucial role that these city regions can play in revitalising towns and villages across the island. The Academy believes that co-operation where appropriate between the island's coastal cities can both maximise the economic potential of our main cities while also contributing significantly to development within a 40-60km radius from these cities.

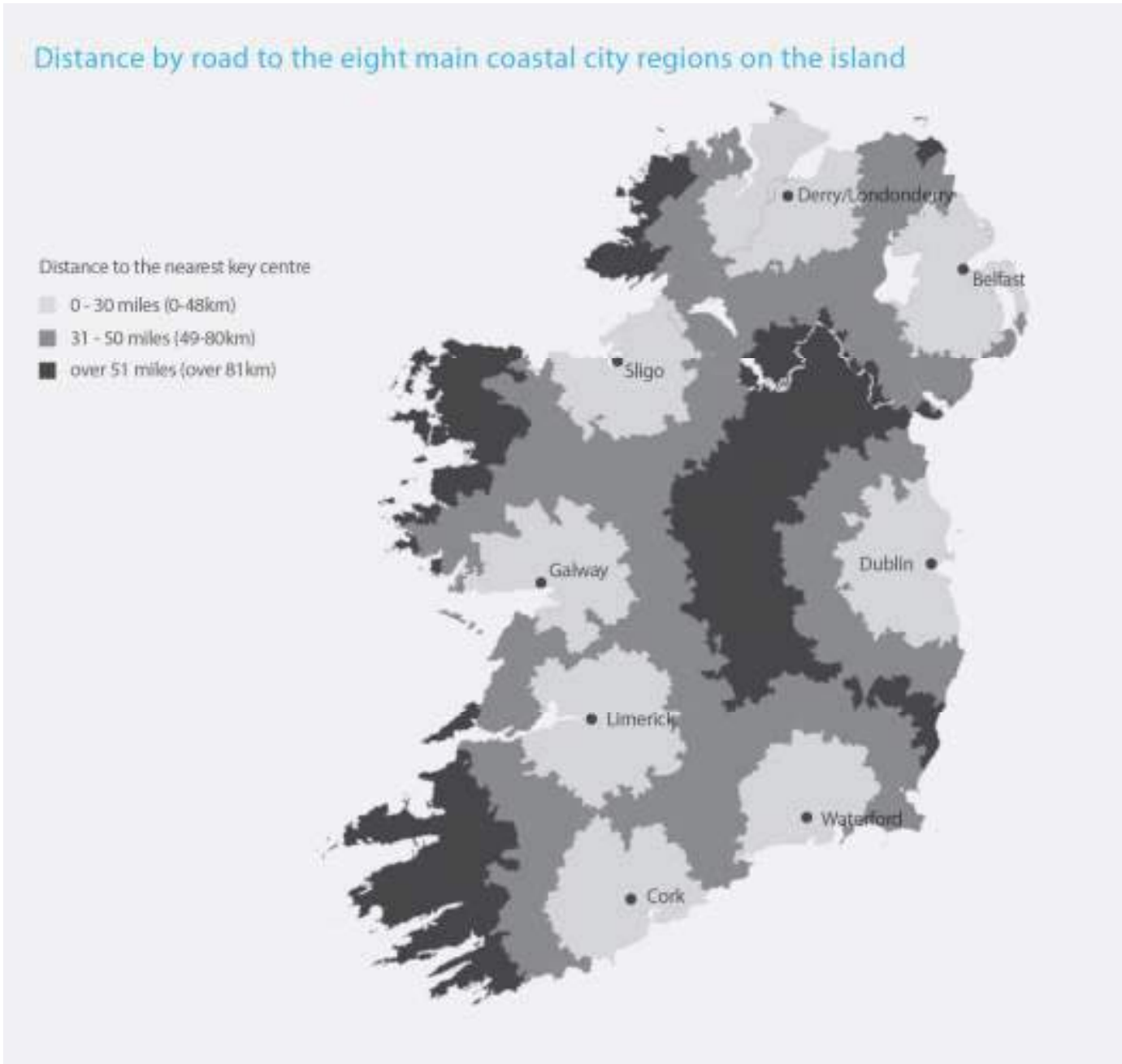

Figure 1: Distance by road to the eight main coastal cities on the island

Outlying areas in the regions will benefit from the growth in these cities and their hinterland through the provision of services, IT support, outsourced manufacturing/sub-supply, and increased numbers of tourists. Increased economic growth will also benefit the more outlying regions by generating the taxation resources necessary for the social and economic development of more dispersed locations. Building on the potential of our coastal cities, balanced regional development will improve the quality of life for society across the island while minimising the strain on services and infrastructure in the larger cities, particularly in Dublin, Belfast and Cork.

The concept of an economic corridor is based on the potential of connectivity between urban centres within a country or large region to add value to the economic development of those centres, including the benefits of additional networking between those centres. Given the relatively small scale of Irish regions, the role of connectivity between cities and their catchment areas in supporting regional development is of crucial importance.

Two of the Academy's Discussion Papers deal with connectivity between our main cities:

1) The Dublin-Belfast Economic Corridor, and
2) The Atlantic City Regions (Galway, Limerick, Cork and Waterford).

The Academy recommends that these should be seen as complementary elements of a comprehensive spatial strategy aimed at achieving more balanced regional development within the island as a whole.

3.2 DUBLIN-BELFAST ECONOMIC CORRIDOR

The Dublin-Belfast Economic Corridor is the only region on the island having the scale and population density to become a significant European growth centre. It has a population of almost half the total population of the island, and has a population density five times greater than the rest of the island. This gives it the potential to compete with larger urban zones such as Hamburg, Manchester and Milan, which rank in the top ten urban zones in Europe, and will make it a magnet for larger-scale inward investment projects that would otherwise not come to the island.

The challenge is to create a conurbation which can match the competitiveness of these highly-developed urban centres. With international competition for foreign direct investment (FDI) increasing all the time, including competitive corporate taxation rates and potential changes in Britain's relationship with the rest of the European Union, it is essential to further strengthen the existing advantages of this corridor.

The enhanced development of the Dublin-Belfast Economic Corridor will enable each urban centre along the corridor to benefit from enhanced economies of scale; increased economic growth and employment; more contiguous customers for indigenous industry; and more inward investment. But, to optimise its potential, it will also require better broadband, transport, energy, waste and water infrastructure, as well as enhanced education, research and health services.

While the evolution of this corridor is now well established, the challenge for the two jurisdictions on the island is to ensure the complementary provision of infrastructure which will support the corridor as a motor for growth that will, in turn, benefit the whole island. In addition, plans prepared by all local authorities along the route should take account of their contribution to connectivity within the corridor.

The trade connections along the corridor and cross-border remain most important for smaller firms. Two-thirds of the goods and services exported by Northern Ireland small firms go to Ireland, while one sixth of equivalent exports from Ireland go to Northern Ireland. This "inter trading" is not only important for small firms, but also for first-time exporters who are taking their first step in Northern Ireland in selling outside their own market. Almost three quarters of businesses take their first steps into exporting through the cross-border market, and 71% of these found that experience led them on to further export markets in Britain, the rest of the EU, and further afield[7].

The development of the Corridor is particularly relevant in offsetting the negative impact of Brexit on cross-border trade.

Transport Services

Road traffic growth in the period up to 2030 looks now set to exceed the growth in GNP on both sides of the corridor, necessitating adding to the case for the completion of the motorway from Dublin to Belfast. Public transport by bus and rail will be the priority modes of transport. A corridor population of four million will require a reduction in the car usage for people movements in the Greater Dublin Area from the current levels of about 70%. This will require the development of high density hubs for both employment and living, where the modal-share car usage is reduced to approximately 20% of people movements, and where priority would be given to public transport, walking and cycling.

[7] Source: InterTrade Ireland

Currently there are only eight through services per day between Dublin and Belfast, whereas commuter rail services between many paired cities in Europe comprise up to 40/50 services per day. A direct service frequency of at least hourly is desirable on the Dublin-Belfast line. This would have a major impact on commuter services into Dublin.

Developing Dublin Airport as a global international hub

Ensuring connectivity to and from global growth centres is critical to Ireland's ability to attract foreign direct investment, and there is also the possibility to strengthen the positon of Dublin Airport as a hub from Europe to North America, the Middle and Far East and Africa. Planning permission for a second runway is in place and its construction is now urgent. This would ensure the viability of Dublin as a major air transport hub, and increase the attraction of the Dublin-Belfast Economic Corridor as a location for international investment. Planning and development must also include increasing terminal capacity at the airport to cope with the likely doubling of passenger throughput by 2030.

Port developments

Demand on Dublin Port is likely to continue expanding in line with national output. An inland port serviced by rail would relieve congestion in the port area and free up land for commercial and residential development, as has been done in Gothenburg for example. In addition, a pipeline connection from Poolbeg to Dublin airport for jet fuel is recommended[8]. Other ports on the corridor, including Larne, Belfast, Warrenpoint, Greenore and Dun Laoghaire all contribute significantly to the movement of people and goods off the island.

Shared water network to enable bulk transfer of water

It is recommended that studies should be undertaken to investigate the feasibility and business case for connecting the planned River Shannon to Dublin water pipeline with a further pipeline from Lough Neagh to Dublin to improve security of water supply on the wider Dublin-Belfast Economic Corridor.

Competitive and adequate energy supply.

The development of an all-island energy strategy comprising complementary, high quality, and internationally-competitive energy infrastructure in each jurisdiction has been recommended by the Academy[9].

Universities

The availability of a cohort of well-educated people, to university graduate level, is a key attraction of the Dublin-Belfast Corridor. Universities have a significant impact on their surrounding regional economies, and can have a substantial impact on the internationalisation of the corridor, particularly when there is a significant proportion of foreign students. About 100,000 students attend the six university campuses located on the Dublin-Belfast Economic Corridor. The development of specialist post-graduate schools involving a number of universities on the island would facilitate economies of scale which would not otherwise be possible.

Economic Corridor Coordination

An advisory body, comprising the local authorities on the Corridor, would promote the development of the Corridor, and these authorities would plan to take account of the connectivity requirements linking their respective areas.

MAIN POLICY RECOMMENDATIONS:

- The governments in both parts of Ireland should work towards developing the Dublin- Belfast Economic Corridor as a shared spatial planning concept.
- Complementary infrastructure should be planned to improve existing connectivity within the Corridor and to facilitate new economic activity.
- Urban densities should be increased, and residential development encouraged, to accommodate likely future population increase within the Corridor.

[8] Irish Academy of Engineering, *Greater Dublin Area Transport Strategy submission,* 2015.

[9] Irish Academy of Engineering, *Energy Advisory Policy: The Future of Oil & Gas* (2013); *Response to Green Paper on Energy* (2014); *Energy Bulletins 1 to 4* (2014/2015). These documents can be accessed on the Academy's website at http://www.iae.ie/

3.3 THE ATLANTIC CITY REGIONS

The four Atlantic City regions – Galway, Limerick, Cork and Waterford - were designated as Gateways in the 2002 National Spatial Strategy; the intention was that they should develop sufficient 'critical mass' to enable them to become effective drivers of their regional economies. Continuity of this approach has been flagged in the NPF Roadmap which stated that the NPF will set out high-level place-based objectives in relation to the main components of Ireland's geographical or spatial structure, i.e.:

- Maintaining and developing an internationally competitive economy at State, regional and local levels, and
- Acknowledging cities as key drivers of regional performance.

However, with the exception of Galway, population growth in these cities has lagged behind the national average, and current trends would indicate that the Greater Dublin Area (GDA) will further increase its share of the national population over the next 20 years.

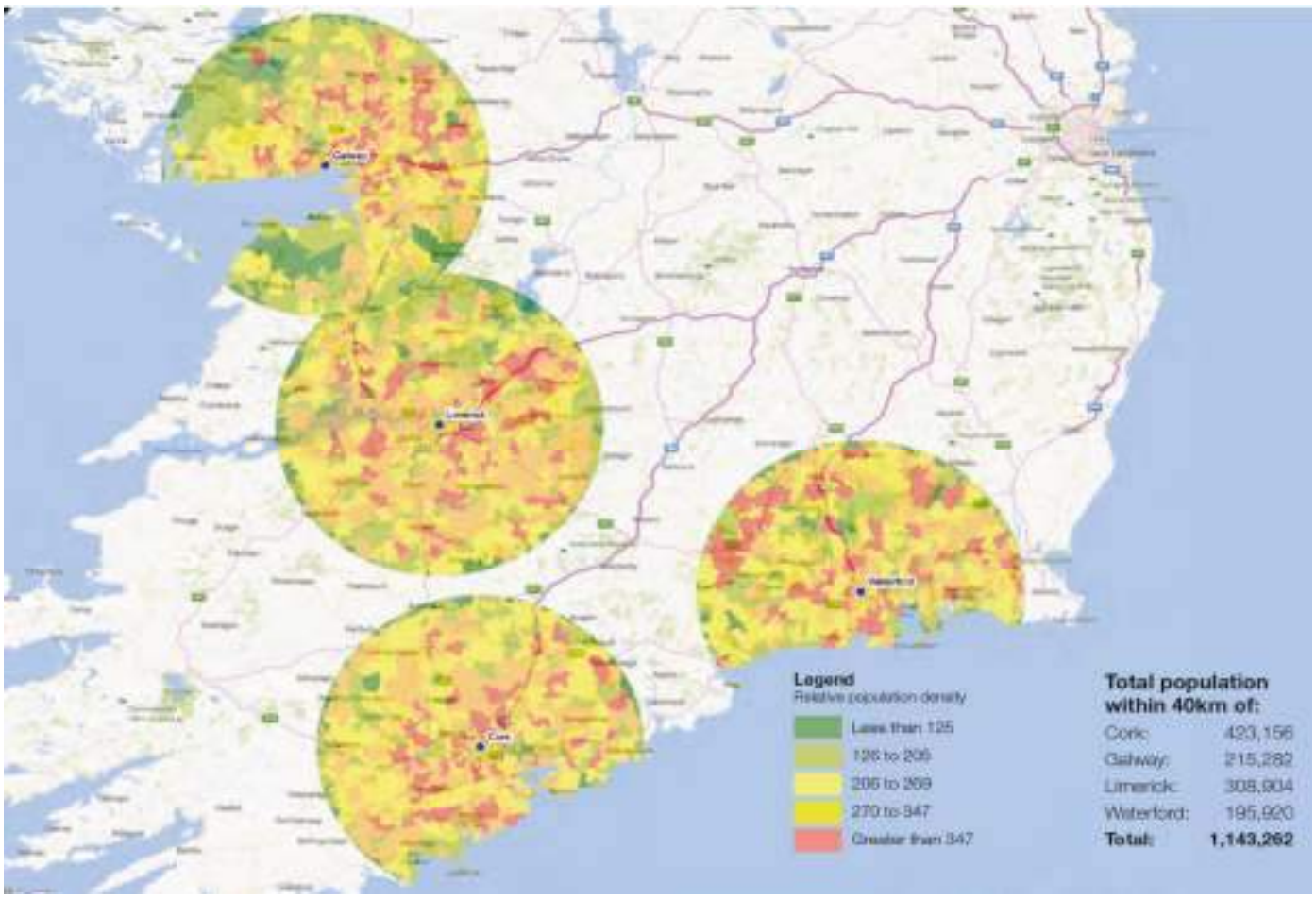

Figure 2: Relative population density in the Atlantic Cities regions

The combined population of the four cities in 2011 was 519,163; if the population of the region within a 40 km radius of each city is taken into account, the combined population of the four city regions amounts to 1.143 million. However, population growth between 2002 and 2011 in Waterford, Cork and Limerick lagged significantly behind the population increase of the State as a whole; only Galway came close to matching the State's growth rate.

A further matter for concern is that, on the basis of CSO population projections, the GDA is likely to increase its share of the national population by 2031. While the total population would grow in all regions due to natural increase, the GDA would see its population increase by just over 400,000 by 2031 if internal migration patterns return to the traditional pattern last observed in the mid-1990s. This increase would account for two-thirds of the total projected population growth in the State over this period. While the South-West region would benefit from a marginal increase in its share of the national total in 2031, the South-East, Mid-West and West would see a

decrease in their regional shares. The Academy considers that the proposed NPF needs to contain specific pro-active measures to promote the Atlantic City Regions – to ensure more balanced regional development.

The Academy is strongly of the view that cities play a critical role in driving economic development and innovation, especially in terms of the knowledge economy. However, given the relatively small scale of Irish cities by European standards, the Academy considers that the best way to achieve more balanced regional development is to establish an increasingly connected network of co-operating and complementary city regions. The issue therefore is how connectivity both within and between the city regions could be improved.

The attraction of FDI companies to regional locations outside the GDA will be an important step in that direction. The Academy supports the policy of the IDA to target a minimum 30% - 40% increase in the number of investments for each region outside Dublin[10]. The plan provides €150 million for an IDA property investment programme to attract FDI into different parts of Ireland over a five-year period, including the development of 'Utility-Intensive Strategic Sites' and related infrastructure provision. These sites are large specialised greenfield sites which require significant capital investment in utilities (i.e. power, water, waste water, gas, telecoms), and which meet the particular requirements of large-scale capital-intensive projects.

Appendix B contains a socio-economic profile of the Atlantic City Regions.

MAIN POLICY RECOMMENDATIONS:

- The four Atlantic City Regions should be enabled to act as drivers of economic growth and employment creation.
- A complementary policy is required to address rural economic activity (see chapter 4.2 re the potential of high-speed broadband).
- Investment in connectivity between the four cities is essential to ensure that they perform as a connected network of complementary and co-operating urban regions.
- The National Planning Framework and the Regional Spatial and Economic Strategies need to be supported by a co-ordinated infrastructure investment plan with projects identified on a priority and value-for-money basis over the life of that plan.
- The Regional Strategies should be able to identify sites for designation as Strategic Development Zones under the Planning Acts.

[10] IDA, *Foreign Direct Investment 2015-2019.*

CHAPTER 4: IMPROVING CONNECTIVITY – TRANSPORT AND BROADBAND

Excellent connectivity is essential for the well-being of both cities and their regions. Connectivity can be both physical (such as roads and rail) and digital (broadband). This chapter sets out the Academy's views on the vital role of transport and broadband in supporting more balanced and more sustainable regional development.

4.1 Sustainable transport infrastructure

Transport has a major impact on every aspect of our lives, on the wider economy, and on our environment, and there is widespread international evidence that transport investment is a vital driver of a strong economy, regional development, and a better quality of life[11]. While business and industry are the heartbeat of the economy, sustainable transport networks are the arteries. Efficient links within and between towns, cities and regions are critically important for our future development.

However, the European Commission's Annual Report for Ireland 2016[12] warned that Ireland's capital spending programme is inadequate for the country's needs. It highlights public transport as a key weakness, particularly in the car-dependent Dublin region. Despite the island's relatively small population, its principal cities are amongst the most congested in Europe, due to underinvestment in public transport systems. TomTom, the Dutch global leader in navigation and mapping, reported in 2014 that Belfast and Dublin were, respectively, the third and fourth most congested cities in Europe. The Academy's recommends a funding requirement to 2035 totalling €32.6 billion for the Republic. However, investment in measures to make public transport more attractive may not be sufficient on their own. It may also be necessary to promote a shift by considering congestion / road-user charging, and workplace car-park charges, to ensure that private car users pay the full costs of their modal choice and to manage demand.

Climate change poses particular new and ongoing challenges for the transport sector, which accounted for 19.5% of Ireland's total greenhouse gas emissions in 2014, and for 26.9% of emissions in the non-ETS sector.

MAIN POLICY RECOMMENDATIONS:

- Efficient transport links within and between regions, cities and towns are critically important for our future development.
- Sustainable transport investment improves the environment and reduces pollution by encouraging a modal split to public transport, through facilitating higher density development, walking, cycling, and low-emission vehicles. Climate change poses new and ongoing challenges for the transport sector.
- Transport infrastructure maintenance and renewal programmes need to be adequately funded on a multi-annual basis.

4.2 Broadband infrastructure

A peripheral nation such as Ireland, with an open, export-orientated market economy, needs technology and economic comparative advantages. A leading broadband service, at internationally competitive prices, is one of the most powerful and affordable advantages we can put in place, in advance of demand. Ireland will increasingly compete on the basis of availability and quality of talent in the coming decades. Technology and connectivity will play an ever larger part in allowing us to attract and retain the necessary talent by facilitating work/lifestyle balance

[11] See, for example, *Investing in our transport future – A strategic framework for land transport.* Department of Transport, Tourism and Sport, Dublin 2014.

[12] *European Commission Staff Working Document: Country Report – Ireland 2016.*

in an age of ‘always on’ availability and the explosion in the number of employees with international or global responsibilities.

Achieving competitive advantage in an increasingly globalised world requires an information infrastructure that is provided ahead of demand, an infrastructure that reduces costs and stimulates innovation. The Global Crossing Initiative in 1999 positioned Ireland as a leading location for data centres and thereby enabled massive service exports by world leading companies such as Apple, Microsoft, Oracle, Google and a new generation of social media firms. Cloud computing will continue to generate rapid increases in the volume of data traffic. This, in turn, has fundamental implications for network technology and underpins the rationale for a fibre based national network.

The Academy recommends that we move to the provision of a broadband service as a basic national public infrastructure, as is the norm for other utilities such as water, gas and electricity. It also recommends that long-term planning (30 years+) must inform the provision of Irelands’ strategic National Broadband Plan, to develop a national broadband grid (NBG). In this context, ambitious “stretched targets” should be considered in order to future proof a resilient, robust NBG, which will enhance national competitiveness by staying ahead of rapidly growing demand. To date, our national broadband capacity has been a drag on competitiveness, because it has consistently lagged demand.

As a starting point, a national target at the very least on par with our international competitor nations should be the national goal**.** Capacities in the order of those currently on offer from providers in the urban areas, namely 100 Megabits per second (Mbps) to 360 Mbps to the home, should be the initial target, recognising that the network equipment to provide particular speeds on a fibre network can be increased in stages.

The current Irish national broadband wholesale market places a significant financial disincentive to locating companies with large data requirements outside of the greater Dublin Area. Unless there is some form of Exchequer support or cross-subsidisation, the cost of delivering fibre to rural areas will always be more expensive than Dublin. Broadband network is hugely important for attracting FDI to the regions, while the current cost of transferring data via Dublin is seen as a major competitiveness issue. A single State-sponsored non-profit organisation to control the back-haul network is thus recommended.

The aim of any national broadband plan must be to ensure all fibre networks owned by State, State-sponsored bodies and Public Services are bought into or are available for productive use, where market forces have failed to do so.

Advanced broadband, widely available, can be combined with education and training in closing the digital divide, as well as the urban-rural divide, to achieve improvement of social cohesion, participation and inclusion. A city should not be seen in isolation from its region. Many towns, villages and dispersed communities in Ireland are suffering from job losses and / or population decline; cities have a crucial role in helping to revitalise them, particularly through home-based employment in the IT sector linked to major firms in large urban areas. High speed broadband should be available to all locations to allow people to work from home, especially where people have to work across different time zones, e.g. the US. This would reduce commuting significantly, provide a better quality of life for employees, and help recruitment of key staff in a competitive market place.

MAIN POLICY RECOMMENDATIONS:

- Achieving competitive advantage in an increasingly globalised world requires an information infrastructure that reduces costs, stimulates innovation, and is provided ahead of demand.
- City regions need to be competitive, both nationally and internationally, in terms of broadband capacity, speed and cost.
- Fast broadband is vital for regional development, particularly in relation to the potential for smaller towns and villages to benefit from the location of major IT-based firms in NPF Gateway cities.
- Both State and privately-created new networks should be maintained as open access carrier-neutral networks.
- Only the provision of a fixed fibre infrastructure, with a design life of 30 years, can ensure the scaling necessary to meet future demands for the “Last Mile” access.
- An independent public body, with the necessary expertise, should be established to drive the national broadband development programme and the subsequent ongoing development of this vital infrastructure.

CHAPTER 5: CRITICAL INFRASTRUCTURE - ADAPTATION FOR CLIMATE CHANGE

The Academy welcomes the fact that the National Planning Framework will address climate change issues in the context of physical planning at a national scale, including greenhouse gas emissions, adaptation and resilience[13].

In October 2009, the Academy published a report *Ireland at Risk: Critical Infrastructure - Adaptation for Climate Change*[14]. The objective of this chapter is to highlight for Government, policy makers and owners of critical infrastructure, and as an input to development of the National Planning Framework, those concerns and recommendations from the Academy's 2009 report, relating to Ireland, which are still relevant and which we believe still need to be addressed.

The impact of severe flooding caused by climate change on those directly affected is catastrophic. However, the impact of climate change, with increased rainfall intensity and frequency at times of the year and potential drought at others; sea level rise; more severe storms; increase in wave height and storm surges, also poses potential significant risks for all of the essential services on which our modern society depends. Critical infrastructure such as water supply, sewage treatment, electricity and gas supply, communications services, transport[15], health and education facilities, are all at risk if we do not adapt to the reality which is climate change.

At the Paris climate change conference (COP21) in December 2015, 195 countries, including Ireland, adopted the first ever universal, legally binding global climate deal. It is now accepted internationally that climate change is a reality with potentially significant impacts for countries across the globe including Ireland.

Since publication of the Academy's report in October 2009 progress has been made across a number of the recommendations made, in particular in relation to legislation, policy and structures. However much remains to be done in relation to what is certainly the biggest ongoing risk to the nation's public and private infrastructure assets and to infrastructure services.

Flood risk within the Atlantic City Regions

The Atlantic City Regions are particularly vulnerable to flood risk and therefore merit significant prioritisation of investment. This is not surprising given the higher rainfall in the west and south west, the prevailing wind direction and the exposure to coastal flooding. Cork has the highest number of areas at risk while the other three city regions are also high on the list.

Given the significant of past flooding and major flood risk, the Lee Catchment was chosen as one of the pilot Catchment Flood Risk and Assessment Management studies and therefore was one of the first areas in the country where flood risk was mapped in any detail. As a follow-on, work is now on-going on the design of a flood relief scheme for the Lower Lee from Ballincollig through Cork City. It will be the largest flood relief scheme to be built in Ireland and will be delivered in a number of phases.

A 40 km radius of Limerick city takes in parts of Co. Clare and Co. Tipperary as well as Limerick itself. There are at least 23 urban areas at risk within this area. Significant schemes are currently at design stage for King's Island in Limerick and for Foynes. Notwithstanding that the proposed scheme for King's Island is welcome, significant flood risk remains from the Shannon and its tributaries (both tidal and fluvial) for other large tracts of land within Limerick City and environs, and it is clear that significant further investment needs to be prioritised for this region.

A 40 km radius of Galway city takes in the north of Co. Clare as well as Galway itself. There are at least 15 urban areas at risk within this area. Significant investment is needed to develop and implement flood defence measures for Galway City and environs. In addition, it is imperative that a much greater quantitative understanding of

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[13] *Towards a National Planning Framework,* (former) Department of the Environment, Community and Local Government, 2015, page 5.

[14] Available on http://www.iae.ie/

[15] The Academy welcomes the consultation paper *Adaptation planning: Developing resilience to climate change in the Irish transport sector* (December 2016), available on http://www.dttas.ie/

groundwater flood risk is developed in the Galway area and the Academy recommends that sufficient investment is provided to study this flooding mechanism to the level of detail necessary to deliver a robust and sustainable solution which looks at all sources of flooding in a holistic way.

A 40 km radius of Waterford city takes in part of Waterford, Kilkenny, Wexford and Tipperary. There are at least 15 urban areas at risk within this area. Completed schemes within the region include major schemes in Waterford City, Clonmel and Carrick-on-Suir.

MAIN POLICY RECOMMENDATIONS:

- Build climate change adaptation into every aspect of the National Planning Framework.
- Carry out climate change risk assessment and prepare climate change adaptation plans for critical infrastructure.
- Review engineering design standards to identify the climate change design parameters that are critical to sustainable infrastructure design across the various infrastructure sectors.

CHAPTER 6: NATIONAL INFRASTRUCTURAL PRIORITIES

Introduction

This chapter summarises the main national infrastructural priorities as identified in the Academy's Discussion Papers.

In addition, two of the Papers – *The Atlantic City Regions: Development and Connectivity* and *Sustainable Transport Infrastructure 2035* – contain further infrastructural priorities of regional importance, and it is hoped that the identification of such priorities will facilitate the relevant Regional Assemblies in preparing Regional Spatial and Economic Strategies, to complement the National Planning Framework. In particular, the Regional Strategies will have a significant role in setting the spatial policy context for city development plans, as cities are seen as the drivers of their regional economies.

***Dublin – Belfast Economic Corridor*:**

- Complete the Dublin–Belfast motorway, with spokes linking the hinterland with the urban centres along the route.
- Electrification of rail-line to achieve one-hour journey time between Dublin and Belfast.
- Dublin Airport – build second runway and additional terminal capacity.
- Investigate supplementary water supply to east coast from Shannon and Lough Neagh.
- Complete North-South electricity interconnector to supply electricity to Northern Ireland.

The Atlantic City Regions:

(a) **Roads**:

- The upgrading of the Cork-Limerick road to motorway standard is the highest priority. The planning process for this project should be commenced urgently, given the prolonged approval and procurement lead-in times. Tolling should be considered as part of funding the project.
- If the current N20 route is chosen as the preferred new motorway route, then the Cork Northern Ring Road becomes an important element of infrastructure to link M20 traffic to the M8 and on to the M25, Cork Port at Ringaskiddy, Cork Airport and the N22 to the west.
- The proposed M6 Galway City Ring Road will result in better connectivity with the other cities and will reduce congestion within Galway. This project is crucial to the economic development of the City and its region.
- Bottlenecks on the N25 Waterford – Cork road should be removed.
- The N24 Waterford – Limerick road needs to be similarly upgraded.

(b) **Public transport**:

- Rail can best contribute through the inter-city routes between Dublin and the four cities as well as rail commuter routes to each of the cities where they are viable. In the medium term the Cork – Dublin journey time needs to be reduced to 2 hours and the other three routes require journey times of less than 2 hours. In the longer term the routes should be electrified leading to lower emissions and further reductions in journey times.
- The quality and competitiveness of inter-city bus services will depend greatly on the quality of the road connections between the cities. Completion of the M17/M18 Gort to Tuam project and construction of the M20 between Cork and Limerick would lead to very competitive bus service on the Cork – Limerick – Galway route. Bus services between Waterford–Cork and Waterford–Limerick need significant investment in road improvements at key points on each route if they are to attract travellers from cars to use public transport. .
- Where possible there should be central bus stations in each of the cities used by public and private services, with costs allocated appropriately. These should have a ready connection to local and regional bus services and provide information on tourism and public transport options. They should also have a convenient connection to the rail station.
- For each city region an up-to-date land use and transportation study should be prepared in the context of the upcoming Regional Spatial & Economic Strategies (RSES). This should aim to release the road space necessary for the development of sustainable urban transport strategies; to provide the residential densification required to make sustainable transport viable and develop a high quality urban environment.

(c) **Water supply / Wastewater**:

- A significant number of water mains in urban areas are cast iron and asbestos cement and are near the end of their useful life. These mains need to be replaced.
- The water treatment plants in the cities of Waterford, Cork, Limerick and Galway should have a 20% headroom in the interests of accommodating new industry.
- The Urban Waste Water Treatment Directive requires nutrient reduction on waste water treatment plants in agglomerations greater than 10,000 population equivalent discharging into sensitive areas. This is not in place in all cases.

(d) **Ports**:

- The Adare Bypass/Foynes Port Access (N69) upgrade, the M28 project to Ringaskiddy Port, and the Dunkettle Interchange Upgrade are all required to enable Foynes Port and the Port of Cork develop their respective plans for the future growth and competitiveness of their businesses. The N20 project is also important in this context. The re-opening of the rail freight connection from Foynes to Limerick should also receive full consideration.

(e) **Airports**:

- The recommended road infrastructure projects will also greatly improve the ability of Cork and Shannon airports to attract more passengers.

Sustainable Transport Infrastructure 2035:

- The inter-city rail network has been placed at a competitive disadvantage in terms of journey times by the completion of the major inter-urban motorway network in 2010, along with the upgrading of the M50 in Dublin. It will be necessary to address this by significant infrastructure enhancements, the delivery of more competitive journey times and, in some cases, higher frequencies on existing lines.
- The Belfast to Dublin rail corridor is a key route on the TEN-T Core network. The Academy recommends that it should have a modern, electrified service on the existing alignment, with one-hour frequency and 1½ hour journey time.
- The Dublin – Derry/Londonderry – Donegal Road Corridor is the critical link to the North-West and within the North-West. It is the policy of administrations in Ireland and Northern Ireland that this road corridor is upgraded to an acceptable standard, a policy the Academy supports.
- The Academy considers that it is now imperative that the two major rail projects in the GDA, namely the DART Expansion Programme, incorporating the DART Underground project and the Metro project, be immediately reactivated. However, the Academy considers that each of those schemes, for which Railway Works Orders were obtained but have now lapsed, should be modified, in line with the Academy's submission on the development of a Transport Strategy for the GDA.
- The Academy recommends that Iarnród Éireann's proposal for a rail connection from Clongriffin Station to the Airport (7.5km spur across largely undeveloped lands) should be seriously considered.

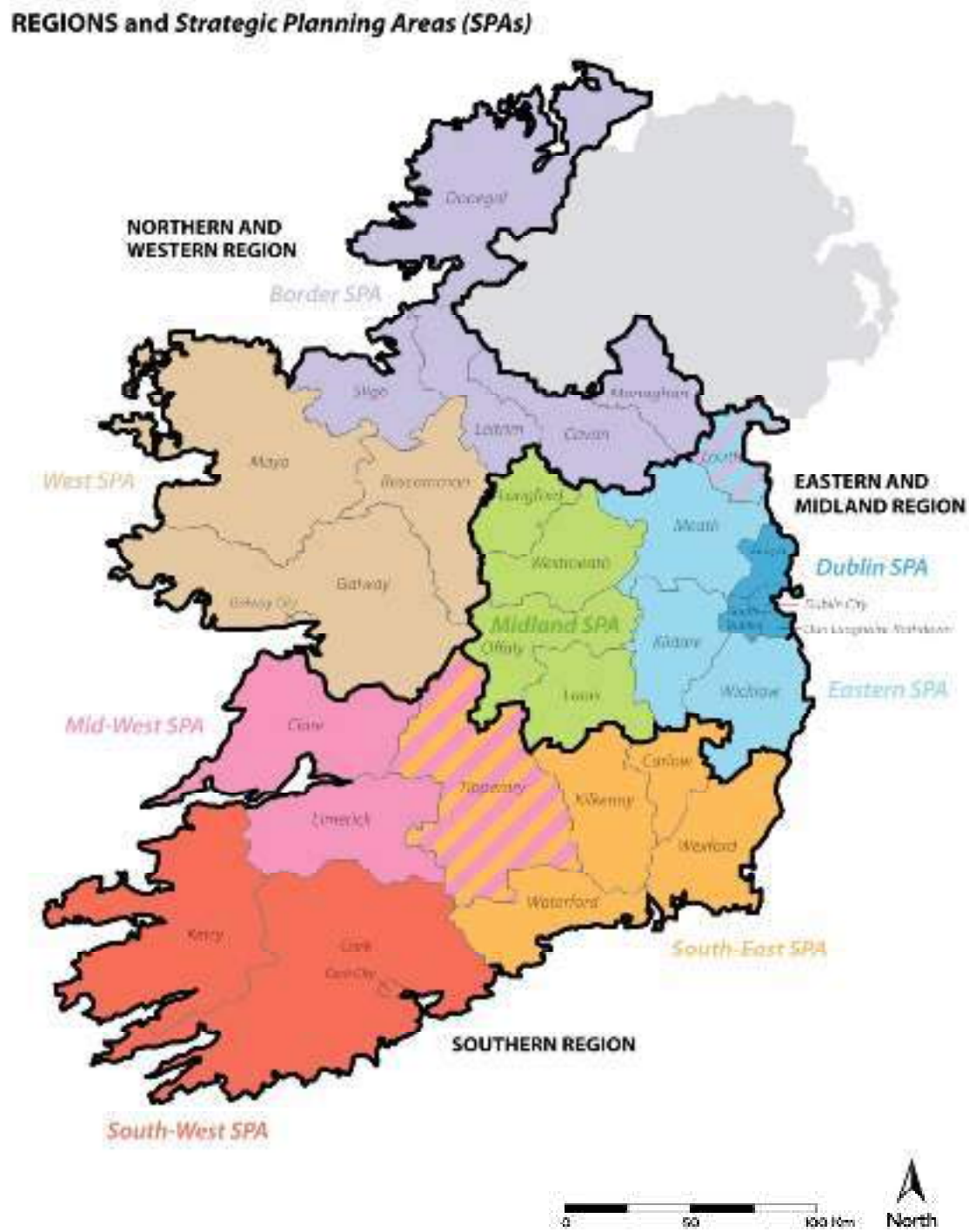
Broadband:

- Develop a fibre based national grid to provide an available service of not less than 100Mbps to all homes and 1Gbps to businesses (during peak times), with the capacity for provision of symmetrical connectivity of 1Gbps to every home and 10Gbps for businesses, at an additional, internationally competitive cost, where sought by the end user.
- Only the provision of a fixed fibre infrastructure, with a design life of 30 years, can ensure the scaling necessary to meet future demands for the "Last Mile" access.

Housing and associated Infrastructure:

- In planning for a significant increase in housing provision, ensure that the required associated infrastructure (transportation, water services, energy, education, health etc.) is built in to planning approvals and provided in a timely manner***.***

APPENDIX A:



Source*: Towards A National Planning Framework,* 2015. Figure 2: Ireland's Regions and Strategic Planning Areas (as per the Local Government Act 1991 (Regional Assemblies) (Establishment) Order 2014).

Appendix B: Socio-economic profile of the Atlantic City Regions[16]

	Cork (CASP metropolitan area)	Limerick/Shannon	Galway city	Waterford city and environs
% population change 2002-2011 (State: +17%)	+12.6%	+ 5.8%	+16.0%	+10.2%
Employment profiles	Employment in Cork City stood at 71,577 in 2011, down 2% on 2006. Some sectors such as the high tech manufacturing and service sectors grew, while others such as retail and professional services declined. However, the city region has a diverse economic base with a strong FDI presence and has performed better than most parts of the country in recent years. The current City Development Plan has set an ambitious target of 16,000 additional jobs over the period from 2011 to 2021 in a range of locations, much of it through redevelopment of brownfield land in the City Centre and Docklands and intensification of existing employment lands in locations such as Mahon and Blackpool.	The Mid-West region has recognised strengths in manufacturing, ICT, aviation, pharma/Med Tech, tourism and renewable energy. The Mid-West region is a proven location for international business and is home to 116 FDI client companies, 10 % of IDA Ireland's total company portfolio. Manufacturing still retains a proportionately larger share of total regional employment (17%) compared to the national figure of 12.8%, reflecting the strength of the manufacturing base in the region.	Galway city provides for a diverse range of economic activities, services and employment opportunities. Professional services are very significant, reflecting the knowledge-based industries in the city. A socio-economic review of the performance of Galway Gateway (2012) found that Galway performed well on both a national and regional level and relative to the other national Gateways. The city has a significant commuter population of over 20,000; travel-to-work studies have shown that its catchment area includes not only Co. Galway but also extends well into Cos. Clare and Mayo.	Waterford city's economy has been affected by the erosion of competitiveness in lower-skilled manufacturing sectors and the economic downturn. While it still remains an important employment centre, a number of high profile companies (such as Waterford Crystal) have been forced to close, resulting in significant job losses. However, Waterford has produced some figures which contradict this trend of decline, most notably in the amount of new firms established in the Gateway since 2006. The North Quays were recently designated as a Strategic Development Zone.
Development opportunities [Source: *Regional Jobs Action Plans,* published by the Department of Jobs, Enterprise and Innovation]	**The South-West region:** There is potential to further strengthen the growing the base of indigenous and FDI manufacturing investment in the region by building on established clusters of life sciences, ICT, and global business services, and on emerging opportunities in marine and energy	**The Mid-West region:** Building on recent significant FDI investments in areas such as biopharma, financial services and ICT, the Mid- West can further enhance its reputation to attract international business and talent, pursuing new investments in proven sectors of strength such as aerospace and aviation.	**The West region:** Currently, IDA Ireland positions the West in the market place as an investment location with a strong ecosystem of both indigenous and multinational companies operating across a diverse range of sectors, but predominantly in the medical	**The South-East region** The region has distinct competitive advantages in the agri-food and drinks sector. It is the largest indigenous industry in the region and is expanding rapidly. It has major opportunities to become a major player in the further development of the sector through the growth in its dairy

[16] Drawn from chapter 4, *The Atlantic City Regions – Development and Connectivity*

	related research. Over 30 per cent of all national energy needs are produced in the region, and the major energy industry players in Cork, as well as academia and local government, have established Energy Cork, the energy industry cluster for the Cork region. CIT, UCC and the Irish Naval Service have formed a three-way partnership in the Irish Marine Energy Cluster, established to enable the partners to drive a range of initiatives in the maritime and marine energy sectors.	Improvement of transport infrastructures around the port at Foynes, including rail and road links, would enhance the potential for development of a logistics hub in the region.	device/Bio Med and technology sectors. Galway is becoming a major technology hub, particularly around internet and collaborative working technologies; building on the hub, IDA Ireland and the local authorities will create a value proposition for the region for data centre developments.	industry and the emergence of an internationally-traded agriculture sector. Growth in global population and changing diets in emerging countries are projected to bring about a 70% increase in global demand for food over the next 40 years. The region's port infrastructure has potential to develop value-added shore based activity to contribute to economic development in different sectors.
Higher education and research institutions	University College Cork (UCC) has a student population of 20,700. It has a high concentration of leading-edge research centres that work closely with industry; since 2011 UCC has supported over 25 start-up companies. Cork Institute of Technology (CIT) has a full-time and part-time student population of 10,000. It has a number of leading Research Centres with expertise in Embedded Systems, Applied Photonics and Medical Devices. CIT's Rubicon Centre is one of Ireland's leading business incubators.	The University of Limerick (UL) has a student population of 13,000, and is home to Europe's largest student Internship programme. It has particular strengths in Materials, Manufacturing, ICT, Applied Maths and Health. UL hosts two large Science Foundation Ireland-funded Centres and three Technology Centres, funded by EI and the IDA. Limerick Institute of Technology has approximately 6,500 students across its campuses in Limerick, Ennis, Thurles and Clonmel.	NUI Galway has a student population of over 17,000. Five thematic research priorities have been identified, many of which, such as in Biomedical Science and Informatics, have a particular relevance to sectors which have strengths in the West region. Galway-Mayo Institute of Technology (GMIT) caters for approximately 7,000 students, with campuses at five locations in the West, including two in Galway city.	Waterford Institute of Technology has 8,000 full-time and approximately 1,400 part-time students. It has prioritized three main areas of research for development: Telecommunications ICT; Pharmaceutical Science, Molecular Biotechnology and Eco-Innovation; and Advanced Manufacturing. A merger between Waterford and Carlow ITs has recently been proposed.