THE IRISH ACADEMY OF ENGINEERING

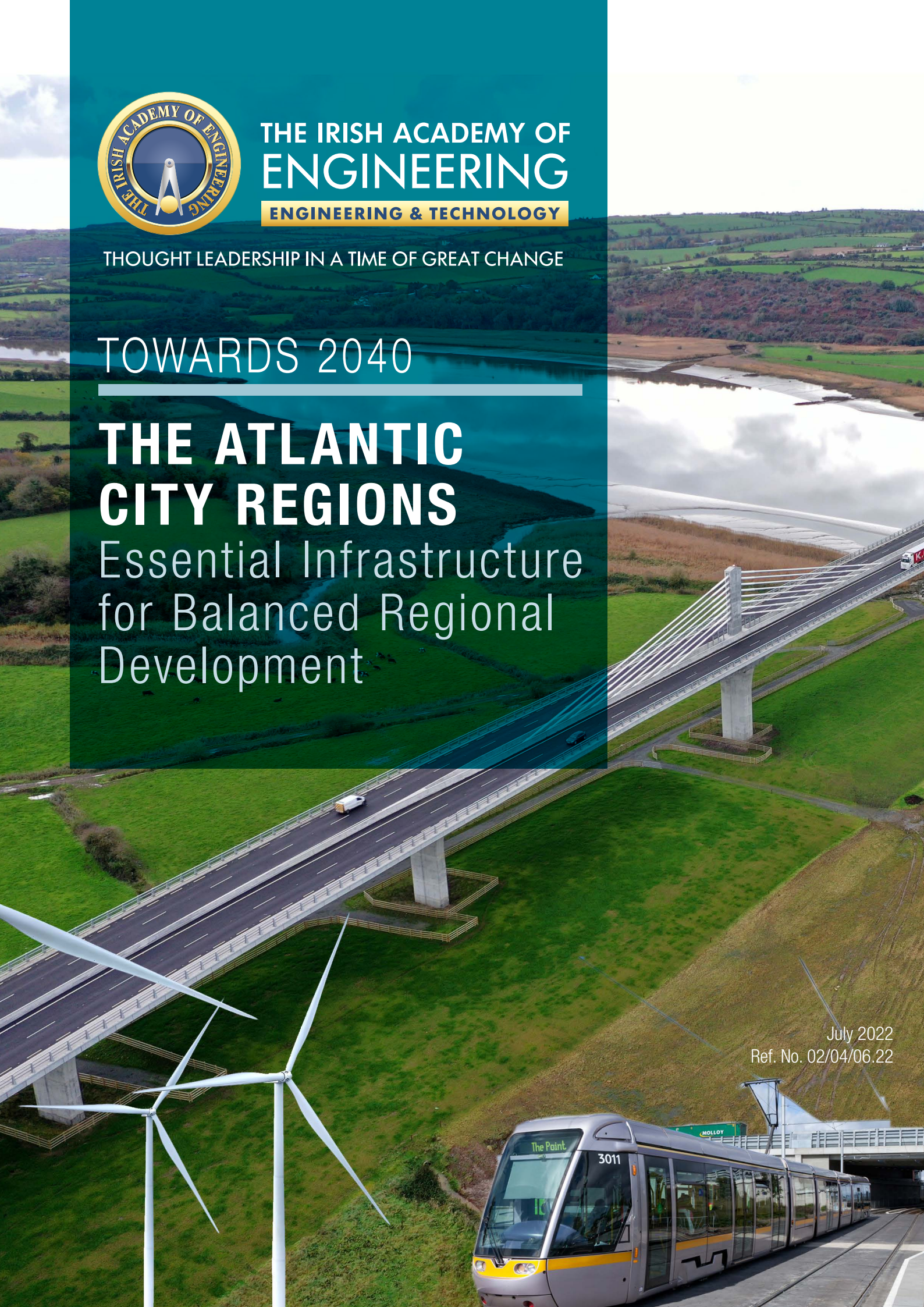
ENGINEERING & TECHNOLOGY

THOUGHT LEADERSHIP IN A TIME OF GREAT CHANGE

TOWARDS 2040

THE ATLANTIC CITY REGIONS

Essential Infrastructure for Balanced Regional Development



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THE IRISH ACADEMY OF ENGINEERING

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INTRODUCTION

In 2016 the Irish Academy of Engineering (IAE) published a report titled *"The Atlantic City Regions – Development & Connectivity"*[1] as an input to the then upcoming National Planning Framework (NPF) and Regional Spatial and Economic Strategies.

The report made recommendations on the infrastructural investments and other actions required to support the sustainable growth of the Atlantic City Regions (Cork, Waterford, Limerick / Shannon, and Galway), individually and in combination, with particular emphasis on the provision of essential infrastructural improvements. The Academy believes that a review of those recommendations is now warranted in the light of changed circumstances in the interim. Six reports on individual infrastructural sectors are attached.

It is widely recognised 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 and world standards, the Academy considers that the best way to achieve more balanced regional development, as recommended in the NPF, is to establish an increasingly connected network of co-operating and complementary city regions. The 2016 report focused on how connectivity both within and between the city regions could be improved; connectivity can be both physical (such as roads and rail) and digital (broadband). The National Broadband Plan has now commenced the provision of broadband connectivity to houses and other premises across those parts of the country that have remained unserved to date. However, there has been no progress in delivering the 2016 government commitment to aggregate all State telecom assets and to provide an open-access high capacity backhaul[2] network to facilitate international connectivity for major users.

Much has happened in the intervening years since 2016. The NPF and the accompanying regional spatial and economic strategies (RSESs) have been published, and funding is coming on stream for NPF projects. The RSESs incorporate metropolitan area spatial strategies for each of the Atlantic Cities. The Atlantic Economic Corridor, which is being driven by the Department of Rural and Community Development, aims to foster regional development in a non-administrative region stretching from Kerry to Donegal, including both rural areas and significant towns such as Tralee, Ennis and Sligo.

Both Brexit and the Covid-19 pandemic have had significant – and often disruptive – effects on society and the economy. More importantly from a longer-term perspective, citizens and government in Ireland have become increasingly aware of the existential threat posed by climate change, and of the closing window of opportunity to take mitigation and/or adaptation measures. Climate change affects all infrastructural sectors, and particularly the energy sector. The Academy's recent paper *"Europe's energy crisis: implications for Ireland"* (2022) pointed out that Ireland has set challenging targets for decarbonisation of its economy by 2030. Inherent in these targets are an immediate expansion of renewable energy sources, primarily wind power, and the increased electrification of domestic heating and transport. A successful transition will mean that by 2030 the Irish economy will be far more dependent on a stable and cost-effective electricity supply than it is at present.

In the latter paper, and in a previous paper on electricity transmission,[3] the Academy emphasised the urgent need to reform the development consent processes, and particularly to address the often lengthy delays caused by judicial reviews. It will be seen from the full infrastructural reports in sections 1–6 below that this is an issue which cuts across many sectors. In particular, planning delays could seriously jeopardise the timely delivery of wind energy projects and the transformation of the national electricity network, which are needed to meet government and EU decarbonisation targets for 2030. It is understood that the Attorney General is conducting a review of the consent process which is due later this year; the Academy recommends that any necessary amending legislation should be implemented as a matter of priority. The Government should also take direct responsibility for engaging with communities to ensure acceptance of the necessary renewable energy infrastructure required to meet its carbon emission targets for 2030 and 2050. In tandem with this, it is essential to ensure that An Bord Pleanála, which will be central to the consent

1 http://iae.ie/wp-content/uploads/2017/07/IAE_AtlanticCityRegions_web.pdf

2 Backhaul means high capacity lines capable of transmitting high broad width at very high speeds.

3 http://iae.ie/publications/the-future-of-electricity-transmission-in-ireland/

process, is fully equipped with the necessary skills and resources to enable it to complete its work properly within satisfactory timescales. Other consent bodies such as those responsible for grid connections and environmental licensing should also be properly resourced.

The contents of this update to the 2016 paper are presented in modules covering the six sectors: Energy, Broadband, Transportation, Ports, Flood Risk Management and Water Services.

EXECUTIVE SUMMARY

Executive summaries of the individual sectoral modules are presented below followed by the more detailed reviews.

A: ENERGY

The Academy fully supports the National Energy and Climate Plan (NECP). However, the energy sector faces huge challenges to achieve the primary target – a commitment to net zero carbon by 2050. It will also be extremely difficult to reduce greenhouse gas (GHG) emissions by an average of 7% per annum by 2030.

As we reduce our dependence on fossil fuels it is critical that continuity of energy supply is maintained under all wind and solar conditions. This will require a reliable supply of natural gas for some considerable time to come. With gas supplies from the Corrib gas field in serious decline by 2030, Ireland will be importing 100% of its requirements. Ireland is especially vulnerable in this regard as it is no longer connected directly to the EU gas network and is the only country in the EU with no gas storage.

Recommendations:

- Meeting the targets of the NECP will require the completion of a great number of infrastructure projects in a timely manner. If the timescales for these key projects are to be met it is essential that the current consent and legal approval processes are amended without delay, while affording reasonable participation by interested parties.
- To ensure security and diversity of energy supply the Academy continues to recommend strongly the need for a Liquefied Natural Gas (LNG) import facility. An application for the construction of an LNG import terminal in the Shannon Estuary is currently before An Bord Pleanála. Approval of this project would also have the potential to provide strategic gas storage. The recent uncertainty over continuity of gas supplies from Russia greatly reinforces the need for a development of this nature.
- The Ireland-France electricity interconnector will come ashore near Youghal. It will require the construction of a large DC/AC converter station, currently proposed between Carrigtwohill and Midleton (subject to planning). The Academy recommends that this connectivity with the EU electricity network should be expedited once all the approvals have been given.

B: BROADBAND

The development of new, large-scale telecoms networks has evolved significantly over the last 10 years and new networks are now almost exclusively focused on data centre to data centre. To date, no such long-haul networks exist outside the Greater Dublin Area (with the exception of the Aurora Telecom network). The lack of availability of high quality, large bandwidth and the higher cost of broadband in the regions compared to Dublin is a major impediment in attracting large entities such as data centres into the regions. This is despite the obvious advantages which the regions enjoy over Dublin in relation to being more adjacent to the sources of power generation and the cost and availability of housing.

It is not clear whether the National Broadband Plan will have sufficient capacity to facilitate the increasingly sophisticated software likely to be required in working from home in the future. 5G technology can benefit smart agriculture, tourism (entertainment / media), energy (rural generation), mobility (autonomous driving and infotainment), healthcare (assisted living) – all have particular relevance in rural societies, not just for the inhabitants but also for tourists and business investors.

5G is not just the cellular network, it also requires huge investment in traditional backhaul networks to create a 'fibre-deep' infrastructure across all regions of the country. If this is not done, it could further widen the urban-rural divide and impact negatively on the development rebalancing envisaged in the NPF.

Recommendations:

- The State should establish at an early date a not-for-profit, commercially-run State entity to manage and oversee all State telecom/broadband assets, which will be empowered to establish a National Broadband Backhaul Network, managed by a special purpose agency.
- The agency should establish an open-access backhaul fibre grid network to service regional Ireland with high quality national and international digital connectivity, using and upgrading existing and appropriate State-owned networks, such as the TII duct network, capable of connecting all international fibre cables landing in Ireland.

C: TRANSPORTATION

The main changes impacting transport issues since the 2016 report include Brexit, Covid-19, the move towards remote working, and an increased emphasis on active travel to improve the health and well-being of people. Covid-19 has already brought about significant change to working/living patterns with evidence of relocation (or potential for relocation) away from the Greater Dublin Area and also possibly greater concentration on the "regions" parts of the Atlantic City Regions – with consequent transport issues relating to connection to Dublin, connection between the Atlantic Cities, and from the regions to the Atlantic Cities.

There is great scope for enhanced public transport connectivity between and within the Atlantic city regions with an improved road infrastructure, using existing bus systems (and their future successors) on the National, Regional and rural roads as appropriate and Bus Connects / BRT[4] /LRT [5]in major urban areas. If this is to be achieved successfully there will have to be full integration between all public transport services, including the most up-to-date communications systems for passengers. It is particularly significant that the road connections between Cork, Limerick and Waterford and between Galway and Sligo are of a far lower standard than those between Dublin and the Atlantic Cities or between Galway and Limerick.

4 BRT = Bus Rapid Transit

5 LRT = Light Rail Transit (i.e. Luas)

Recommendations:

- The Metropolitan Area Transport Strategies for each of the Atlantic Cities need to be progressed to accommodate the forecast population growth. Each city should have a public transport interchange that accommodates both public and private operators and has ready access to the national rail network. Full integration between all public transport services is required including up-to-date communications, payment/ ticketing systems and coordinated timetabling to meet journey and traveller needs.
- Connectivity between the Atlantic Cities must be prioritised. The N/M20 project and the upgrades to the N24 and N25 must be expedited to improve safety and to form the backbone of a strong inter-city bus network connected to the city Bus Connects networks and to the regional towns. Regional park-and-ride facilities need to be planned at appropriate locations along the inter-city routes as part of the *Connecting Ireland* strategy.[6]
- The delivery of a programme of works which combine the Galway Ring Road with key sustainable and active travel measures such as the City Centre Cross City Link and the Primary Cycle Network is the only means of delivering the mobility change needed in Galway.

6 https://www.nationaltransport.ie/connecting-ireland/

D: PORTS

Since 2016, some significant developments impacting the ports have emerged including Brexit, Covid 19, the National Planning Framework, and the National Climate Action Plans. An example of the Brexit impact is that 34% of all Republic of Ireland traffic now operates on direct routes to EU ports, up from 16% in 2019. Traffic to Britain has declined by 25% in the same period.

National Ports Policy, now in existence since 2013, is being reviewed in order to meet current and emerging needs not envisaged at the time of port corporatisation and policy publication.

Recommendations:

- As part of the review of the National Ports Policy, the Academy recommends that a forum be convened by the Department of Transport, supported by the Department of Environment, Climate and Communications, of key stakeholders including port companies, customers, logistical providers and potential offshore energy providers to review the shortcomings and constraints of existing policy. A different funding model, which still respects competition and transparency considerations, which would have the potential to deliver the required port facilities at the optimum locations from a national and regional perspective should form part of the review.
- There is often a mismatch between delivery times for new port facilities and their connections to the national transport network. Timely delivery of infrastructure to support port development is critical and needs to be improved. An example is the N/M28 access road to Ringaskiddy which has again been deferred, despite enduring a lengthy planning and legal process. Completion is now targeted for 2030 at the earliest. Due to traffic demand management restrictions being imposed on the existing access road, the capacity of the new deep-water container terminal will be limited for at least eight years, also delaying the redevelopment of the Tivoli docklands area.

E: FLOOD RISK MANAGEMENT

Significant progress has been made by the Office of Public Works (OPW), in conjunction with local authorities, in this area since 2016. The catchment-based Flood Risk Asset Management programme has been completed resulting in some 200 urban areas where schemes are required; 50 of these have been completed and 92 are in various stages of progress. The assessment of coastal flood risk has also been improved greatly with the production of the National Coastal Flood Hazard Mapping in 2021 which is now available on *www.floodinfo.ie*, a one-stop-shop for all flood risk management information. A Sectoral (Flood Risk) Climate Change Adaptation Plan has also been prepared.

A major challenge to the delivery of schemes has been an increasingly complex and time-consuming consents process with a growing number of legislative issues and case law, both of domestic and EU origin, often resulting in major delays in progressing essential projects. A case in point is the construction of the first phase of the much-needed Cork City Flood Relief Scheme which is currently subject to a lengthy legal challenge.

Recommendations:

- Construction inflation has been rising rapidly in recent times, due in good part to supply shortages in materials and manpower. The cost/benefit approach adopted in evaluating business cases can be very narrow. The Academy recommends a review of the methodology to ensure that the wider benefits of projects are taken into account.
- The Academy recommends that a Steering Group is established for each of the Atlantic Cities, comprising representatives from OPW, Environmental Protection Agency, Irish Water and the local authorities to prepare an integrated surface water management plan for the cities. A single agency should be given responsibility for the sustainable management of the coastline, addressing both erosion and flood risk in an integrated fashion.
- Coastal management is a complex area requiring strong leadership and coordination of the many interested parties involved. Consideration should be given to investing one of the senior Ministers involved with responsibility to ensure effective coordination of all stakeholders.

F: WATER SERVICES

Since 2016 Irish Water has made significant progress in its capital investment plans; annual funding has increased from approximately €0.5bn/year to over €1.2bn/year and this is reflected in the many projects recently completed, under construction or in the planning and design phase. In addition, Irish Water is undertaking a National Leakage Reduction programme to repair and replace leaking watermains. Similarly, a Sewer Rehabilitation programme is reducing groundwater infiltration into sewer networks. Both programmes release capacity in Irish Water treatment plants for new housing and other developments.

While the water and wastewater treatment capacity in each of the Atlantic Cities is forecast to be generally satisfactory until the end of the decade, much of the proposed housing in their draft Development Plans is located in “Regeneration and Opportunity Sites” in city centre or urban locations. Challenges exist for several of the larger sites which may not have access to adequate capacity in the existing city water and sewerage networks, given the ambitious targets being set for population increases. Significant action will be required to remedy these shortcomings, necessitating increased annual funding in Irish Water’s next capital Investment plan from 2025 onwards.

Recommendations:

- Increase the annual budget for Irish Water to support the delivery of the ambitious population growth targets in the NPF and the Atlantic Cities’ draft Development Plans 2022 – 2028.
- Review the capacity of the existing watermain and sewer networks to service “Regeneration and Opportunity Sites” where there will be significant densification.

A more detailed commentary on significant changes since 2016 in each of the six sectors reviewed with updated policy and implementation recommendations for that sector is presented in the following sections of this paper.

1. ENERGY MODULE

Windfarm, image courtesy ARUP

1.1 Significant Changes Since 2016

1.1.1 BREXIT

As the United Kingdom is no longer a member of the European Union and the future shape of the relationship between the EU and the UK is still uncertain, Ireland's future connectivity to Europe's energy networks may very well change significantly. Ireland is the only country in Europe without dedicated gas storage, despite being remote from the main gas hubs in the EU and with less interconnection than most others.

1.1.2 National Energy & Climate Plan

The most significant external change that will impact the energy sector in the region is the National Energy and Climate Plan (NECP), Government's commitment to transition the country to a Climate Neutral society with net zero carbon by 2050. This will be the main influencing factor in formulating energy policies for the foreseeable future. It will also result in all existing fossil fuelled generators in the region being shut down by 2050.

1.2 Infrastructure Delivery: Progress and Challenges

There has been little progress in the delivery of energy infrastructure in the Atlantic City Regions since the 2016 report of the Academy. However there are very significant challenges posed by the infrastructure requirements of the NECP targets of a reduction in Greenhouse Gas (GHG) emissions of 7% per annum up to 2030. The NECP has also set an immediate (short term) target of increasing annual electricity generated from renewables to 70% of total system production by 2030, up from 42% in 2021, and a follow on (long term) target of complete decarbonisation of electricity production by 2050. This target will present a very significant challenge for Ireland as we approach 2050.

The Plan includes an additional 10GW of renewable energy, comprising 5GW of offshore wind, 4GW of onshore wind and 1GW of solar. At present there is 5GW of onshore wind installed on the system.

In terms of types of energy products consumed, Ireland has one of the highest dependencies on oil in the EU. Oil accounts for 50% of final energy demand as against 35% in the EU as a whole. The government has identified the need to significantly decarbonise the transport sector within the overall 7% per annum reduction in GHG emissions. This represents a major challenge.

Almost all the oil used in the Southern region is supplied by the Whitegate oil refinery, while the bulk of oil used in the Dublin region is imported mostly from the British west

coast. (Over 70% of imports are sourced from UK with balance from U.S., Netherlands and Scandinavia).

The addition of biofuels to petrol and diesel is one of the measures through which suppliers of petroleum products reduce carbon and GHG emissions achieving a reduction of some 520 kt CO_2eq in 2020. 5% of gasoline sold in Ireland was actually biofuel (ethanol - up from 1.7% in 2010) and 6.5% of diesel is FAME, i.e. Fatty Acid Methyl Ester (2.6% in 2010).

The government recently announced an updated biofuel obligation to enable a 10% blend of ethanol in petrol (E10) and a 12% blend of biodiesel in diesel (B12), respectively, by 2025 and a commitment to further increases before 2030. This marks a step change in ambition for supply of low carbon liquid fuels. In achieving this ambition alternative transport fuels such as “Green Hydrogen” (see below), Biomethane, Hydrogenated Vegetable Oil and renewable fuels from non-biological origin (RFNBO) will complement those biofuels already being supplied.

In may be noted that all of these fuel changes are in addition to the steep targets for electric vehicles in Ireland by 2030.

50% of the homes in the Southern region are heated using oil, (65% of rural homes). To meet the renewable energy share in home heating will require the establishment of a major new industry in home retrofit schemes. In the meantime a renewable fuel obligation scheme similar to that for transport is signalled by government to commence in 2023 with a further call on low carbon liquid fuels.

Aviation and Marine are both sectors which are more difficult to decarbonise. Technology to produce Sustainable Aviation Fuels (SAF) is progressing to commercial production with obligations for their use required by 2025 under the EU ‘Fit for 55’ package. Likewise for Marine fuels, GHG reduction targets are projected which will require alternative fuels some of which may be derived from “Green Hydrogen”.

Achieving the targets set out in the NECP will require the delivery of numerous major infrastructure projects, e.g. offshore and onshore wind turbines and transformation of the electricity grid. The recent history of developing major infrastructure in Ireland is one of significant delays in securing approvals, often in spite of extensive consultations with frequent challenges through lengthy legal proceedings with no certainty as to timescales or outcomes. This is a major concern in relation to realising the goal of Net Zero Carbon by 2050 and the intermediate target for 2030. Experience elsewhere in Europe suggests that governments must take responsibility for persuading communities to accept the renewable energy infrastructure required to meet a country’s climate change obligations, including transformation of the national electricity grid to accommodate renewable generation.

1.3 RECOMMENTATIONS AND PRIORITIES

1.3.1 Planning and Legal Consent Processes

The current processes for enabling and approving key infrastructure projects are unsatisfactory and far too slow. If they cannot be improved significantly there is great danger that the key infrastructure projects required to meet the targets in the NECP will not be delivered in anywhere near the required timescales.

It is essential that the current review of the planning and legal processes in the national permitting system is completed as soon as is practicable and that the recommendations are then implemented with urgency. In tandem with this, it is essential to ensure that An Bord Pleanála, which is central to the consent process, and other consent bodies (EPA, Eirgrid, MARA etc) are fully equipped with the necessary skills and resources to enable them to complete their work properly within satisfactory timescales.

1.3.2 Offshore Wind

The design and manufacture of larger and more efficient wind turbines is progressing internationally. The major challenge for large scale offshore power generation will be the design, construction, anchoring and servicing of the support structures for very large individual turbines, up to 15MW. While the timeline for these projects is 8 to 10 years, Cork Harbour, the Shannon Estuary, Waterford and Galway should be preparing to provide the necessary support and infrastructure required for these new offshore industries.

The output from the offshore projects is so large it is unlikely that all can or will be connected to the national grid. New markets will have to be created in the direct export of renewable electricity, probably to continental Europe. New electricity storage, possibly new battery design or more probably in the generation of “Green Hydrogen” (see below) can be used directly as a fuel or a feedstock in the production of renewable liquid fuels.

1.3.3 Security of Supply

Energy use today is vital in all aspects of our society - industry, commercial business, households, and transport. With the variability in the day to day production of renewable energy it is critical that as we reduce our dependence on conventional energy the continuity of supply is maintained under all wind and or solar circumstances.

1.3.4 Natural Gas

With the Kinsale Head gas field shut down and supplies from the Corrib gas field in decline, Ireland will likely be importing 100% of its gas requirements by 2030. At that stage, the decline in North Sea output will mean the UK will be importing 75% of its gas.

In this context the Academy has strongly recommended the need for an Liquified Natural Gas (LNG) import facility. Such a facility will have long term relevance - even if the NECP targets are met, Ireland in 2030 will still require some 80% of its current gas consumption. Within the EU, despite extensive pipeline distribution systems, many coastal countries have installed LNG import facilities. These provide alternative natural gas bulk supply routes facilitating imports from Middle East, Australia and the United States. Ireland is an outlier in this regard. A planning application for the construction of an LNG import terminal in the Shannon Estuary is currently before An Bord Pleanála.

In line with the growth in the economy and hence growth in the demand for electricity the Commission for the Regulation of Utilities (CRU) recently advised that an additional 2,000MW of gas fired generation will be required by 2030 to support and backup the 70% renewable target. This will be procured by competition with the locations likely to be set at grid strong points. In the Southern Region these strong points include Wexford, Cork Harbour and the Shannon Estuary. It is not unreasonable to expect that 50% of these new gas fired generators will be located in the region.

1.3.5 Green Hydrogen

The intermittent nature of large offshore wind production will lead to the development of new storage options, currently batteries and so-called ‘green’ hydrogen production are being evaluated, with the potential to feed this ‘stored’ energy back to the system at times of shortage.

There are proposals for Green Hydrogen hubs in Cork Harbour, Galway Port and the Shannon Estuary. With a large accessible offshore wind resource a plentiful supply of green electricity could be used to produce Green Hydrogen for transport, heat and electricity production to balance supply and demand.

1.3.6 Oil

While there are ambitious targets for electric vehicles and home retrofit there will be a continued need for petroleum products in the Irish market. Retention of indigenous oil refining ensures choices in purchasing finished product, crude oil and production of indigenous biofuels. Retention of conventional refining also facilitates a pathway in transition to the refinery of the future which will see integrated solutions with offshore wind, green hydrogen and production of synthetic liquid fuels.

Green Hydrogen could also be used in the oil refinery, already Ireland's largest producer and consumer of hydrogen for the purposes outlined above in addition to decarbonising the production process.

The availability of Green Hydrogen will assist in further developing the existing oil refinery to continue to redevelop the processing units to increase the volumes of biofuel produced from indigenous agricultural products/ waste, consistent with similar developments at a number of international refineries.

1.3.7 Electricity

The Ireland-France electricity interconnector will come ashore near Youghal. It will require the construction of a large DC/AC converter station, currently proposed between Carrigtwohill and Midleton (subject to planning). The period for public consultation has closed and as An Bord Pleanála has decided there will not be an oral hearing a final decision is now awaited. In the meantime a public consultation is progressing in the UK as the cables will traverse the UK Exclusive Economic Zone. The Academy recommends that this connectivity with the EU electricity network should be expedited once all approvals have been received.

1.3.8 Nuclear

The recent proposal from the EU that Nuclear Energy can be recognised as carbon-free in the updated taxonomy regime is welcomed by the Academy and is worthy of serious consideration for security of supply in the long term. Investigation of this option using Small Modular Reactors (SMEs) would need to commence immediately to meet a target date of 2050.

2. BROADBAND MODULE

Broadband Infrastructure

2.1 INTRODUCTION

In 2016 the Academy produced a broadband advisory paper with the stated intention of assisting in the preparation of a national broadband policy.

The advisory paper noted that the scale of the task ahead in providing for a world class broadband network and service "will be immense". The Academy believed that "the timescale involved will be short and the investment required will be significant". Estimates of the costs of providing a connection to 750,000 addresses in the "Intervention Area" ranged from just under €1bn to almost €2.2bn.

The study authors concluded that a substantial contribution of Exchequer funding would be required "combined with an independent dedicated public body empowered to drive the initiative.".

The document set out six "policy advisories", as follows:

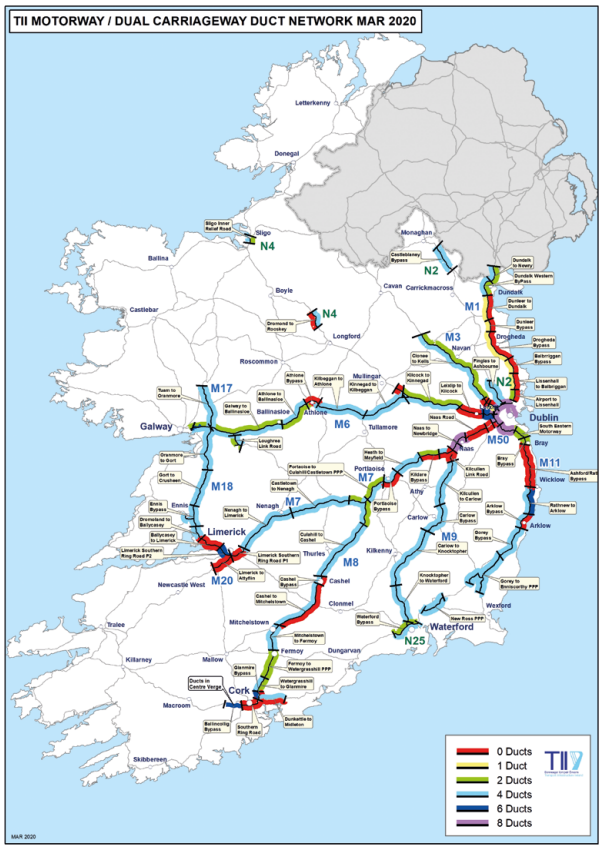
- Setting Targets: Provide a fibre-based national broadband grid of not less than 100Mbps to all homes and 1Gbps to businesses (during peak times) "as a basic national public infrastructure… such as water, gas or electricity".
- Competitive Pricing: Irish national broadband wholesale market pricing should be brought into line with competitive EU market pricing.
- Maximise Use of Assets: All non-ISP State companies should be required to partake in the new entities envisaged or divest their dark fibre networks to ensure those public or pooled assets are optimally employed. Both State and private new networks should be maintained as open access carrier-neutral networks.
- "Last Mile" issues: Provide a fixed fibre infrastructure with a design life of 30 years to ensure the scaling necessary to meet future demands for "Last Mile" access.
- Regulation: Provide appropriate regulation of the dark fibre market to bring pricing into line with best international rates in an open market.
- Measuring Success: Establish an expert independent public body to drive the national broadband development programme into the future.

There have been many changes in the broadband landscape in the period since 2016 and this update will outline and comment on them.

2.2 SIGNIFICANT CHANGES SINCE 2016

2.2.1 Developments to date

The sale of Telecom Éireann in 1999 to a private sector entity included both the business and the underlying infrastructure resulting in the loss of public control of the majority of the State's telecom and fibre network.



In 2004, the government built the first phase of the Metropolitan Area Networks (MANs) around the regional cities and large towns to provide fibre broadband infrastructure on an open access wholesale basis to facilitate the deployment of broadband by multiple operators in the regions resulting in the lowering of prices and greater bandwidth options and speeds. A significant barrier to the success of the MANs project was the lack of adequate fibre backhaul to connect the MANs through a national grid fibre network resulting in E-Net, the company chosen to manage, operate and maintain the MANs having to purchase backhaul connectivity on a piecemeal basis from mainly private entities.

The 2016 Programme for Government contained a commitment to set up *"a centre of expertise for managing all the State's commercial activities in communications such as the TII fibre ducts, the MANs network and masts in OPW lands, as well as the ultimate National Broadband Plan contract."* Unfortunately, the progress made in setting up such an entity has been very limited.

The arrival of the State-sponsored carrier neutral open access internationally connected sub-sea Global Crossing Cable into Dublin in 1999 was a game changer for the country that heralded the arrival of the digital age in Ireland. It subsequently enabled the Dublin region to attract leading ICT companies such as Microsoft and Google and also social media companies such as Facebook to locate their European headquarters in Dublin. The lack of a nationally-owned broadband infrastructure outside the Greater Dublin Area has been a significant barrier to the migration of these companies to the regions. The government did build out the western digital corridor from Dublin to Shannon in the early 2000s as an open access carrier neutral fibre backhaul cable but unfortunately this infrastructure never operated as originally envisaged.

2.2.2 National Infrastructure

The electricity transmission and distribution networks enable the delivery of electricity at a similar cost throughout the country irrespective of where the generating source is located. However, a more disparate situation applies regarding the deployment of broadband as the regional fibre backhaul connectivity is owned and controlled by a variety of public and private entities. This adversely affects cost, supply and quality considerations. The emerging 4th industrial revolution and rapidly developing artificial intelligence (AI) capabilities will require very high capacity broadband services to be available countrywide in order to rebalance the overdevelopment of Dublin and the East coast.

The lack of availability of large bandwidth and the higher cost of broadband in the regions compared to Dublin is a major impediment in attracting international data entities such as Google and Microsoft into the regions. This is despite the obvious advantages the regions enjoy over Dublin in relation to proximity to the sources of power generation and eventually renewable power. These problems are likely to be exacerbated by the decision of the Commission for Regulation of Utilities or CRU in November 2021 to assess the location of new data centres, which are heavy electricity-users, when deciding

on a grid connection and EirGrid's proposal to ban them in the Dublin area until at least 2028. That essentially means that new data centres are unlikely to be in built in or near Dublin where the grid is heavily constrained already.

The Minister for Environment, Climate and Communications has stated that his department is working with the Department of Enterprise, Trade and Employment on a new policy relating to data centres. This will have a plan-led, regionally balanced approach which will take into account existing grid availability and the opportunity to co-locate data centres close to significant renewable energy sites. This will only be feasible if high quality backhaul fibre is also available in these locations.

The development of new, large scale telecoms networks has evolved significantly over the last 10 years and new networks are now almost exclusively focused on data centre to data centre and adjacent to the head offices of those data based companies. Such networks accommodate multi-thousand fibre pairs of high specification glass with dedicated in-line amplification sites at sub-80km intervals. To date, no such long-haul networks exist outside the Greater Dublin Area, with the exception of the Aurora Telecom network which links Dublin to Galway via Athlone and Mullingar and to Cork City via Ennis, Shannon and Limerick, and also extends into Co. Mayo. The MANs distribution network would also significantly benefit from a national long-haul network.

2.2.3 National Broadband Plan

In November 2019 the State signed a contract with National Broadband Ireland (NBI), a consortium led by Granahan McCourt, to build, operate and maintain a highspeed broadband network in the 'intervention area' where commercial operators had no plans to provide such a service. This area comprises primarily rural areas covering circa 23% of the premises across the State. Rollout of this network has been delayed somewhat because of the Covid pandemic. Investment by commercial operators in quality, secure and resilient Gigabit network services will cover circa 77% of the premises across the State, primarily in urban and suburban areas.

The National Broadband Plan is a State subsidised project to provide broadband services to approximately 550,000 homes and premises, mainly, as noted, in rural areas. NBI, which is responsible for its delivery, is renting existing poles and ductwork from eir. This contract will not be addressing the lack of backhaul fibre which has far greater capacity and quality requirements.

The project is due for completion by the end of 2026 and has a number of annual targets set to enable that target to be achieved. Progress to date has fallen well behind the early targets which NBI has attributed mainly to the Covid pandemic and the poor state of repair of parts of the eir network, requiring it to be upgraded. NBI has said that it will accelerate the delivery and will still meet the completion date in 2026.

2.2.4 Remote working and connected hubs

As a result of the Covid pandemic, thousands of people were forced to work from home, often with less than adequate broadband. Nonetheless, many will wish to continue doing so, perhaps for part of the working week, for quality-of-life reasons, including a reduction in long-distance commuting.

Working remotely mainly entails people working from a home base. However a great effort has been made to establish digital hubs in towns and villages across the country. The Ludgate Hub in Skibbereen has been a great example for all subsequent hubs. The hubs have been very successful in accommodating users whose broadband service at home is inadequate as well as those whose circumstances are such that it is preferable for them to work locally but outside the home.

National and local authorities have responded by encouraging the provision of digital hubs and communal working spaces in smaller towns. The overall objective is to bring vitality and vibrancy back to the regional town centres by providing year-round, quality employment and training opportunities. These hubs serve to develop the towns to become the driving centre for enterprise growth and enhance the capacity of the towns for business initiative to build enterprise capacity nationally.

The Government's digital hub website (www.connectedhubs.ie) has established an online portal listing the registered digital hubs in Ireland and enabling the booking of remote workspace. Established in May 2021, there are already 232 hubs registered with many located in or close to the Atlantic Cities corridor.

It is not clear whether the National Broadband Plan will have sufficient capacity to facilitate the increasingly sophisticated software likely to be required in working from home in the future.

5G technology can benefit smart agriculture, tourism (entertainment/media), energy (rural generation), mobility (autonomous driving and infotainment), healthcare (assisted living) – all have prominence in rural societies, not just for the inhabitants but also for tourists and business investors.

5G will deliver incredible levels of connectivity but requires network upgrades to deliver its functional drivers – superfast broadband, ultra-reliable low latency, communication, massive machine-type communication, high reliability/availability and efficient energy use. 5G is not just the cellular network, it also requires huge investment in traditional backhaul networks to create a 'fibre-deep' infrastructure across all regions of the country. Without investment in these areas any existing urban-rural divide will likely be exacerbated.

2.3 RECOMMENDATIONS AND PRIORITIES

Multiple scalable economic networks are required from Dublin to the regions to facilitate the development of an open-access Atlantic Digital Corridor from Donegal to Wexford. This would cater for multiple sub-sea cable landings and would be the catalyst in attracting data dependant entities to the regions. The Points of Presence that would emanate from such networks would serve as ultra-high capacity interconnect points or digital exchanges from which local distribution networks would develop to serve large, medium and local demands. The Academy recommends that the State should as a matter of urgency:

- Develop and adopt a National Broadband Strategy similar to the National Water Resources Plan which is focused on the future demand for water services over the next 25 years.
- Establish a not-for-profit, commercially run State entity to manage and oversee all State telecom/ broadband assets, which will be empowered to establish a National Broadband Backhaul Network, managed by a special purpose agency.
- The agency should develop an open access backhaul fibre grid network to service regional Ireland with high quality national and international connectivity, using and upgrading existing and appropriate State-owned networks, such as the TII duct network, capable of connecting all international fibre cables landing in Ireland. This must be commenced as soon as possible if the Government's population targets for balanced regional development are to have any prospect of being met.
- Create a national database of dark fibre routes in which details, such as fibre type and latency, are recorded. This database should be available to telecommunications operators.
- Require fibre owners to allow access to networks or ducts at competitive prices where there is available capacity.

3. TRANSPORTATION MODULE

LUAS, image courtesy Donal Murphy

3.1 SIGNIFICANT CHANGES SINCE 2016

A number of potentially significant external changes have occurred since the 2016 report. – such as:

- The provisions contained in the Climate Action and Low Carbon Development (Amendment) Bill 2021 (net zero carbon by 2050) will dominate infrastructural investment over the medium to long-term leading to a much greater emphasis on Sustainable Transport - Public Transport and active transport.
- The COVID-19 pandemic has already brought about significant change to working/living patterns with evidence of relocation (or potential for relocation) away from the Greater Dublin Area and also possibly greater concentration on the "regions" parts of the Atlantic City Regions – with consequent transport issues including connection to Dublin, connection between the Atlantic Cities and from the regions to the Atlantic Cities. These changes are still happening, and the transport strategy has the potential to influence the direction of change for the better.
- The advent of Brexit has had significant consequences. In particular, Brexit potentially changes the relative importance of goods transport routes and facilities. The importance of direct import/export connection to mainland Europe has increased and this also potentially affects the importance of access routes to ports in the Atlantic City Regions. It has also had significant impact on costs and supplies of materials.
- The publication and coming into effect of the National Planning Framework (NPF), the Regional Spatial and Economic Strategies (RSES) for the Southern Region and the Northern & Western Region, and the Metropolitan Area Strategic Plans (MASPs) for Cork, Limerick-Shannon, Galway, and Waterford since the previous reports were published.
- The publication of a draft National Investment Framework for Transport in Ireland and its principles in relation to modal investment prioritisation and the modal hierarchy.
- Increased emphasis on Active Travel and the importance of health and wellbeing which is critical for our social, economic and cultural progress. Also, the publication of the new National Sustainable Mobility Plan.
- The NDP Review.

There is a strong alignment between the Atlantic Cities concept in the 2016 Academy report and the now statutorily supported Cities and Metropolitan Areas which are the focus of the Regional Spatial and Economic Strategies (RSES) prepared by the Southern Regional

Assembly and the Northern & Western Regional Assembly. The Academy has engaged in consultation with the Regional Assemblies during the preparation of the RSES. The Academy supports the objectives of the RSES for each Region - many of which are echoed within this review.

3.2 INFRASTRUCTURE DELIVERY: PROGRESS AND CHALLENGES

Progress has been made regarding some of the priorities that were identified in the 2016 report. However, it is critical that that the impediments to the timely delivery of essential infrastructure should be examined at government level. The timescale for commencing projects on site has increased hugely in the last 15 to 20 years. The urgency of many of these projects must be recognised and yet issues include consents, legal and procedural matters, procurement issues and others all contribute to delay. Examples of such delayed projects within the Atlantic City Regions are numerous, hindering economic development, international trade, and connectivity. The processes involved are in urgent need of revision.

Progress since 2016 has included:

- Completion of the M17/M18 from Gort to Tuam. Positive impact on north-south connectivity in the Galway City region, particularly as the new motorway intersects the east-west M6.
- N/M20 Cork to Limerick proceeding through planning - preferred route corridor announced March 2022.
- Oral hearing for the Foynes-Limerick Road (incl. Adare bypass) held in Feb 2021. Decision awaited.
- Limerick Northern Distributor Road – Phase 1 (Coonagh to Knockalisheen section) is on site.
- N24 Limerick-Waterford, including the Cahir to Limerick Junction and Cahir to Waterford Schemes, is progressing with the Cahir to Limerick Junction project currently at Option Selection Stage.
- N21 Abbeyfeale Road Scheme and N21 Newcastlewest Road Scheme – Public Consultation on route options occurred February /March 2021 and preferred route announced in November 2021,
- Limerick Greenway - route from Rathkeale to Abbeyfeale opened in July 2021, 40km route along old railway line. Abbeyfeale to Listowel Greenway under construction – due to open in 2022.
- Galway City Ring Road has been approved (with conditions and modifications) by An Bord Pleanála.

In addition, there has been a strengthening of the role of rail networks including recent national reviews such as the “All Island Strategic Rail Review” and the “Rail Freight 2040 Strategy”. The following table summarises progress with specific actions.

Specific Transport Recommendation	Progress	Action
N/M20 Cork-Limerick	Ongoing	Support
Cork Northern Ring Road	Ongoing	Support
Dunkettle Interchange Upgrade	Being completed	
Road to Ringaskiddy port (N28)	Ongoing	Support
N22 Baile Bhuirne - Macroom	Being completed	
N69 Foynes to Limerick Road including Adare Bypass	Ongoing	Support
Castlemartyr/Killeagh Bypass	Awaited	
Carrigtwohill-Midleton	Ongoing	Support
N24 Waterford to Limerick	Ongoing	Support
Bus Rapid Transport system in Cork	Ongoing	Support
Commuter Rail services Cork-Mallow-Cobh-Midleton	Ongoing	Support
Galway City Ring Road	Ongoing	Support
Limerick Northern Distributor Route	Ongoing	Support

Strategic/High Level Recommendations	Still Recommended
"Quantum Leap" in the modal shift from cars to Public Transport	YES
The recommendation that compressed natural gas should be considered as a fuel for urban bus services has been overtaken. The NTA's current plan is to replace all urban fleets with zero emission vehicles by 2035. These may be plug-in battery electric or hydrogen fuel cell electric fleet. Gas powered bus fleets in cites are not now proposed.	YES (for revised recommendation)
Reduced rail journey times between Dublin and the four cities (Galway, Limerick, Cork and Waterford	YES
Electrification of mainline rail from Dublin to the four cities in the longer term	YES
Competitive/attractive bus services on Cork-Limerick-Galway route via completed M17/18 and new N/M20.	YES
Improved bus services on Waterford-Cork and Waterford-Limerick using improved roads	YES
Improved bus services from Killarney/Tralee to Cork/Limerick along improved N69 and N22	YES
Central bus Ssations in each of the cities (revise to "Central Transport Hub")	YES
Up-to-date Land-use and Transportation Study for each city region to release road space for sustainable transport and provide residential densification	YES
Integrated (and cashless) ticketing for all bus transport. It is noted that Leap Card is accepted on all State subsidised bus services across Ireland (other than Locallink services) and many commercial services. Mobile ticketing complementary to Leap system is being introduced on Bus Éireann subsidised services).	YES
Consider reopening of rail freight connection to Foynes through Limerick	YES

High level recommendations made in 2016 are re-visited and reviewed in the following table.

3.3 RECOMMENDATIONS AND PRIORITIES

3.3.1 Net Zero and Decarbonisation of Transport

As indicated above, the provisions contained within the Climate Action and Low Carbon Development (Amendment) Bill 2021 (net zero carbon emissions by 2050) will dominate infrastructural investment over the medium to long-term.

- There will be a need to justify investment on the basis of carbon emissions, over journey time savings. New roads will still be required to ensure safety or to facilitate capacity for active and sustainable travel modes but increased capacity routes for private cars will be harder to justify.
- The delivery of enhanced (safer and with a reliable journey time) road connections between each of the cities should remain a clear objective. However, any proposals for enhanced road connections must be developed in tandem with an improved public transport offering and active travel investment within and between the towns along the corridors.
- Support the delivery of walking and cycling greenway networks for the corridors having a number of functions: (a) as an amenity for the residents of the region, (b) as a tourist facility, and (c) as a commuter facility. Non-greenway pedestrian and cycle facilities are also required.
- Consider role of blueways as transport resources.
- Greater provision of electric car charging facilities.
- Promote electric, hydrogen and other energy sources for buses.

3.3.2 Public Transport

- Every effort must be made to maximise the modal shift from cars to public transport, whether it is to be provided by public or private companies. This was a key aspiration in the 2016 report and is even more valid now.
- The Metropolitan Area Transport Strategies for each of the Atlantic Cities which identify active and public transport modes need to be progressed and implemented.
- Heavy rail transport has a key role to play for people travelling between Dublin and the Atlantic cities

and the major towns along these routes and major investment is required to improve services available. In particular, journey time must be reduced further, and electrification will be required.

- The possibility of improving journey times and capacity between the Atlantic Cities (and some intermediate towns) should be considered – possibly as part of the ongoing All Island Rail Strategy.
- However, while the practicality/affordability of improving heavy rail transport between the cities may be challenging, the focus of regional infrastructural connectivity must be more public transport focused in any case. This would include enhanced inter-city bus services, new city centre public transport hubs, regional park and ride sites, smart payment systems and other elements.
- Each of the Atlantic Cities and major towns should have a public transport interchange that accommodates both public and private operators and is linked to any rail transport.
- There is great scope for public transport connectivity between and within the Atlantic city regions with an improved road infrastructure, using existing bus systems (and their future successors) on the National, Regional and rural roads as appropriate and Bus Connects/BRT/LRT in major urban areas. If this is to be achieved successfully there will have to be full integration between all public transport services, including the most up to date payment and communications systems for passengers.
- Future public transport systems including buses, active travel, etc., will require availability of sufficient priority road space if they are to be successful. To be effective, that will require bypassing many urban areas and freeing up the road space. Many major and minor roads will need improvement. These can be readily identified and prioritised.
- Where possible, the heavy rail system should be utilised to remove freight from the road network. The potential for developing rail freight connections to the Region's major ports should be explored fully including reopening the connection to Foynes through Limerick (a recommendation of the 2016 report), the rail connection accessing Marino Point in Port of Cork, and developing/concentrating the Dublin- Rosslare rail link for commercial freight traffic.

3.3.3 Roads

There is no doubt that the need for and justification of new road schemes is undergoing significant challenge. Essential HGV and car transport will clearly have to be accommodated but making small time savings will not be persuasive in promoting projects. New roads will still be possible to ensure safety, or to facilitate capacity for public transport or active and sustainable travel modes but increased capacity routes for private cars will be harder to justify.

Nevertheless, the completion of high-quality road connections between the Atlantic Cities, to match the inter-urban connectivity between Dublin and the Regional cities, is essential in terms of enabling the Atlantic City Regions to act as an effective counterbalance to the Dublin Region in terms of national development.

Road connections between Limerick, Cork and Waterford and between Galway and Sligo are of a significantly lower standard than the connections between Dublin and the major cities or between Galway and Limerick. This directly impedes the National Planning Framework aim to develop Cork, Galway, Limerick/Shannon and Waterford as an increasingly inter-connected and developed network of co-operating and complementary cities. The link from Dublin to Sligo (and the north-west generally) is also in need of substantial upgrading over much of the length from Mullingar to Castlebaldwin and again north of Sligo to Letterkenny and Derry in order to complete Atlantic Economic Corridor links.

While the enhancement of services on existing rail lines would be a welcome improvement, the existing infrastructure and routes will not suffice. The Connecting Ireland strategy of improving direct bus connections within the regions and the rural areas will be significantly enabled by regular reliable bus services between hubs on the improved primary interconnecting roads. Similarly, the efficient movement of goods and freight within the Atlantic City Regions relies on dependable journey times by road. Improved inter-city and bypass routes will also enable emergency vehicle access, private transport where a public transport alternative is not yet viable, and, critically, will enable greater allocation of existing road space within the cities and towns to active and public transport modes by removing through traffic.

As an example, the delivery of the Galway City Ring Road must be focused on providing the opportunity to deliver enhanced public transport and active travel modes in the heart of Galway. To support sustainable and active travel

modes in Galway City, current street and road space will need to be re-purposed away from private cars to more sustainable travel modes. To achieve the significant level of intervention needed with respect to walking, cycling and public transport infrastructure a large volume of strategic, goods and freight, and through traffic will need to be displaced from the existing city's road and street network. The construction of the Galway Ring Road to the north of the city provides the mechanism to cater for this displaced traffic and allow for the significant level of interventions needed in Galway City to make a real change in how people move within the city and achieve the mobility targets set for the city. The delivery of a programme of works which combine the Galway Ring Road with key sustainable and active travel measures such as the City Centre Cross City Link and the Primary Cycle Network is the only means of delivering the mobility change needed in Galway. The same principles apply for many towns on the routes between the Atlantic Cities including the creation of suitable bus routes to hubs within the towns that are uncongested and reliable.

New or improved roads (including bypasses) will be required (a) to provide safe and reliable public transport routes, (b) to add to or enhance active travel modes, (c) to enable viable haulage and distribution routes and ((d) to continue to provide transport options for the more remote "regions" where reliable and regular public transport is not yet a realistic option.

- The delivery of an enhanced (safer and with a reliable journey time) road connections between each of the cities remains a clear objective of the Strategy.
- In particular, the N/M20 Cork Limerick, the N24 Limerick-Waterford, and the N25 Cork Waterford, need to be significantly improved and the current plans need to be accelerated along with completion of the N22 Cork-Killarney-Tralee, and the N21 Limerick-Tralee.
- These enhanced road connections must be delivered in tandem with an improved public transport offering and active travel investment within the towns along the corridor.
- The continued delivery of infrastructure that provides for the most efficient movement of commercial and freight traffic on the island is essential.

3.3.4 Active Travel

Image courtesy of Donal O'Callaghan

Over recent years, there has been a significant increase in the number and complexity of proposed Greenway projects overseen by the Department of Transport, having increased from 5 in 2018 to over 40 in 2021. Similarly, the budget for Greenways has increased from €3.6 million to circa €70 million in the same timeframe. The National Sustainable Mobility Policy, published in April 2022, sets out a strategic framework to 2030 for active travel (walking and cycling) and public transport journeys to help Ireland meet its climate obligations.

In signalling the Government's commitment to developing Ireland's Active Travel (i.e. cycling and walking) and Greenway infrastructure, the Programme for Government contains a commitment to allocate an equivalent of 20% of the 2020 transport capital budget per annum, or €360 million, to cycling and walking projects for the period 2021 to 2025 inclusive. There are many examples of planned and potential Active Travel/Greenway schemes throughout the Atlantic City Regions – it is vital that these are progressed and supported.

In addition, the publication of the Healthy Ireland Strategic Action Plan 2021-2025 asserts that population health and wellbeing is critical for our social, economic and cultural progress, and our overall quality of life. It recognises the requirement for a 'whole of government' approach to addressing the social determinants and predictors of health and wellbeing, many of which fall outside the health sector, e.g. housing, transportation, education, workplaces and environment along with an individual's socio-economic status.

3.3.5 Pandemic Impact

Covid-19 has had a hugely significant impact on the way and where people live and work. Significant numbers of people have "worked from home" or remotely over

the time since March 2020. How that will translate into a new way of working is still to emerge fully, but there is little doubt that people will continue to live and work more remotely or in regional hubs with regular or occasional trips to larger cities (including Dublin). Thus, work-based transport may require multiple modes to be efficient and practical. This increases the importance of effective servicing of the needs of the "regions" part of the Atlantic City Regions. Increased reliable connectivity between the Cities and particularly within the regions is vital to enabling the "new normal" which is supported by many employers and government. That may include contributions from some or all of road (private vehicles and buses, etc.), Light Rail, BRT, Heavy Rail, and, of course, improved broadband/digital.

3.3.6 Regions

General

- The 2016 report noted that the National Spatial Strategy recognised that the best prospects for establishing critical population mass of the type and scale capable of competing with that of the Greater Dublin Area lay in developing Cork, Galway, Limerick/Shannon and Waterford as an increasingly inter-connected and developed network of co-operating and complementary cities. That remains true.
- For our cities and major towns, higher density development needs to be supported through greater investment in active travel modes with clear objectives to create more compact cities and towns where employment, retail and leisure opportunities are provided closer to where people live.
- In terms of public transport provision, the current focus on the redesign of the bus networks in Galway and Cork under the BusConnects programme and the likely roll-out to Limerick and Waterford must be supported.
- At a regional level there is a need for a greater examination of bus services serving areas beyond the core of the cities if we are to deliver on our climate targets.
- The NTA "Connecting Ireland" plan needs to be supported and enhanced to progress towards providing a much-improved public transport system in rural Ireland – new connections, more frequency and integration with regional transport.
- There needs to be a regional bus network plan put in place for the corridor (routes, interchange locations, localised parking, etc) to ensure that improved accessibility, within and between the city regions, has a strong public transport focus.

Cork

- The N/M20 Cork to Limerick Motorway is an essential connection between the two cities which, added to the motorway connection between Limerick and Galway (and ultimately to Sligo), will help to create a viable social and economic entity capable of competing with and complementing the Greater Dublin Area – an aspiration of the National Planning Framework. The N/M20 will enable a 1 hour travel time between Cork and Limerick, improving connectivity, greatly enhancing public transport and creating a single economic zone. The N20 is currently on the comprehensive TEN-T route, important for the movement of people and goods.
- The Tier 1 port at Ringaskiddy is a key facility, especially in the context of Brexit. The new N28 Access Road is required as a matter of urgency. The M28 will be the "last mile" section of the EU North Sea Mediterranean Corridor, which is Core TEN-T.
- Castlemartyr/Killeagh Bypass(es) to enhance connectivity between Cork and Waterford on the comprehensive TEN-T route.
- Cork Light Rail Project to be supported.
- Cork BusConnects to be supported.
- The plan for improved Commuter Rail services on Cork-Mallow-Cobh-Midleton to be supported/ expedited.
- Cork City Northern Transport Project (formerly referred to as Cork Northern Ring Road.

Galway/West

- The critical piece of infrastructure needed in the region is the N6 Galway City Ring Road. The growth of the city and the wider region is adversely affected by the absence of this route. The potential for the route to deliver enhanced public transport and active travel modes in the heart of Galway City is very important to the development of the city and improved mobility within the city.

- Connectivity to Sligo and the north-west should be enhanced through upgrades to the N17 north of Tuam. Improved links are also required from Dublin to Sligo (N4) and north of Sligo to Letterkenny and Derry/Londonderry (N13/N15). These works would also improve uptake of road-based public transport in the north-south direction along the Atlantic Economic Corridor.
- Sections of the N59 from Galway to Clifden are being upgraded and this will certainly benefit communities in the Connemara area.
- An integrated transport hub in the Ceannt Station/ Eyre Square area of Galway City would provide significant benefit to the city/region.
- Galway BusConnects should be supported.
- Prior to the pandemic, the Galway-Dublin rail line was heavily used and this level of use is expected to return.
- Even allowing for new flexible working opportunities, commuter traffic congestion remains a big problem in Galway City. This is impacted by a poor public transport network in the city and its environs and the distributed rural population who commute to the city on a daily basis. The provision of a light rail system was considered as part of the Galway Transport Strategy 2016 and will be re-examined in 2022. The topography and scale of Galway City means that cycling, walking and bus transport are potentially viable options for commuting. As regards heavy rail a second track from Galway to Athenry would likely encourage or increase commuter patronage.

Kerry/Tralee/Killarney

The importance of the Kerry region is likely to increase further with the likelihood that people will return to live and work in "The Kingdom" as new ways of working take root. This will add to the need to provide efficient sustainable and reliable transport within Kerry and from the various parts of the Kerry region to the Atlantic Cities and beyond. The following road schemes are particular important for connectivity of the Kerry Region:

- N21 Abbeyfeale Road Scheme.
- N21 Newcastle Road Scheme.
- Foynes to Limerick road including the Adare bypass.
- N22 Baile Bhuirne to Macroom (under construction).

Limerick/Shannon

- The complete Limerick Northern Distributor Road will need to be built out to alleviate traffic issues to the north of the city as well as opening up valuable development potential for education and industrial uses to the north of UL.
- The N/M20 Cork to Limerick Motorway is an essential connection between the two cities which, added to the motorway connection between Limerick and Galway, will help to create a viable alternative capable of competing with the Greater Dublin Area – an aspiration of the National Spatial Strategy. The N/M20 will enable a 1 hour travel time between Cork and Limerick, improving connectivity, enabling public transport and creating a single economic zone.
- N69 Foynes to Limerick Road (including Adare Bypass), which is on the EU North Sea Mediterranean Corridor and is Core TEN-T.
- Limerick BusConnects to be supported.
- Adoption of the Limerick Shannon Metropolitan Area Transport Strategy (LSMATS).
- N24 Limerick to Waterford including the Cahir to Limerick Junction and Cahir to Waterford schemes.
- The rail line between Limerick and Waterford is an important asset and the potential for Limerick Junction to have a greater role as an intermodal hub for passengers and freight should be examined.
- N21 Abbeyfeale and Newcastlewest Road Schemes.
- Connectivity with Clare and Ennis – one of the Region's largest key towns.

Waterford/Wexford

- The "Region" of Waterford City needs to be recognised as including Wexford Town area, New Ross, and Rosslare including the ports in Waterford, New Ross and Rosslare.
- It is noted that the rail link from Rosslare to Waterford has been closed since 2010. Public transport traffic is now accommodated on buses resulting in a more economic and regular service.
- Dublin-Rosslare rail link to be developed/focussed for commercial freight traffic. Again, public transport can be efficiently accommodated by buses which can also serve the more remote parts of the region.

- Brexit has brought the ports of Waterford and Rosslare to the frontline and Rosslare Europort now has 30+ ferry sailings per week and is continuing to grow. Euroroutes E01(Belfast to Seville) M11 and E30 (Cork to Moscow) N25 converge on Rosslare Europort. Access to the port is a priority.
- Waterford BusConnects and new sustainable transport bridge connecting to north of city.
- The completion of the M11 from Oilgate to Rosslare, the Rosslare Europort Access Road and the upgrading of the N25 from Cork to Rosslare are critical and must be supported.

3.3.7 Priorities

It is noted that many of the 2016 recommendations are progressing and that many of the items considered in Section 3 above are already the subject of commitment from government. In general terms the following are supported:

- The delivery of enabling transport infrastructure priorities identified through the MASPs and Metropolitan Area Transport Strategies for each city and metropolitan area.
- Multi-modal connectivity across the Region connecting the cities and metropolitan areas.
- Connecting our urban areas, ports and airports along strengthened networks (road and rail) for an economically resilient region.
- Improving public transport services, especially inter-city bus services optimising and expanding our rail network for the movement of people and freight.
- Sustainable mobility projects, especially enhanced public transport, active travel, public realm regeneration, and connectivity by green and blue modes.

The following specific transport infrastructure elements from the preceding sections are essential for the connected development of the Atlantic City Regions, concentrating on those which need renewed or added commitment/prioritisation.

- BusConnects in each of the cities.
- Cork Metropolitan Commuter Rail Project
- Cork Light Rail project and consideration of BRT/ LRT for each of the cities
- High quality inter-urban road links between the Atlantic Cities, including the Atlantic seaboard north of Galway, which facilitate public transport, freight transport, and general connectivity and which include town bypasses to enable/provide space for active travel and public transport within the towns.
  - N/M20 Cork to Limerick
  - N/M24 Limerick to Waterford
  - N/M25 Cork to Waterford
  - N/M21 Limerick to Tralee
- Galway City Ring Road
- Limerick Northern Distributor Road
- Access to ports at Shannon/Foynes, Ringaskiddy and Rosslare
- Cork City Northern Transport Project
- Improved Transport Hubs especially facilitating integrated bus transfers and timetabling.
- Establish potential for enhancement of rail passenger and freight services in the region.
- Review planning and approval processes to reduce delays to critical infrastructure.

4. PORTS MODULE

Cork port, image courtesy Port of Cork

The Ports of Galway, Shannon-Foynes, Cork, Waterford and Rosslare play key roles in the economic and social development of our Atlantic City Regions. While Dublin Port handles in the region of 75% of national trade, the other ports will play an increasing role in advancing Ireland's overall social, economic and environmental objectives.

While each of the Atlantic City Ports serve different and distinct markets currently, new opportunities are emerging such as facilitating offshore energy projects and unitised cargo. The national challenge is to ensure that structures and policies are in place to facilitate the Atlantic City ports and Dublin Port – all acting in the most efficient and cost-effective way to meet overall national and island-wide objectives and obligations.

4.1 SIGNIFICANT CHANGES SINCE 2016

Since the publication of the Academy document in May 2016 a number of significant developments impacting on ports have emerged such as:

- Brexit and its continuing and evolving impacts
- Covid-19 – Global and local impacts
- National Planning Framework and related Development and Regional Plans
- National Maritime Planning Framework including the Maritime Area Planning (MAP) Act enacted in December 2021
- EU Green Deal and National Climate Action Plans
- Drive for More Innovation and Smarter Ports
- Global and regional supply chain logistics changes with cost and delivery impacts
- Continuing demand for deepwater facilities to accommodate deeper drafted vessels which drive economic and environmental efficiencies
- Logistical Innovations and changes in logistics patterns
- Road haulage developments, e.g. driver shortages for heavy goods vehicles

While this report will naturally focus on the Atlantic City ports (including Rosslare) these must be viewed as part of the overall ROI (Republic of Ireland) and NI (Northern Ireland) network of ports.

A review of recent trends in unitised cargo (containers or heavy goods vehicles) together with a brief overview of likely trends in all cargo modes nationally may help to illuminate some of the above points.

4.1.1 Recent Unitised Cargo Trends

The following information has been gathered from the most recent Irish Maritime Development Office (IMDO) - Q3 Unitised Traffic Report (October 2021).

Roll On – Roll Off (RoRo)

While the number of RoRo Units which were handled at Dublin, Rosslare and Cork Ports is on a par with 2019 the configuration of this traffic in terms of route choice and shipping mode is much changed as follows:

- 71% of all ROI traffic is now unaccompanied, compared to 64% in 2019.
- 34% of all ROI traffic now operates on direct routes to EU ports - up from a 16% share in 2019 giving a 52% increase in ROI – EU traffic in the period.
- The number of direct EU services has increased from 6 in 2019 to 13 in 2021.
- ROI – GB traffic has declined by 25% since 2019.
- NI ports have shown significant growth over the period.
- Underlying these trends are (i) a declining use of the "Landbridge" via GB to EU by ROI traffic and (ii) the return by many NI hauliers to using NI ports rather than Dublin to access some GB destinations because of simpler customs and trading arrangements post Brexit.

A port comparison for Q1- Q3 (2021) vs Q1-Q3 2019 is as follows:

	2021 (Units)	Growth
Cork	4,221	3%
Dublin	706,521	-11%
Rosslare	136,899	+47%
NI Ports	697,952	+9%

The growth in volumes and number of direct EU services at Rosslare in 2021 has been significant.

Load On – Load Off (LoLo)

ROI LoLo traffic grew by 13% in 2021 compared to 2019. The majority of LoLo services on the entire island are direct to EU ports. LoLo volumes reflect the demand from all Irish importers and exporters to access EU markets directly where possible without the need to adhere to customs arrangements at EU ports.

Over recent years the introduction of ConRo services (Containers and Unaccompanied RoRo) has led to the blurring of the previous distinctions between the different unitised cargo vessels leading to increased competition and dynamic capacity is now evident in the market.

A port comparison for Q1-Q3 (2021) vs Q1-Q3 (2019) is as follows:

	2021 (TEUs*)	Growth
Cork	211,898	+17%
Dublin	637,401	+9%
Waterford	37,026	+4%
NI Ports	194,706	+4%

* Twenty Foot Equivalent Units – traditional volume measurement for boxes

Some ConRo services, previously solely ex-Dublin are now recently operating out of Cork direct to EU. The opening of the new Container Terminal in Cork early in 2022 is timely to meet growing demands.

Other Cargo Modes – Likely Trends

- **Bulk Cargo (Solid):** Overall trade in this mode is likely to be relatively static particularly because of (i) likely constraints on beef and dairy production possibly leading to less animal feed imports and (ii) likely phasing out of coal imports due to climate change considerations. While other substitution products or other opportunity cargos may emerge this is unlikely to be a growth area for port trade.
- **Bulk Liquids:** A reduction in fossil fuel imports is inevitable over the longer term once emerging energy alternatives come on stream. Substitute fuels are likely to emerge in the medium term which will compensate ports for this trade loss. This will be a challenging issue particularly for the Atlantic ports at Cork, Shannon Foynes and Galway.
- **Break Bulk:** Trade in this cargo mode is again likely to be static with a continuing trend of transfer to unitised cargo. There is a planned increase in both off- and onshore wind turbine development that should benefit Atlantic ports.
- **Cruise:** Dublin Port's decision to limit both the number and size of vessels to enable it to address cargo capacity constraints is likely to have an overall negative impact on national cruise business activity.

Other ports traditionally benefited from spin off visits following a Dublin port call. There may however be opportunities for some ports which have plans to accommodate larger vessels or can currently do so.

4.2 INFRASTRUCTURE DELIVERY: PROGRESS AND CHALLENGES

The May 2016 Document put forward the following port related recommendations and their current status is noted:

1. M28 Cork - Ringaskiddy upgrade – progressing to construction
2. N69 Foynes to Limerick upgrade – at planning and design stage
3. Dunkettle Interchange upgrade – under construction
4. M/N20 upgrade – at planning stage
5. Foynes-Limerick rail freight connection- under consideration.

All of the above are transport connectivity projects, funded by the State, designed (inter alia) to support marine developments at the individual ports. The individual port projects themselves, in accordance with the current National Ports Policy, are obliged to be funded by each port's own capital programme without State support, although some limited EU support has been available recently.

The provision of port infrastructure is expensive and dependent on a number of complex consenting processes. This presents significant challenges for individual ports with limited turnover and capital resources. The private sector, while facilitated to do so, has not been active to date in the provision of public port infrastructure on a joint-venture basis with individual ports.

In some areas, such as Cork and Galway, a major challenge is to provide modern replacement facilities elsewhere to facilitate urban regeneration close to city centres. Finding a fair and equitable means of facilitating such developments, where the relocation costs are in excess of the lands being vacated, is an ongoing challenge.

4.2.2 Plans and Projects at Individual Ports

The following is a brief resume of ongoing and proposed developments together with opportunities identified at each port:

Galway

- New reclaimed area for port logistics, Industrial uses and renewable energy
- New quays and Increased depths to facilitate larger vessels
- New Western Marina
- Freight rail link
- Facilitation of urban regeneration
- Cruise business growth

Shannon Foynes

- Significant expansion and industrial development in Foynes and upgrade of connecting N69.
- Promoting non-core assets in Limerick Docks for alternative uses.
- Rail connectivity to Limerick and beyond
- Harnessing the estuary's natural attributes to develop it as an ocean energy hub
- In particular offshore renewables, biomass, other energy projects (including proposed LNG terminal), waste to energy and recycling are all target areas for growth.
- The Port and ESB are working with other parties to develop a land and sea based renewable Energy Hub at Moneypoint post fossil fuel importation. The focus will be on offshore wind technology and hydrogen generation.

Cork

- The Port is preparing a new Masterplan to 2050 which is likely to be published in 2022.
- The Cork Deepwater Container Terminal at Ringaskiddy became operational in mid-2022. However the new N28 will not be delivered until 2030 thus limiting the facility's potential until then.
- Being well positioned to directly connect to European ports future growth in the Unitised Sector is envisaged and further expansions at Ringaskiddy are likely to be required.

- The Port is working with partners to promote the Harbour for developing and servicing both the offshore and onshore energy markets.
- Marino Point, along with Ringaskiddy, is being developed to accommodate some trades needing to be relocated to facilitate inner city renewal. The facility is rail connected thus offering potential rail freight possibilities. Funding these transfers is a challenge.

Waterford

- Minimising requirement for maintenance dredging and improving marine access initially through installation of training wall at Cheekpoint
- Development and Improvements to berths at Belview and adjacent private berths.
- Shore side developments including improving land bank access, services, offices and warehousing.
- As a rail-connected container terminal growth in rail freight services is envisaged.
- Servicing both land based and offshore wind facilities.

Rosslare

- Based on strong growth in RoRo services a new configuration of the port is underway on a phased basis in a live port environment incorporating a new entrance to port.
- New Freight Access Road from N25 being delivered by TII and Wexford County Council with work due to start in 2022.
- Significant new facilities and infrastructure including the required extensive facilities for state agencies post Brexit being provided.
- Some berth reconfiguration envisaged to accommodate larger vessels
- On-going drive to become a sustainable, seamless and smart port.
- Based on its strategic location a partnership has been developed with a Dutch company based in adjacent business park targeting offshore wind projects.
- Ambition to obtain consents for new deepwater facilities and adjacent land developments within 24 months to facilitate offshore wind fabrication, servicing and maintenance.
- Ultimate ambition to incorporate new deepwater berths into the main port to facilitate RoRo operations expansion.

4.3 SUMMARY OF OVERALL CHALLENGES

A government initiative is underway to streamline and integrate the various consent and legal processes required for both land based and marine projects. Once completed this should address one of the key areas of difficluty to date. Other areas of challenges include:

- Provision of port infrastructure is complex, expensive and lengthy taking 10 years or more to deliver. With Dublin Port dominant nationally in terms of trade and related revenues, funding major capital projects in individual ports is problematic. The current requirement to return a dividend to the state is a further financial constraint on development. The opportunities for joint ventures or alliances between ports are limited because of competition and transparency considerations. The regular mismatch between the delivery times for new port facilities and their connections to the national transport network is unfortunate, unsatisfactory and has severe financial implications. It also delays regeneration of city dockland areas.
- Use of lands close to port facilities for related activities should be encouraged by the planning process and by a more formal relationship with other state agencies holding such possibly spare lands to maximise overall national and regional interests.
- While distances from the major population and industrial centres in Ireland is economicallly sub-optimal in European terms for rail freight viability, further use of rail freight should be encouraged wherever possible. Greater use of the unitised rail facilities at both Waterford and Dublin ports could be facilitated by the provision of new rail depots at suitable locations while Foynes, Galway and Marino Point offer potential for distribution of bulk cargoes by rail.
- The potential of floating wind turbines and tidal energy to contribute to net-zero targets is significant. Floating wind projects in the Celtic

Sea and Atlantic are being encouraged. These projects need access to port facilities with special characteristics such as deep water and robust quay structures. Strategic port development locations need to be identified either within or adjacent to the Atlantic Ports to serve this critical need. To facilitate this National Ports Strategy needs to be reviewed and updated.

- Obtaining the necessary consents for routine port capital or maintenance (e.g dredging) activities in a timely manner continues to be a challenge. While efforts have been made by State agencies those dealing with foreshore licensing and NPWS agreements suffer from insufficient personnel resources – especially those with specialist expertise,. Current resource levels are insufficient to deal efficiently with potential conflicts or third party issues as they arise.
- Dublin Port is to be complimented for the initiatives it is undertaking to increase port capacity having lost a significant area of land for new immigration and customs facilities post-Brexit. It has also embarked on a 3-phase masterplan strategy, the first of which has been completed. The second phase is underway and the third phase, namely the 3FM project at Ringsend, is now at preliminary public consultation phase. These works are all designed to bring the port to its ultimate and final capacity by 2040. A related issue is that Drogheda Port Company in conjunction with a private developer is seeking to advance a major new port project as a complementary or alternative development at Bremore in Co Meath. A review of National Ports Policy is urgently required to explore the merits of both the Dublin Port and Bremore proposals having regard to all national and regional considerations. In addition the question of whether other ports should play a role and, if so, how funding for such development should be arranged.

4.4 RECOMMENDATIONS AND PRIORITIES

4.4.1 The implementation of the current government initiative to streamline and integrate the various consent and legal processes for both land-based and marine projects should be accelerated, resourced and implemented. A raising of the threshold for the granting of judicial reviews of consent decisions for strategic infrastructure should form a key element of the initiative. While projects in other sectors will benefit, ports and the offshore energy market require such change if Ireland's renewable energy targets are to be met.

4.4.2 National Ports Policy, now in existence since 2013, is being reviewed in order to meet current and emerging needs not envisaged at the time of port corporatisation and policy publication. As part of this review the Academy recommends that a forum be convened by the Department of Transport supported by the Department of Environment, Climate and Communications of key stakeholders including port companies, customers, logistical providers and potential offshore energy providers to review the shortcomings and constraints of existing policy. A different funding model, which still respects competition and transparency considerations, that would have the potential to deliver the required port facilities at the optimum locations cost-effectively from a national and regional perspective should form part of the review.

4.4.3 Transport Infrastructure Ireland (TII) and the individual ports should identify and advance any required road or motorway upgrades for connectivity purposes in a co-ordinated manner with the port upgrades themselves to ensure that there is no time lag, no financial loss and no delay in realising redevelopment opportunities. This work should be undertaken at programme level within both the Department of Transport and the Department of Public Expenditure and Reform.

4.4.4 The Department of Transport should engage with landowners (including State agencies), identified by ports and local authorities, to determine if and how some of such lands could be made available to support what are currently scarce shore-side infrastructure facilities at many ports.

5. FLOOD RISK MANAGEMENT MODULE

5.1 SIGNIFICANT CHANGES SINCE 2016

5.1.1 COVID 19

As in most sectors of the economy the COVID-19 pandemic has had a significant effect on the Flood Risk Management programme. Delays have been caused at all stages of the process by the necessity for remote working and the consequent reduction in productivity. Construction activity has been hindered greatly and activities such as virtual consultation, meetings, legislative and approval processes have been much more difficult and time consuming.

Many key skilled people have moved abroad or returned to their homelands and may no longer be available for Irish projects.

5.1.2 Climate Change

The concern about climate change and the Government commitment to take action have increased significantly on foot of evidence of increased rainfall intensity and sea level rise. These problems are predicted to increase as climate change progresses.

5.1.3 National Development Plan (2021 – 2030)

The National Development Plan (NDP) was issued in October 2021. It highlighted the need for major investment in infrastructure to accommodate sustainably the anticipated growth in population across the country. The NDP contained ten National Strategic Objectives (NSOs). Under NSO 8, Transition to a Climate-Neutral and Climate-Resilient Society, a number of key flood risk management schemes were identified and funding, already secured, was re-affirmed.

5.1.4 Regional Spatial and Economic Strategies

The Regional Spatial and Economic Strategies (RSESs) were published in early 2020. Among their key aims are place-making and urban regeneration. These require that, where possible, all infrastructure projects should contribute positively towards these aims. This applies particularly to flood relief schemes which are usually linear projects, most frequently in urban areas.

5.1.5 BREXIT

Brexit is likely to have an impact on the availability of expert professional and construction companies from the UK who will in future be operating from outside the EU. Demand in the construction sector is already facing capacity issues. Difficulties in supply chains are also impacting and the consequential delays are likely to have cost implications for the exchequer.

5.2 INFRASTRUCTURE DELIVERY: PROGRESS AND CHALLENGES

5.2.6 Progress

Significant progress has been made by the Office of Public Works (OPW), in conjunction with the local authorities, on many of the issues in the Academy's report in 2016. The Catchment-based Flood Risk Assessment and Management (CFRAM) programme has been completed successfully. At national level, of the circa 300 urban settlements originally identified as Areas for Further Assessment, the completion of the CFRAMS has resulted in the number of urban areas where schemes are deemed to be required reducing to circa 200. Of these 200 areas, circa 50 schemes have now been completed, 92 schemes are in various stages of progress with 58 future schemes identified but yet to commence. Out of the national total, 20 of the completed schemes are within the countywide radius of the Atlantic Cities, with 22 ongoing and 14 future schemes within the cities and/or counties of Galway, Limerick, Cork and Waterford.

The Waterford City Scheme is now complete. Significant progress has also been made in Limerick, with an advanced contract completed at Verdant Place, planning consent received in 2021 for the scheme for King's Island, which is due to go to construction in 2022, and consultants have recently been appointed to advance the main Limerick Flood Relief Scheme for the remainder of the city area and environs. Consultants have also been appointed for Galway with a successful first virtual public day held earlier this year.

In Cork City, planning consent has been received for a public realm and flood defence project in a critical tidal reach of the Lee at Morrison's Island, but this is currently the subject of a legal challenge. The main Lower Lee Flood Relief Scheme is due to go for Ministerial Confirmation in mid-2022.

Within the wider counties of the regional cities, significant progress has also been made with Schemes completed in Foynes, Bandon, Clonakilty, Skibbereen, and Douglas, and on the Dunkellin and Clare Rivers. Schemes are also at various stages of development in Castleconnell, Blackpool, Midleton, South Galway, Clifden and Ballinasloe.

In the 5 year period the OPW has made significant progress in the assessment of coastal flood risk.

Following on from coastal mapping produced as part of the Irish Coastal Protection Strategy Study (ICPSS) in 2011, they commissioned an update in 2018 as part of the Irish Coastal Wave and Water Level Modelling Study (ICWWS) - completed in 2020 - and the subsequent production of the National Coastal Flood Hazard Mapping 2021, now available on *www.floodinfo.ie*. This site is a one stop shop for all flood risk management information, including information on historic flooding, predictive flood mapping, and details of catchment flood risk management plans and ongoing flood relief schemes. It is an excellent resource.

OPW has also prepared its Sectoral (Flood risk) Climate Change Adaptation Plan which sets out its high-level approach to how it will manage adaptation for climate change across its work in the area of flood risk management.

5.3 CHALLENGES

5.3.1 Consents and Legislative Issues

The consents process has become increasingly complex in recent years with a growing number of legislative issues, both domestic and of EU origin. This has assisted a rapidly developing and expanding jurisprudence comprising case law from the Irish courts and the European Court of Justice (ECJ). In 2019 judicial review proceedings in relation to Bord Pleanála decisions and procedures were instituted in 55 cases, an increase from 41 in 2018.

There have been significant and welcome changes in environmental legislation in the last number of years aimed at increasing public participation and protection of the environment. At the same time technological developments have caused a significant shift in how the public receive information, with a much greater role being played by people on social media platforms.

5.3.2 Integration of Pluvial Floor Risk Management

Similar to elsewhere globally, there is growing evidence of increasing rainfall intensity which will increase significantly with climate change. Met Eireann predicts that autumn and winter will become much wetter with increases of approximately 20% in heavy precipitation events. The evidence suggests that the Atlantic City Regions will be more affected than those further east due to precipitation being dominated by the Atlantic weather regime.

While great progress has been made in considering fluvial and tidal flood risk and progressing the development of flood relief schemes for our cities, understanding of the surface water equivalent is significantly further behind, with little progress made in developing comprehensive digital records of our surface water systems, undertaking detailed hydraulic modelling and considering network capacity both in the immediate term and considering the potential impacts of climate change.

An issue in relation to Climate Change impacts is the number of small rivers and streams that have been culverted over the decades in cities and larger towns. The capacity of such culverts may come under pressure as more intensive and frequent rainstorms occur due to Climate Change. Also there is need for national standards or guidance in designing for rainstorms in new or replacement works.

Prior to the formation of Irish Water, local authorities were responsible for foul, combined and surface water systems within their administrative areas. As there is significant interaction between the systems, having a single authority responsible ensured that the interactions of the systems could be best understood and managed. Following its formation, responsibility for managing foul and combined drainage transferred to Irish Water, but responsibility for surface water remained with local authorities. This splitting of responsibility potentially creates administrative barriers to ensuring there is a holistic understanding of our drainage systems.

5.3.3 Integrated National Approach to Coastal Erosion and Flood Risk Management

The growing evidence of global science confirms that sea level rise is no longer a case of if, but rather of when and how fast. What is certain, is that a degree of sea level rise is already built in and therefore we must prepare to mitigate and adapt. The Atlantic Cities are exposed to a significantly increasing risk as a result of sea level rise where problems will arise in the shape of both coastal erosion and flooding. Both issues are interrelated as coastal erosion will in many areas result in the loss of existing coastal protection structures or regimes and thus increase flooding in addition to the direct increase from higher seas.

We welcome the production of mapping for more extreme scenarios. While only two scenarios of sea level rise had previously been considered, namely the Mid-Range Future Scenario (MRFS) of 0.5m of sea level rise and the High-End Future Scenario (HEFS) of 1m of sea level rise, the latest modelling considered two further extreme scenarios of H+EFS and H++EFS of 1.5m and 2m of sea level rise respectively. These scenarios may be significant in the future and consideration of such extremes is vital in ensuring that current decisions on investment funding are considered in the longer term to ensure that they are robust and adaptable for an uncertain future.

The report of an Inter-Departmental Group on Managing Coastal Change is awaited. The Group, which is jointly chaired by the Department of Housing, Local Government and Heritage and OPW, is to bring forward options and recommendations for Government to consider. Some difficult decisions will be required in due course as defence solutions may not be possible in all areas and it may be necessary to consider a managed retreat as an option to mitigate the risk.

5.3.4 Procurement and Supply Chain Issues

The delivery of major flood relief infrastructure is dependent on the availability of skilled flood risk professionals and designers as well as suitable civil engineering contractors. Following the completion of the CFRAMS programme, a further significant increase in spending will be required to deliver the resulting 200 schemes - OPW's annual budget has already trebled in recent years. Delivery of this increased output requires the industry to grow significantly as there is evidence of an acute shortage of the relevant skills within the country at present. This situation has been caused in part, as noted above, by the COVID-19 and BREXIT as many overseas workers have returned to their homelands. Increasing the capacity of the industry, and the availability of workers with the necessary skills, will require creation of the right conditions to encourage workers to enter the industry. There have been significant problems with global supply chains for construction materials and BREXIT has also contributed to this for Irish projects.

Public procurement is hampered at present by the adoption of a model that appears to be focused on lowest cost and/or cost certainty as opposed to value for money, and forms of public contracts which seek to inappropriately transfer certain risks to the private sector which are impossible to quantify. This leads to significant time being spent in difficult, expensive and time-consuming dispute resolution processes which act as a disincentive to tenderers for certain projects.

5.3.5 Inflation and the Wider Business Case

The timescale for the delivery of flood risk management infrastructure has historically been extremely lengthy with projects often taking over ten years and sometimes up to 20 years from initial assessment to completion on site with substantial cost increases added to serious delays. Unfortunately, there is growing evidence that there are significant risks that these problems may increase. Public objections at advanced stages of projects, notwithstanding often extensive consultation throughout the design stages, are adding to the timescale of projects and the situation is further exacerbated where a judicial review is granted by the courts.

A large number of the circa 200 schemes identified as part of the CFRAMS process have negative or very marginal cost benefit ratios. After a decade or more of almost no general inflation, we are now entering a period of significantly higher inflation. Construction inflation is currently at a very high level, caused, inter alia, by a shortage of material supplies resulting from of the COVID-19, BREXIT and other supply factors. These inflationary pressures may affect the business cases negatively for these schemes.

Unfortunately, the cost/benefit approach adopted is very narrow and often underestimates the wider benefits of these schemes as well as potential beneficial effects that could arise in mitigating climate change. We recommend a review of the business case approach adopted to ensure that the wider benefits are accurately reflected such that critical schemes are not prevented from being advanced because of an underestimate of the true value of the schemes.

5.3.6 Long Term Climate Change Adaptation Planning

The introduction of the Climate Action and Low Carbon Development (Amendment) Act 2021 now places legally binding obligations on Government to reduce emissions and become a carbon neutral economy by 2050 at the latest. This has implications for coastal and flood risk management. The development of all new flood relief schemes requires the completion of a Scheme Climate Change Adaptation Plan to ensure that interventions being proposed to address the current risk are prudent stepping stones in a longer term climate change strategy which looks at the long term as well as short term risks.

Like many infrastructure projects, traditional flood relief schemes have typically had a high carbon footprint as a result of a high dependence on reinforced concrete and steel solutions. OPW now requires that the carbon footprint of schemes be quantified. This requirement will also fall out of future EIA requirements as a result of the Government's proposal to factor the carbon footprint of projects into the prioritisation of funding for major infrastructure projects.

5.4 RECOMMENDATIONS AND PRIORITIES

5.4.1 Improving and Expediting the Delivery of Flood Risk Management Projects

As outlined earlier the timescale for the delivery of the flood risk management infrastructure has been extremely lengthy often taking between ten and twenty years from initial assessment to project completion with substantial cost increases caused by the delays involved. Many of the schemes now proposed are essential for the sustainability of the Atlantic City Regions and funding has already been approved by Government and re-affirmed in the National Development Plan (RS08)

We strongly recommend that the Government review urgently both the planning process and the subsequent processes for legal challenges. It is imperative that all citizens' rights are maintained, and that the intent of the various sections of environmental legislation is protected. However, individual claims must be balanced appropriately with the public good in the delivery of schemes in a reasonable timescale, where the technical expertise of those commissioned to design and assess flood risk management projects is weighted fully, along with the overriding public need for such projects. It is clear that there are inadequacies in the current arrangements which must be amended to ensure that well designed and considered projects, which comply with all the relevant policies and legislation, can be advanced in a more timely manner.

It is also vital that the External Assurance Process, which has been added to the Public Spending Code in November 2021, is implemented in a manner which does not increase project timelines.

5.4.2 Integrated Pluvial Flood Risk Management

Advances in digital technology and computing power now provide the ability to cost effectively undertake detailed integrated modelling of our surface water systems. Accordingly, we recommend that a Steering Group is established for each Atlantic City comprising representatives from OPW, EPA, Irish Water and relevant Local Authorities, with a mandate to prepare an integrated surface water management plan for our cities. Consideration should also be given to the option of either Irish Water or OPW become a national agency for surface water management to bring efficiency and consistency of approach and policy and supporting Local Authorities with the future management of surface water/pluvial flood risk.

5.4.3 Long Term Climate Change Adaptation Planning

Coastal and Flood Risk Management has a central role to play in ensuring the sustainable future of our Atlantic Cities and must be informed by careful consideration of climate change. This is particularly important in the context of the very real risk posed by the inevitable rise in sea levels.

Understanding and considering the flexibility and adaptability of proposed schemes in the longer term, with the possibility of more extreme outcomes than anticipated, is vital to ensuring that schemes delivered now are robust. Developing similar adaptation plans for existing schemes will also be essential.

5.4.4 National Approach to Coastal Erosion and Flood Risk Management

The publication of the Government's interdepartmental working group on Coastal Change Management is expected shortly. Coastal Management is a complex area involving many sectors and disciplines, including planning, the environment, coastal erosion, flood risk management, marine transport, fisheries, social and leisure activities and tourism. Strong leadership and coordination is required for sustainable and balanced progress. Consideration should be given to investing one of the senior ministers involved with responsibility to ensure effective coordination of all stakeholders.

5.4.5 Planning and Integrating Flood Risk Management interventions as part of wider social infrastructure projects

Delivery of flood relief solutions along our major watercourses, and within urban areas, presents many opportunities to create new amenities such as greenways and blueways, to improve biodiversity and contribute to regeneration. By putting placemaking at the heart of project design we can ensure that our rivers are at the heart of our future cities' sustainability. The shift in emphasis will realise multidimensional benefits but requires a significant change in how we plan and deliver our infrastructure. Greater cooperation is required between local authorities and national bodies with local authorities having a role as delivery agents for multifaceted projects and national bodies providing technical guidance and funding relating to their areas of responsibility.

6. WATER SERVICES MODULE

Mutton Island Wastewater treatment plant, image courtesy of Irish Water

6.1 SIGNIFICANT CHANGES SINCE 2016

There are several significant external changes which have occurred since the 2016 report. These include:

- The provisions contained within the Climate Action and Low Carbon Development (Amendment) Bill 2021 (Net ZERO carbon by 2050) will dominate infrastructural investment over the medium to long-term leading to a much greater emphasis on sustainable management of water resources.
- COVID-19 has already brought about significant change to working / living patterns with evidence of relocation (or potential for relocation) away from the Greater Dublin Area and the likely increase in population in the Atlantic Cities Metropolitan Areas.
- The publication and coming into effect of the National Planning Framework (NPF), the Regional Spatial and Economic Strategies (RSES) for the Southern Region and the Northern & Western Region, and the Metropolitan Area Strategic Plans (MASPs) for Cork, Limerick-Shannon, Galway, and Waterford since the previous reports were published.
- Irish Water Plans including:
  - Water Services Strategic Plan 2015 (25 Year Strategic Plan)
  - National Water Resources Plan 2021 (25 Year Strategic Plan)
  - Irish Water Business Plan 2015 (7 year plan to 2021)
  - Capital Investment Plan 2020-2024
- Preparation of the Draft Development Plans in the Atlantic City Regions, in particular the Draft City Development Plans in Waterford, Cork and Limerick (2022-2028) and Galway (2023-2029). These Plans are expected to be adopted in 2022.
- The National Development Plan (NDP) Review.

There is a strong conceptual alignment between the Atlantic Cities concept in the 2016 Academy Report and the now statutorily supported Cities and Metropolitan Areas which are the focus of the Regional Spatial and Economic Strategies (RSES) prepared by the Southern Regional Assembly and the Northern & Western Regional Assembly. The Academy has engaged in consultation with the Regional Assemblies during the preparation of the RSES. The Academy supports the objectives of the RSES for each Region - many of which are echoed within this review.

6.2 INFRASTRUCTURE DELIVERY: PROGRESS AND CHALLENGES

6.2.1 Introduction

Irish Water was established on the 1st January 2014 as the national water utility to provide public drinking water and wastewater facilities. Its economic activities are regulated by the Commission for the Regulation of Utilities (CRU) and the EPA is its environmental regulator.

6.2.2 Progress in Capital Investment

Since publication of the 2016 IAE Report, Irish Water has made a series of capital investment plans: RC1 2014-2016 (3year, €1.6bn), RC2 2017-2019 (3 year, €2.07bn). Its current 5 year Capital Investment Plan is RC3 2020-2024 (€5.35bn). Since 2014, the annual capital investment has increased from approximately €0.5bn/year to over €1.2bn/year. This a very significant increase, reflected in the many projects recently completed, under construction and in planning and design phase.

Recently completed large infrastructure projects include:

- Waterford:
  - Growth Programme (Water) Kilbarry
- Cork:
  - Cork Lower Harbour Main Drainage Project
  - Carrigrenan Wastewater Treatment Plant (Little Island)
- Limerick:
  - Growth Programme (Water) Mungret
- Galway:
  - No recent significant projects

Projects currently under construction:

- Waterford:
  - Growth Programme (Wastewater) Kilbarry
- Cork:
  - Cork City Supply Schemes
    - Eastern Strategic Trunk Watermain
    - Lee Road Water Treatment Plant Upgrade
    - Shanakiel Watermains Upgrade
    - Western Trunk Watermain
  - Lee Road Water Treatment Plant
- Limerick:
  - No significant construction underway in Limerick City
- Galway:
  - No significant construction underway in Galway City.

Projects currently under design:

- **Waterford:**
  - Growth Programme (Wastewater) Gracedieu
  - Waterford City Wastewater Treatment Plant
- Cork:
  - Ballyvolane and Monard Wastewater Network
- Limerick:
  - Wastewater Treatment Plant, Mungret
  - Wastewater Treatment Plant, Castletroy
  - Wastewater Treatment Plant, Foynes
- **Galway:**
  - Growth Programme (Wastewater), Ardaun
  - Growth Programme (Water), Ardaun

In addition, Irish Water is undertaking a National Leakage Reduction programme to repair and replace leaking watermains. Similarly, a Sewer Rehabilitation programme is reducing groundwater infiltration into sewer networks. Both programmes release capacity in Irish Water treatment plants for new housing and other developments.

Under the Drainage Area Plan programme significant work is on-going to build verified hydraulic models of the wastewater networks for all the Atlantic Cities. The models allow for an understanding of risks associated with climate change, growth and the increase in contributing area (urban creep) that erode the network capacity. The network models are important tools to enable decisions to be made around where and when

network upgrades are required to service future growth and development.

To provide resilience, manage flood risk, provide benefits in terms of water quality and reduce the impact of climate change and urban creep it is important that stormwater, wherever possible, should be removed from the combined sewer networks that service the cores of the Atlantic Cities by applying Blue-Green Infrastructure and Sustainable Drainage systems.

6.2.3 Ten Year Water Services Capacity (2021)

A review of the 10 year water supply capacity register (Irish Water Nov 2021) evaluated the ability to support existing 2031 population targets:

- Waterford City – capacity available
- Cork City – capacity available- LOS improvement required
- Limerick City – capacity available
- Galway city – capacity available

LOS: level of service. Improvement required which might take the form of leakage reduction and/or capital investment.

A similar review of the 10-year wastewater treatment capacity register, (Irish Water Nov 2021) indicates:

- Waterford city – available capacity
- Cork city – available capacity
- Limerick city – available capacity
- Galway city – available capacity

The overall water services treatment capacity within each city appears positive for the current population needs and growth. However, there is a very substantial shortage of housing in the Atlantic cities and nationally. Reasons for this shortage are many and complex and include inadequate zoned land, underused brownfield sites, Covid 19, construction industry capacity, planning difficulties and particularly relevant to this paper, sites remote from water services treatment plants and / or network capacity deficiencies. Orderly planning and fit for purpose statutory processes, including planning legislation, are required to ensure timely delivery of housing in areas with water services capacity. Water services infrastructure challenges need to be addressed to meet housing demands.

6.2.4 Projected Population Growth

In response to the NPF and the Regional Spatial and Economic Strategies (RSES), the draft Development Plans contain ambitious population growth targets for 2022-2028, and beyond to 2031 and 2040. A total growth of at least 50% in the population of the Atlantic City Regions is forecast for 2040. The targets are:

	2016	2028	% Increase	2031	2040 (NPF)
Waterford	54,000	70,000	30%	75,000	81,000+
Cork	209,000	260,000	24%	286,000	314,000+
Limerick	94,000	127,000	35%	130,500	141.000+
Galway	80,000	108,000	35%	115,000	120,000+
Totals	**437,000**	**565,000**	**29%**	**606,500**	**656,000+**

This projected increased population will require houses and jobs and the associated support developments such as schools and healthcare facilities. Irish Water has advised that the projected population growth is included in RC3 2020-2024 but most importantly, it needs to be included in RC4.

6.2.5 Location of Proposed Housing, Draft Development Plans

Much of the proposed housing in the Draft Development Plans is located in "Regeneration and Opportunity Sites" which are generally in city centre or urban locations. While a number of projects are underway, the larger of these sites might not have adequate network connections to the water and wastewater treatment plans, for example the 69ha site at Colbert Station in Limerick. Similar challenges exist for several suburban sites identified in the Draft Development Plans, for example Gracedieu in Waterford, Ardaun Phase 1 in Galway and extensive lands on the north side of Cork City. Water services infrastructure improvements need to be proactively progressed if the Draft Development Plans and targets are to be achieved by 2028 or soon thereafter.

6.2.6 Industry and Ports

Water services infrastructure also needs to service industry and ports. To attract both indigenous industry and Foreign Direct Investment to the Atlantic City Regions, more headroom and resilience of water services is required. Otherwise, opportunities may be lost to the Atlantic City Regions in particular. Biopharmaceutical and medical technology facilities have modest but not inconsiderable water services demands which need to be available when required.

Strategic sites with water connections for large industrial projects are required. Askeaton has a suitable site but does not have appropriate water services infrastructure. This lack of available strategic sites with necessary water services infrastructure needs to be addressed collaboratively by Irish Water and the IDA, otherwise the potential of Askeaton and other similar sites will not be realised.

At present, the regulator (CRU) does not allow Irish Water to install capacity for speculative purposes. All new capacity provided for industry needs to be paid for by industry and Irish Water needs to have development agreements in place before it can proceed with construction. Consideration should be given to direct government investment in water services infrastructure to service strategic and other key industrial sites, on a later cost recovery basis

6.2.7 Impediments to Infrastructure Delivery

Progress has been made regarding some of the priorities that were identified in the 2016 report. However, it is critical that impediments to the timely delivery of essential infrastructure should be examined at government level. The timescale for commencing on site has increased hugely in the last 15 to 20 years. The urgency of many of the projects discussed must be recognised. Current issues include delays in securing consents, legal and procedural delays and procurement issues. Examples within the Atlantic City Regions are numerous, delaying the construction of housing and restricting the planned growth of the Atlantic Cities. Many existing processes need to be revised.

6.2.8 Finance for Infrastructure Delivery

Irish Water has an annual capital investment budget of approximately €1.2bn per year until 2024. However, with plans to significantly increase population in the Atlantic City Regions – as described in the Draft Development Plans and discussed above – ongoing and increased capital investment will be required for the water services infrastructure necessary to support the ambitious population growth targets for Waterford, Cork, Limerick and Galway.

This investment could come from the Exchequer or possibly from developers seeking to develop large sites constrained by lack of water services and other infrastructure. Consideration should also be given to borrowing money, from sources such as ISIF or EIB, and installing the necessary infrastructure on a cost recovery basis from the end users. Where such alternative sources of finance are adopted, compliance with Irish Water design and construction standards will be critical.

6.2.9 RECOMMENDATIONS AND PRIORITIES

- Increase the annual budget for Irish Water to support delivery of the very ambitious growth targets in the NPF and Atlantic Cities Draft Development Plans 2022-2028. The projected population growth and associated developments are included in RC3 2020-2024 and importantly, need to be included in RC4.
- Accelerate the design and construction of water services for large unserviced or partly serviced zoned lands planned for development within the Development Plan period 2022-2028. These lands include:
  - Gracedieu, Waterford
  - Ballyvolvane and other northside lands, Cork
  - Mungret, Limerick
  - Ardaun, Galway
- Review the capacity of the existing watermain and sewer networks to service “Regeneration and Opportunity Sites”, a strong focus of the Draft Development Plans and where there will be significant site densification. An example is the Colbert Station site in Limerick. Where necessary, accelerate the design and construction of this Infrastructure.
- Government to invest directly in water services infrastructure to service strategic and other key industrial sites recognising that, at present, the regulator (CRU) does not allow Irish Water to install capacity for ‘speculative’ purposes.
- Develop and implement a satisfactory mechanism to allow developers to deliver water services infrastructure, in support of developer-led housing projects. Consideration should be given to borrowing money, from the ISIF or EIB, and installing the infrastructure on a cost recovery basis from the end user;
- Address infrastructure delivery issues urgently, such as consents, legal and procedural delays;
- Align the Planning Periods of Irish Water Plans (2022-2024) and Local Authority Development Plans (2022-2028) to coordinate the planning and delivery of water services infrastructure for housing and other developments; and
- Continue to accelerate the excellent National Leakage Reduction programme (Watermains) and Drainage Area Plans (DAP) to inform Sewer Rehabilitation programmes.

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