ENGINEERS IRELAND

The State of Ireland 2020

Engineering a green and digital recovery

A community of creative professionals delivering solutions for society

www.engineersireland.ie

Contents

Who we are

With over 25,000 members, Engineers Ireland is the voice of the engineering profession in Ireland. Engineers Ireland was established in 1835, making us one of the oldest and largest professional bodies in Ireland. Members come from every discipline of engineering and range from engineering students to fellows of the profession.

Our responsibilities

- Promote knowledge of engineering
- Establish and maintain standards of professional engineering and engineering education
- Provide opportunities for continuing professional development (CPD) for engineers
- Maintain standards of professional ethics and conduct
- Ensure that professional titles are granted to qualified candidates, and
- Act as the authoritative voice of the engineering profession in Ireland

Executive Summary

The COVID-19 pandemic has not only revealed the vulnerability of our social and healthcare systems, but highlighted the myriad of economic and environmental challenges we face. The pandemic has demonstrated the agility of the nation to engineer dramatic improvements for the good of society, including innovation in healthcare technology and the built environment.

The State of Ireland 2020 is the tenth annual instalment in a series of reports examining the state of critical sectors of the country's built environment. The report advocates for Ireland's recovery to be green and digital, driven by investments in infrastructure, technology and education. Informed by a dedicated advisory group of engineers and other professionals, the report outlines a set of recommendations that will help the Irish economy to recover by tackling the challenges and embracing the opportunities arising from climate change, digitalisation and Brexit.

1 Targeted investment in infrastructure strengthens economic growth through job creation and enhances efficiency, productivity and competitiveness. Capital spending should be increased across the lifetime of the National Development Plan, focused on decarbonisation and balanced regional development. Legislative reforms in planning will be needed to enable effective project delivery and consideration to increasing procurement thresholds. Critical State bodies will also need to be sufficiently resourced to deliver the increased capital programme.

2 A Green New Deal for Ireland has the potential to accelerate a reduction in greenhouse gas emissions, supported by a statutory net zero target for 2050 and funding through the European Green Deal. Communities must be at the heart of this transition, involved as early as possible and receiving clear benefits from infrastructure projects. A Green New Deal for Ireland should include energy system integration and achieving 70% renewable electricity, a seaport to support offshore wind development, a hydrogen strategy, a radical national retrofit strategy, re-engineering our transport system, active State land management, and multi-annual funding for water, wastewater and flood risk management.

3 Digitalisation is transforming how and where we live, work and learn. A National Programme for Digital Transformation should set out a vision for an equitable, secure and sustainable transition to a digital society fuelled by data, the reusable raw material of the 21st century. The required digital infrastructure is dependent on the accelerated rollout of the National Broadband Plan and 5G, reinforced cybersecurity, and a digital-first public sector. An all-island data economy could be based on a post-Brexit Common Data Space, a connected network of digital enterprise hubs and the continued expansion of an Industry-4.0-ready and sustainable manufacturing base.

4 Education will be pivotal to the green and digital future. Our higher education system needs a sustainable funding model to respond to current challenges and to prepare for longer-term transitions. A reskilling imperative meanwhile calls for a culture of lifelong learning ('digital skills' and 'human skills'), which professional bodies like Engineers Ireland can lead on and support through their Continuing Professional Development programmes. A nationwide digital literacy programme can combat disinformation and foster the adoption of new technologies. New ways of learning, such as professional engineering apprenticeships, indicate a future path to fill skills gaps emerging for the sustainable recovery.

This report contains new and immediate proposals to support national recovery efforts, the realisation of the ambitious Programme for Government and the revision of the National Development Plan. We need to grasp this real opportunity now to make climate action and digitalisation central to Ireland's recovery, to reduce detrimental impact on the environment and improve the quality of our lives.

Recommendations

Infrastructure for economic stimulus

1. To stimulate the economy and deliver much needed infrastructure, increase capital spending by €25 billion over the lifetime of the National Development Plan. This investment should be targeted at decarbonisation and aligned to the National Planning Framework.
2. Enact the following pieces of legislation to improve planning and project delivery:
   - Marine Planning and Development Management Bill 2020 to provide a planning regime for offshore renewable energy;
   - Water Environment (Abstractions) Bill 2018 to enable the Eastern and Midlands Region Water Supply Project;
   - Housing, Planning and Development Bill 2019 to speed up planning.
3. Ensure that critical State and semi-State bodies are sufficiently resourced to deliver the significant countrywide increase in infrastructure that is required over the next decade.
4. Increase the national procurement threshold for open tendering for works and works related services from €50,000 to €250,000.

A Green New Deal for Ireland

5. Implement the European Green Deal by accelerating greenhouse gas emissions reductions, enacting the Climate Action (Amendment) Bill 2019 for net zero emissions by 2050 and seeking funds through the European Green Deal Investment Plan.
6. Put communities at the heart of a sustainable recovery by involving local citizens as early as possible in the development of new infrastructure and ensuring local communities benefit directly from it.
7. Ensure the delivery of a low-carbon, reliable and resource-efficient energy system at the least possible cost for society in Ireland through energy system integration, including: direct electrification of end-use sectors, achieving the 70% renewable electricity by 2030 target, a hydrogen strategy for Ireland, and collaboration and public engagement.
8. Ireland's electric grid will need new system services, capacity and interconnectors to be developed as soon as possible to ensure Ireland continues as a world leader in renewable electricity integration, which will also support electrified heat and transport.
9. Urgently identify a seaport to support offshore wind development. The port will need sufficient port depth, quay length and storage space.
10. Actively manage public land, through the mechanism of the Land Development Agency and/or other means. Ensure there is a strong legislative framework and sufficient capacity to coordinate the development of State lands and to assemble strategic land banks from a mixture of public and private lands.
11. Develop and implement a radical national retrofit strategy, providing absolute clarity and a roadmap for retrofitting over the next 20 years. As well as improving the building fabric, this should include retrofitting the heating supply by replacing oil boilers with heat pumps in rural areas and gas boilers with district heating in urban areas.
12. Re-engineer our towns and cities for walking, cycling and public transport through 'hard' and 'soft' measures and by progressing major projects such as BusConnects, Metrolink, light rail systems and the DART Interconnector.
13. Provide multi-annual funding for the delivery of Irish Water's capital investment plan and for the delivery of the Flood Risk Management Plans.

A Digital Ireland

14. Adopt a National Programme for Digital Transformation setting out a vision for an equitable, secure, and sustainable transition to a digital society.
15. Accelerate the rollout of the National Broadband Plan and 5G mobile networks.
16. Adopt an all-island approach to physical, digital and social connectivity and support the development of connected digital enterprise hubs.
17. Legislate for a post-Brexit Common Data Space for the island of Ireland and prioritise its implementation so as to underpin the emergence of an all-Ireland data economy.
18. Review the security of the State's critical infrastructures and digital services and reinforce their protection from cyberattacks.
19. Accelerate public sector modernisation focusing on a digital-first culture with collaborative working practices, transparent processes and algorithms, and the sharing and reuse of data.

Education for a green and digital future

20. Introduce a sustainable funding model for higher education, including core funding, programmatic funding, infrastructure investment and industry-academic collaboration.
21. Increase the number and range of professional engineering apprenticeships through industry-led consortia and expand Skillnets to fill skills gaps for the sustainable recovery.
22. Invest in a culture of lifelong learning, targeting digital skills (such as data analytics, AI and cybersecurity) and 'human' skills (such as communications, management and critical thinking).
23. Launch a nationwide digital literacy programme to combat disinformation, to foster the uptake of digital technologies, to raise awareness of the abuse of personal data and to counteract the socio-economic and geographical digital divides which have been exacerbated by COVID-19.

Glossary

ABP An Bord Pleanála
AEC Atlantic Economic Corridor
BIM Building Information Modelling
CAP Climate Action Plan
DEI Digitising European Industry
EV Electric vehicle
ICT Information and Communications Technology
MMC Modern Methods of Construction
NBI National Broadband Ireland
NDP National Development Plan
RESS Renewable Electricity Support Scheme
SDGs UN Sustainable Development Goals
SEM All-island Single Electricity Market
STEM Science, Technology, Engineering and Mathematics


Yuan Ming Yuan
Chinese Restaurant
021 4254968
CLANCYS SPIRIT STORES 16
tedo
ÓCO
CHOCOLATE BAKERY
RISTORANTE
On Street and
in house dining.
Homemade pasta

Introduction

COVID-19 and national recovery

During the COVID-19 pandemic, engineers around the world supported those at the frontline through the delivery and development of medical supplies and new innovations for protecting healthcare workers and wider society. Additionally, utility companies and their engineers ensured that essential services such as water, electricity, gas and broadband sustained healthcare, businesses and supported families, including older people and workers at home.

The pandemic has highlighted the vulnerability of many of our social and healthcare systems. Building increased resilience into these systems in the coming months and years will be crucial in order to assist in mitigating not just future pandemics but also the effects of climate change. The pandemic has also demonstrated our ability to make dramatic improvements for the good of society, including innovation in healthcare technology and the built environment. There is a real opportunity now to make sustainability and climate action central to Ireland's recovery, in order to reduce human impact on the environment while improving quality of life.

Infrastructure and technology are core elements of a modern society and economy. They strengthen economic growth through job creation and enhancing efficiency, productivity and competitiveness. Correctly targeted investment in infrastructure and technology will underpin social cohesion by providing vital facilities for citizens, such as public transport and broadband. It helps to tackle fundamental challenges in climate change and changing demographics as well as the short-term shocks of Brexit and COVID-19. Engineering, through infrastructure and technology, can therefore play a central role in the national recovery.

Programme for Government and National Development Plan

The Government has indicated that it will prioritise capital investment to increase employment and deliver projects in health, transport, education, housing and other sectors. The Government has also committed to a New Green Deal, including greenhouse gas (GHG) emissions reductions of 7% per annum on average over the coming decade and carbon neutrality by 2050. They have highlighted renewable energy, electric grid infrastructure, public transport, electric vehicles and home energy retrofitting as priorities. Engineers Ireland recognises, and will respond to, the clear call for new and innovative engineering solutions.

The July Stimulus 2020 and Budget 2021 increased capital investment to more than €10 billion for the first time. The Government also committed to reviewing the National Development Plan (NDP) in the coming months (see page 9). Engineers Ireland would like to assist national recovery by bringing our expertise in infrastructure, technology and related areas to bear on the implementation of the Programme for Government and the NDP review. We are publishing new and immediate proposals in this year's dedicated edition of the long-running 'The State of Ireland' series.

Brexit

The United Kingdom's decision to leave the European Union colours every aspect of Ireland's economic future, and the associated uncertainty has been impacting the professional activity of engineers across the Republic of Ireland, Northern Ireland and Great Britain since 2016. Surveyed in 2017, 84% of engineers stated that they were opposed to a hard Brexit, with many citing border controls and trade restrictions between the Republic of Ireland and the UK as extremely negative for the engineering sector and the wider population. Since then, Engineers Ireland, our members and partners have been working to reduce the impact of Brexit to various sectors, for example

to ensure the continued international mobility of engineers and securing supply chains. Further work is necessary to mitigate the impact of Brexit and indeed grasp the opportunities which may arise for Ireland in the medium term.

Sustainability and the UN Sustainable Development Goals

On 4th March 2020, World Engineering Day for Sustainable Development, Engineers Ireland declared a Climate and Biodiversity Emergency, publicly recognising that climate breakdown and biodiversity collapse are the most serious issues of our time. Engineers Ireland acknowledged the considered opinion of the scientific community that transformational action is required now to achieve meaningful outcomes over the coming decades. The planet has ecological limits and a finite biocapacity, a paradigm shift is required to realign humanity's ecological footprint within this capacity.

Engineers Ireland is committed to the UN Sustainable Development Goals (SDGs), which act as a useful framework to tackle societal challenges. One of our international partners, the World Federation of Engineering Organisations has specifically highlighted the need for engineers to lead the way on the goals for clean water and sanitation, reliable energy, sustainable infrastructure, manufacturing, innovation and education. The next page list some of the SDG targets the achievement of which will require engineers to play a leading role. In Ireland, we must ensure that the national recovery is sustainable; we are positioning this report in the context of these SDGs.

The State of Ireland background

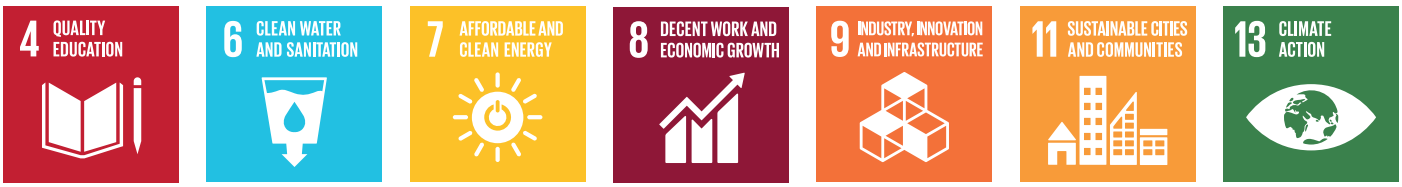
The State of Ireland is an annual, expert-led, action-orientated analysis of our infrastructure and built environment, published by Engineers Ireland. Since 2011, the aim of the series has been "to contribute to the debate on Ireland's future, to stimulate that debate and to recommend actions vital to the future prosperity of Irish society as well as informing the general public". The State of Ireland highlights the infrastructural needs of the country and the valuable contribution of the engineering profession to Irish society, environment and economy.

Balancing the economic imperative, the management challenge of delivering high quality infrastructure quickly and cost-effectively, with environmental and sustainability considerations requires a range of specialist skills. This expertise is available within Engineers Ireland and the network of governmental and professional bodies with which we work. The quality of the report content each year is assured by the invited experts who make up our advisory groups and agree the assessment and recommendations.

The previous four reports have focused on: housing (2019), water, wastewater and flooding (2018), transport and communications (2017), and energy (2016). The reports have also highlighted the interdependencies between different sectors of infrastructure and the potential for improvements in the investment, planning and delivery of infrastructure projects and programmes.

UN Sustainable Development Goals – adapted targets

- Substantially increasing the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. **(4.4)**
- Ensuring that all learners acquire the knowledge and skills needed to promote sustainable development. **(4.7)**
- Universal and equitable access to safe and affordable drinking water and sanitation. **(6.1, 6.2)**
- Improving water quality, water-use efficiency and water resource management. **(6.3)**
- Universal access to affordable, reliable and modern energy services. **(7.1)**
- Increasing the share of renewable energy and increasing energy efficiency. **(7.2, 7.3)**
- Achieving higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors. **(8.2)**
- Achieving full and productive employment and decouple economic growth from environmental degradation. **(8.4, 8.5)**
- Developing quality, reliable, sustainable and resilient infrastructure, with a focus on affordable and equitable access for all. **(9.1)**
- Increasing resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes. **(9.4)**
- Enhancing technological capabilities and research and development workers. **(9.5)**
- Access for all to adequate, safe and affordable housing and basic services. **(11.1)**
- Access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport and inclusive and sustainable urbanisation. **(11.2)**
- Integrating climate change measures into national policies, strategies and planning. **(13.2)**



Engineers Ireland Sustainability Framework

Engineers Ireland has adopted a Sustainability Framework to align our sustainability actions with our core objectives under the headings: **Learn** (professional formation and development), **Live** (operations), **Lead** (advocacy and regulation) and **Link** (collaboration).

Our approach to sustainability includes the resilience of our built and natural environment in the face of extreme weather (climate adaptation), the need to reduce emissions related to our buildings, vehicles and infrastructure (climate mitigation), biodiversity protection and enhancement, and achieving the UN SDGs.

The Sustainability Framework includes a set of initial actions which has been developed in consultation with our members and staff. The Sustainability Framework will be delivered as part of next Engineers Ireland Strategy and progress will be communicated to members.

Find out more at **www.engineersireland.ie**

The State of Ireland 2020:

Engineering a green and digital recovery

This year's edition of The State of Ireland report is quite different to the preceding nine editions. It seeks to support national recovery efforts in the wake of COVID-19, the realisation of the ambitious Programme for Government and National Development Plan, and the response to Brexit. The report places these issues in the longer-term context of climate action and digitalisation, drawing on European policy and advocating for a green and digital recovery.

As in previous years, an advisory group of engineers and other professionals (listed on the next page), from the public and private sectors, was convened to assess Ireland's challenges in a variety of sectors and to develop recommendations for public policy. These invited experts deliberated and contributed to the report through videoconferences and email correspondence over several months.

The report and recommendations are structured in four interrelated sections:

1. **Infrastructure for economic stimulus**
2. **A Green New Deal for Ireland**
3. **A Digital Ireland**
4. **Education for a green and digital future**

These four areas are interrelated and should be approached in an integrated and coordinated manner emphasising that:

Ireland's recovery will be green and digital, driven by investments in infrastructure, technology and education.

The State of Ireland 2020 Advisory Group

Chair: Maurice Buckley, President, Engineers Ireland
Conall Boland, Senior Consultant in Sustainability / Planning, RPS
Dr David Connolly, CEO, Irish Wind Energy Association (IWEA)
Dr Declan Deasy, former Director, European Commission, DG Informatics
Clare Duffy, Network Development and Electrification Manager, ESB Networks
David Feighery, Director of Operations, Jacobs Engineering
Paul Goldrick-Kelly, Economist, Nevin Economic Research Institute (NERI)
Dr Sarah Ingle, Secretary General, Association of Consulting Engineers of Ireland (ACEI)
Dr Muireann Lynch, Research Officer, Economic and Social Research Institute (ESRI)
Dr Pádraig Lyons, Senior Specialist – Future Networks, ESB Networks
Dr Richard Manton, Deputy Registrar & Policy Officer, Engineers Ireland
Dr Tom McDonnell, Co-Director, Nevin Economic Research Institute (NERI)
Prof. Barry McMullin, Faculty of Engineering and Computing, Dublin City University
Fergal O'Brien, Director of Policy and Public Affairs, Ibec
PJ Rudden, Managing Director, Aengus Consulting
Catherine Sheridan, Communications Manager, Ervia
Tony Smyth, Chair, Infrastructure Standing Committee, Irish Academy of Engineering
Dr Damian Thomas, Senior Policy Analyst, National Economic and Social Council (NESC)

Engineers Ireland also hosted brainstorming sessions and other engagements on national recovery with representatives of our Regions, Divisions, Societies, Officers and Senior Management Team. This included contributions from: Academic Society, Biomedical Division, Civil Division, Cork Region, Electrical & Electronic Division, Local Government Division, Mechanical & Manufacturing Division, Midlands Region, Northern Region, Roads & Transport Society, South East Region, West Region and Young Engineers Society.

1 Infrastructure for economic stimulus

Infrastructure and technology are core elements of a modern society and economy. They strengthen economic growth through job creation and enhancing efficiency, productivity and competitiveness. Correctly targeted investment in infrastructure and technology will underpin social cohesion by providing vital facilities for citizens. Engineers Ireland has long campaigned for investment in infrastructure as part of a strategic approach to enhance living standards and meet the needs of a growing society.

Capital investment fell dramatically during the last recession and there are ongoing deficits in many sectors, including housing, health, transport, energy, water and waste. As well as physical infrastructure, Ireland also needs to expand our digital networks (e.g. telecoms, high-speed broadband, smart grids for energy management). According to the National Competitiveness Council[2],

> "It is essential that public investment does not suffer similar cutbacks during this economic disruption, as high-quality infrastructure boosts long-term sustainable growth and productivity. Continued roll out of the National Development Plan, with a reviewed prioritisation to frontload projects that can enhance productivity and provide economic stimulus once the recovery begins, would be beneficial."

Beyond the clear economic, social and environmental benefits, investment in productive infrastructure acts as an excellent economic stimulus and creates much-needed jobs in the construction sector. While public investment in infrastructure is important in its own right as a driver of economic activity, it also has an enabling impact on other policy areas (such as climate action) and private sector capital investment. Capital investments are needed now to stimulate economic recovery, however, these should be linked to achieving more medium-term strategic policy goals.

According to Kane & MacSweeny of EY (see next page):

> "According to a 2014 study by the IMF, an unanticipated increase in capital spending of 1.0% of GDP leads to a 0.4% uplift in output that same year, and a 1.5% rise four years later. This economic dividend occurs because building new infrastructure lays the groundwork for future economic growth, whether that's an improved transport network to move goods, a digital backbone to power a new economy or education facilities to train a skilled workforce for the future. Moreover, countries that spend on new capital stock tend to attract more private investment – as we have seen time and again, the availability of reliable underlying infrastructure boosts productive capacity and enables sustained economic activity."[3]

Engineers Ireland contributed to and welcomed the 10-year National Development Plan 2018-27 (NDP), which committed to increasing Exchequer capital investment to 4% GNI* by 2024 and included a strong pipeline of projects, linked to the National Planning Framework as part of Project Ireland 2040. Engineers Ireland strongly supports a long-term, spatially planned approach to capital expenditure. We see the role of the engineering profession as helping to ensure value for money, high-quality, rapid delivery of the associated capital projects and will work with Government to achieve this.

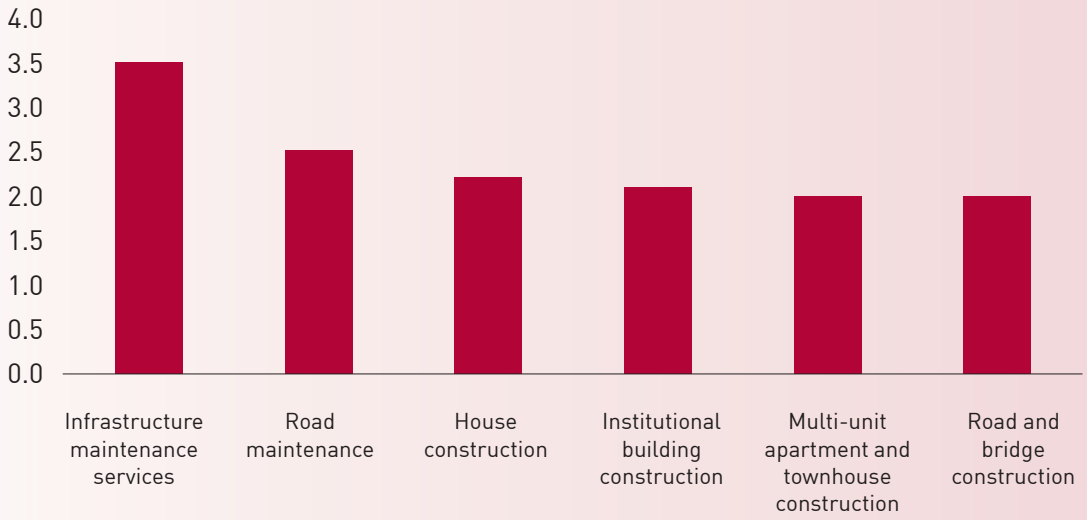
The Programme for Government[4] committed to investment in infrastructure and the July Stimulus provided €500 million in additional capital spending in areas such as sustainable transport and energy efficiency. In response, the Irish Fiscal Advisory Council stated: "This equates to just over 2 per cent of total direct supports provided thus far in terms of the cumulative amount of policy support implemented by the Government and about 6 per cent of planned capital spending for 2020. There is scope for future measures to be more focused on investment areas that would be more likely to provide stronger support to economic activity."[5]

Repairing the damage from COVID-19

How infrastructure spending can help economies return to full strength

Using an example from Australia, EY analysis demonstrates the positive impact that spending on infrastructure has on overall employment, with every direct job in the sector creating two or more across the economy. Maintenance, in particular, is a key driver of employment activity with each direct job creating up to 3.5 more across the economy. This form of investment is labour-intensive, involves ready-made works programs where crews can mobilise quickly, and supports the most critical infrastructure networks. The retrofitting programme set out in the Climate Action Plan, is another example of smaller scale projects which could be accelerated quickly. Further, this spending can enable stimulus to be targeted at specific regional areas that are most in need of help.

Construction employment multipliers



While small is indeed beautiful to get funds flowing in the early days of recovery, it's the big projects that will carry the momentum. Prioritising and procuring infrastructure projects can be a centerpiece of the post-crisis, long-term stimulus approach. But again, they must be new initiatives that were not already planned and committed. "Business as usual" capital spending, as set out in the National Development Plan, must continue once things get back to normal. As EY analysis clearly demonstrates, spending on infrastructure as part of a long-term stimulus program can have a material impact on post-pandemic GDP growth next year.

Even at the best of times, these projects take time to identify, plan and procure. Working in parallel with the short-term spending, now is the moment to get moving with these projects. Government should already be working to determine priorities, cut through political and regulatory barriers, and expedite decision-making so that contracts can be let within 6 – 12 months of the economy reopening. To get the true benefit of infrastructure stimulus as we embark on the long march toward economic recovery, government should create and commit to a program that has incremental investment contracted within 24 months and spent within 6 years. And, just as importantly, government should leverage AI, robotic process automation and all the other technology-driven tools to better manage program oversight and spending to ensure true value is added to the economy.

This content was written by MacSweeney, Kane and Watson and has been reproduced with the permission of EY. The full report can be found on the EY website www.ey.com.

Budget 2021 significantly increased capital investment by €1.6 billion to €10.1 billion. This represents €600 million more than the planned increase under the NDP and includes capital spending related to Brexit and COVID-19 measures. This is the first time that Exchequer capital investment has surpassed €10 billion. Spending was provided for transport (roads, public transport and active travel), housing (social housing, servicing sites and retrofitting), education and other areas.

Budget 2021 also included a €3.4 billion Recovery Fund as a targeted stimulus to increase domestic demand and employment. The Fund will focus on three main areas: infrastructure development, reskilling and retraining, supporting investment and jobs. The Fund is designed to be flexible so that the Government can respond to the changing environments of COVID-19 and Brexit.

In his Budget 2021 speech, Minister for Public Expenditure and Reform, Michael McGrath TD, stated:

> "To ensure our capital spending supports regional development, and to align with Programme for Government priorities, a review of the National Development Plan will be launched shortly. This will result in a revised National Development Plan for the next decade."

Engineers Ireland will engage with the NDP review and we are setting out our priorities in this report.

In overall spending terms, Engineers Ireland would like to see the level of ambition set out in Budget 2021 and the Programme for Government reflected in an expanded NDP. We support Ibec' call for an overall capital spending increase of €25 billion across the lifetime of the NDP. A more ambitious NDP should seek to maximise available non-Exchequer financing opportunities such as the European Recovery Fund, European Green Deal, European Investment Bank and Public Private Partnerships.

Increased capital spending will need to be balanced with managing the capacity and productivity of the engineering and construction sector. Prior to the pandemic, there were concerns regarding a lack of capacity in the sector, expressed in for example the 'Build 2020' report (see Section 4). Consideration will need to be given to effective delivery on investment and overcoming bottlenecks which might otherwise cause high costs, delays, and reduced value for money. Engineers Ireland is working to increase technical capacity by attracting new international members. In 2019, 38 % of our new members were 'global' engineers who have come to work in Ireland.

Prioritising projects and improving delivery

Engineers contribute to the development of infrastructure and the built environment from many perspectives: preliminary concepts, pre-planning and design, scope and design of civil/structural/building services projects, project management, inspection and certification, health and safety supervision, and much more. Based on this experience, the following pages and sections outline our proposals on how increased capital investment can be prioritised and delivery improved.

We support the view that programmes and projects need to be determined and prioritised on the basis of an overarching strategy. This should set out the high-level policy outcomes, the specific outputs from programmes, the stages that are required, and a critical path analysis to determine the interdependence of the stages to meet the outcomes efficiently.

The NDP review should maximise the opportunity for an ambitious capital investment programme to be a central element of a medium-term economic recovery plan beyond the focus on the short-term stimulus impact of the shovel-ready projects. For example, the NDP should support the implementation of the Climate Action Plan commitments and net zero by 2050, drive digitalisation and deliver much-needed housing and balanced regional development in line with the National Planning Framework.

Such an investment approach can provide short-term stimulus effects and long-term environmental benefits. According to Prof. Brian Ó Gallachóir, writing in Irish Times:

> "Public and private investment in infrastructure to enable low-carbon technologies will provide short-term employment benefit and enable a long-term return in enabling climate action. Infrastructure investment should initially focus on electric vehicle charging infrastructure, upgrading the electricity network to accommodate increased wind and solar energy and renewable gas injection facilities into the gas network. Infrastructure related to renewable diesel and hydrogen should also be considered."[7]

Priority climate action projects are examined in Section 2.

Planning system effectiveness

There are several known issues with the planning regime. There are three pieces of planning legislation, which should improve the delivery of infrastructure:

- The Marine Planning and Development Management Bill 2020: The Bill provides for major reform of Ireland's marine spatial and consent planning system, and will modernise and streamline the process for approving maritime infrastructure projects, including offshore renewable energy.[8] Ireland's decarbonisation plan leans heavily on offshore wind energy, meaning this legislation is critically important.
- The Water Environment (Abstractions) Bill 2018: The Bill provides for the introduction of a regime for the control of the abstraction of water on a risk-based approach, as signalled in the River Basin Management Plan for Ireland 2018 - 2021 published in April 2018, in order to comply with Ireland's obligations under the Water Framework Directive. It will facilitate the development of public water supplies by Irish Water, including progressing the Eastern and Midlands Region Water Supply Project.[9]
- The Housing, Planning and Development Bill 2019: The Bill provides for legislative reforms to the judicial review provisions in the Planning and Development Act 2000, as amended, including reforms of the standing rights to bring judicial review proceedings in planning cases and also the special legal costs rules relating to such judicial review challenges.[10] We would like to see stronger rules around the judicial review system to match those in other countries, but this piece of legislation is an important first step.

These three Bills are scheduled to undergo pre-legislative scrutiny in the coming months. Also important is the forthcoming revised Climate Action (Amendment) Bill 2019[11] which enshrines in law the approach outlined in the Climate Action Plan, including legislating for net zero by 2050. Finally, the Land Development Agency Bill 2019[12] should be enacted for the active management of public lands, the assembly of strategic land banks and the development of sustainable communities (see Section 2).

Ibec's 'Better Planning: Reforms for sustainable development' outlines five complementary actions: political leadership to transform the planning regime; oversight of Local Authority planning decisions; refining Strategic Infrastructure Development and Strategic Housing Development; revising the laws governing Compulsory Purchase Orders; discouraging frivolous and vexatious challenges to ABP decisions and processing legitimate challenges more speedily.[13]

Lessons from the Strategic Housing Development (SHD) system

In 2017, the Government introduced new legislation to streamline delivery of large-scale housing development, in response to the housing crisis. Standard planning legislation was suspended for schemes of more than 100 houses, in favour of a direct application to An Bord Pleanála (ABP). Legislative reforms included:

- Mandatory timeline for decision making by ABP (16 weeks) with a financial penalty to apply to ABP where this was not met.
- New procedures for pre-application meetings (limited to 9 weeks).
- A presumption against the holding of Oral Hearings.

The Department of Housing, Planning and Local Government provided significant additional resources to ABP in order to meet these new targets and ten additional planning inspectors were appointed by ABP. The 2019 ABP Annual Report highlights the success of the system in terms of output:

- 82 applications were decided (three times more than in 2018).
- 100% compliance with time limit.
- Permissions granted for 16,600 residential units.

Infrastructure projects are typically more complex than housing projects, and an oral hearing is often an essential aspect of the case. A timeline of 16 weeks would not be realistic, considering the need to carry out Environmental Impact Assessment and Appropriate Assessment on complex projects.

Nevertheless, the SHD system has shown what can be achieved. It is now almost 15 years since the Strategic Infrastructure system was introduced in 2006. Lessons learned from SHD should be considered for the delivery of strategic infrastructure. Key ingredients that are recommended are:

- A strong political focus on reform and greater efficiency,
- Increased resourcing on ABP to deliver on new targets,
- Better use of online technology to enable effective public engagement.

Infrastructure institutional structures and resourcing

Progress has been made in recent years to improve coordination in the management and delivery of public infrastructure, including the Project Ireland 2040 Delivery Board and the Investment Projects & Programmes Office in the Department of Public Expenditure & Reform alongside the Office of Public Works with its expertise in infrastructure delivery. The alignment of NDP investment priorities with the spatial policy of the National Planning Framework under Project Ireland 2040 has also brought coherence and policy certainty for investments. However, more can be done to bring together the political, technical and social dimensions of infrastructure policy, financing and delivery.

'Boosting the Irish economy with 70% renewable electricity by 2030' (see page 18) outlines how resourcing will be critical to unlocking investments in renewable energy. Resources are critical in:

1. Government Departments particularly on energy and planning;
2. ABP resourcing to meet the decision timelines objective of 18 weeks, and
3. EirGrid / ESB Networks resourcing and capital spend for the next five years defined under the Commission for the Regulation of Utilities' Price Review 5 process.

The relatively small cost of providing additional resourcing to these bodies could unlock billions of Euro of private investment. As planning is the first step for a renewable energy project, the Wind Energy Development Guidelines also need to be finalised for onshore wind.

COVID-19 Responses: Injecting urgency and agility into public sector delivery

A number of effective built environment interventions have been delivered by public bodies in response to the COVID-19 crisis, for example:

- Street interventions – place-making: several central business districts have enlarged pavements, changed traffic systems and opened pedestrian-friendly streets to make more space for social distancing and outdoor dining.
- Cycle-lane interventions – many new pedestrian and cycle lane interventions have been achieved in a short number of months.

These interventions show the ability of Local Authorities and other public bodies to respond in an agile manner to the crisis. This has required rapid decision making, efficient procurement timeframes, streamlining design and construction operations. Collaboration within agencies and across agencies has been strong and should continue through the national recovery.

Effectiveness and efficiency of procurement

The national procurement thresholds for procurement procedures relating to construction are relatively low. For works and works related services with an estimated value of €50,000 or more, an open procedure is required with a contract notice published to eTenders (for works and works related services with an estimated value less than €50,000 direct invitation is permissible by seeking five or more written tenders).[14] Smaller projects supporting local SME construction companies could be rolled out more quickly and efficiently if the procurement threshold for the e-tendering of public construction work was increased. Engineers Ireland recommend an increase in the national procurement threshold for works and works related services from €50,000 to €250,000.

Project 13 is an industry-led response to infrastructure delivery models that fail not just clients and their suppliers, but also the operators and users of our infrastructure systems and networks. It seeks to develop a new business model – based on an enterprise, not on traditional transactional arrangements – to boost certainty and productivity in delivery, improve whole life outcomes in operation and support a more sustainable, innovative, highly skilled industry. The Project 13 Framework is made up of Five Pillars, the Project 13 Principles and the Maturity Matrix.[15]

We should move towards broader understanding and quicker adoption of Project 13 Frameworks across all infrastructure projects, with a focus on integrated, collaborative working and partnerships. The government should review public sector procurement and embrace market-led proposals, innovation and sharing of risk via the creation of a clear framework for longer, performance-related contracts where the traditional focus on cost is balanced with rewards closely linked to outcomes.

Shared-island approach

The Programme for Government commits to enhancing, developing and deepening all aspects of North-South cooperation and the all-island economy, including seeking an all-island approach to national planning frameworks. The Government also targets a joined-up approach to environmental issues on an all-island basis, seeking to develop an all-island strategy to tackle climate breakdown and the biodiversity crisis.

Engineers Ireland supports such an all-island approach and would like to see significantly improved cooperation and connectivity North-South, particularly in the face of Brexit. Improved connectivity on corridors such as Galway-Sligo-Letterkenny-Derry, Dublin-Dundalk-Belfast and Dublin-Derry/Letterkenny would enhance the attractiveness of all of these centres, providing focal points for growth throughout and between the regions. Increased investment in cross-border land transport would help to maintain connectivity and to encourage population and employment growth. This approach could generate a critical mass of employment and housing to attract further industry and services as well as supporting an enhanced range of local services and attractions. Two priority transport projects are the A5 Aughnacloy to Derry and high speed, high frequency rail between Dublin and Belfast. Mobility and collaboration, particularly in education and research and development, should be facilitated and encouraged.

The Republic of Ireland's energy future is inextricably linked with Northern Ireland as part of the all-island Single Electricity Market (SEM) which maximises market efficiencies and has helped to reduce electricity prices, integrate renewables and secure electricity supply. The North-South Interconnector will improve transmission across the SEM and further bolster energy security and reduce cost to the consumer; this project needs to be advanced as a priority. Although the majority of Irish gas demand is now supplied from the Corrib gas field (which has peaked), Ireland still imports a substantial volume of gas from Britain and does not have gas interconnection with other markets.

Recommendations

1 To stimulate the economy and deliver much needed infrastructure, increase capital spending by €25 billion over the lifetime of the National Development Plan. This investment should be targeted at decarbonisation and aligned to the National Planning Framework.

2 Enact the following pieces of legislation to improve planning and project delivery:

- Marine Planning and Development Management Bill 2020 to provide a planning regime for offshore renewable energy
- Water Environment (Abstractions) Bill 2018 to enable the Eastern and Midlands Region Water Supply Project
- Housing, Planning and Development Bill 2019 to speed up planning

3 Ensure that critical State and semi-State bodies are sufficiently resourced to deliver the significant countrywide increase in infrastructure that is required over the next decade.

4 Increase the national procurement threshold for open tendering for works and works related services from €50,000 to €250,000.

2 A Green New Deal for Ireland

Climate action

Critical infrastructure, planning and technology enablers should be identified and progressed for the decarbonisation of the energy system. Moreover, plans to decarbonise heat and transport focus on electrification, which is directly dependent on decarbonising the electricity generation system. This section of the report will tackle greenhouse gas emissions reduction and priority actions in the water, wastewater, flooding, energy, housing and transport sectors.

The World Bank has called for stimulus packages to achieve decarbonisation of the world economy: "energy efficiency for existing buildings; production of renewable energy; preservation or restoration of natural areas that provide ecosystem services and resilience to floods, drought, and hurricanes; the remediation of polluted lands; investments in water treatment and sanitation; or sustainable transport infrastructure, ranging from bike lanes to metro systems."[16] The International Energy Agency raise similar points on longer-term objectives and priority investments: "Large-scale investment to boost the development, deployment and integration of clean energy technologies – such as solar, wind, hydrogen, batteries and carbon capture (CCUS)".[17]

The European Green Deal[18] is the plan to make Europe climate neutral by 2050, boosting the economy through green technology, creating sustainable industry and transport and cutting pollution. It aims to turn climate and environmental challenges into opportunities, and making the transition just and inclusive for all. The European Green Deal provides an action plan to boost the efficient use of resources by moving to a clean, circular economy, and restore greater biodiversity and cut pollution. The European Green Deal's Investment Plan - the Sustainable Europe Investment Plan - mobilises public investment and helps to unlock private funds through EU financial instruments, notably InvestEU, which would lead to at least €1 trillion of investments.

The implications of the European Green Deal for Ireland are: "consideration of a revision to existing greenhouse gas emission targets for 2030 as well as a new longer-term goal to achieving carbon neutrality by 2050. Meeting these targets will require significant investment and behavioural change across a number of sectors including energy supply, transport, agriculture, industry and the built environment. The implementation of a green deal will also have an impact on regions and communities and the need to deliver a just transition which ensures that no one is left behind remains a key policy priority at a national and EU level."[19]

According to the National Competitiveness Council:

> "There is mounting support within EU institutions for the idea of linking economic recovery strategies to the goals of the EU Green Deal. Ireland is currently falling very far behind its carbon emissions targets and environmental commitments and early action on initiatives in Ireland's Climate Action Plan, and linking economic stimulus measures with environmental objectives can be an engine for growth and innovation. There is significant potential for existing enterprise, agricultural and sustainability initiatives to be reframed and expanded in order to provide a stimulus for sustainable growth, and spur a transition in our economy and society toward low carbon activities."[20]

The Programme for Government commits to a 'Green New Deal for Ireland', including acceleration of Ireland's carbon emissions reduction, five-year carbon budgets and a new Climate Action Bill to legislate for net zero emissions by 2050. It also proposes a plan on achieving at least 70% renewable electricity by 2030, including the necessary skills base, supply chains, legislation and infrastructure. Government has also published a Waste Action Plan for a Circular Economy.[21] With this strong policy commitment, it is likely that a re-prioritisation of the programmes and projects in the current NDP will be necessary, with a stronger emphasis on climate action.

Community engagement

Climate action must be fully integrated in the planning system and the political system, using long-term modelling and evidence-based solutions, while engaging communities and the general public on the challenges we face and the solutions needed to improve our performance. We need to engage communities and the public at the design and planning phase, allowing them to play an active role in the shape taken by climate action. For example, wind farms often change parts of their design based on early stage engagements with communities[22] and once the wind farm is built, there is significant economic benefits to the local area via a dedicated community benefit fund, local jobs and significant contributions to Local Authority rates. Government and other political actors should help to build public support through citizen engagement, community leadership and facilitating a just transition. Securing societal and political support is key for major infrastructure projects that are designed to drive the transition to a low carbon economy. The engineering profession is a core stakeholder and has a role to play in terms of using its knowledge and expertise to foster community engagement and build societal support.

Reflecting on the Irish experience of controversy, media attention and public opposition in relation to a range of high profile infrastructure projects in energy, water, waste and transport, Morrissey states that the traditional low priority afforded to public engagement by the engineering profession must be reversed if vital projects are to be delivered.

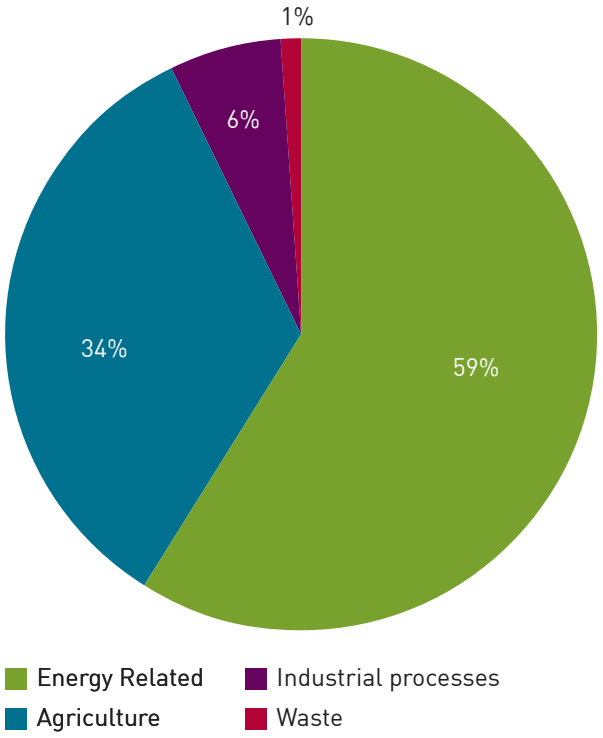
> "Not involving communities in project development can have serious long-term negative impacts on communities' economic environmental and social outcomes. Establishing dialogue and building strong and genuine partnerships with local communities and other stakeholders is now recognised as a vitally important part of any project. From large-scale resource projects and transport infrastructure to the development of local community facilities, stakeholders matter!"[23]

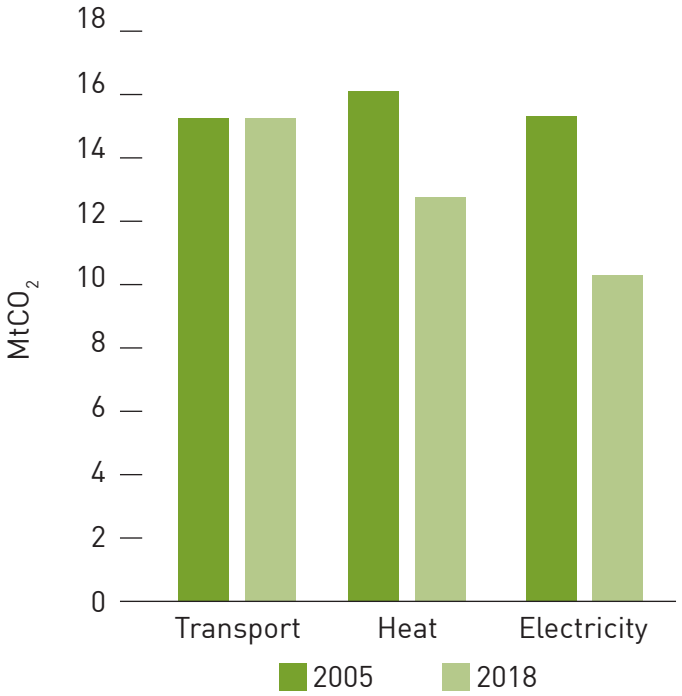
Public engagement moreover should not be a parallel or secondary activity to the main task of delivering the infrastructure but rather should be integrated as a formal and key strand of the overall process of project management.

The Irish Academy of Engineering Report 'Lessons from the Covid-19 Experience' argues:

> "The most practical way to build consensus, avoid undesirable social and economic outcomes and achieve the goal of a sustainable, decarbonised economy is by re-tasking the Citizen's Assembly with proposing the most equitable way of transitioning to a decarbonised, sustainable economy with key milestones in 2030, 2040 and 2050."[24]

Communities must be at the heart of Ireland's energy transition. They must be supported and empowered to play their part in driving decarbonisation. While technology and engineering solutions can be developed, sustainable enduring success will only be achieved by changing citizen's behaviour and engineers have a role to play in public education. An active energy citizen model shows how Ireland might encourage changes in consumer behaviour that facilitates a transition to a lower carbon future. This would involve education, incentives and the sharing of best practice from those innovation projects underway around the country, e.g. the Dingle Electrification Project, the +CityXchange project in Limerick and the REACT project in the Aran Islands. Modelled on Local Energy Scotland, Ireland could establish a new organisation to support community-owned renewable energy and to advise communities on how to maximise the opportunities from enhanced community benefit and investment opportunities in developer-led projects.





Source: Sustainable Energy Authority of Ireland[25]

In 2018, 38 $MtCO_2$ or 59% of Ireland's greenhouse gas emissions were related to energy (left chart).
Transport (15 $MtCO_2$) is the largest source of energy-related greenhouse gas emissions (right chart).
The largest reduction in energy-related greenhouse gas emissions was achieved in electricity generation (-5 $MtCO_2$).
The following sections explore electricity, heat and transport.

Electricity

Ireland is now number 1 in the world for onshore wind share of electricity.[26] Wind energy is breaking records each month and has firmly put Ireland on track to meet the 40% renewable electricity target for 2020, the only 2020 climate action target (out of 5) that Ireland is on course to achieve.[27] While there have been challenges, building more than 250 wind farms over the past 20 years represents a major success and several surveys suggest that majority of people are very supportive of wind, onshore and offshore.[28] The Climate Action Plan will require doubling the amount of onshore wind from 4,200 MW today to 8,200 MW by 2030.

The single most challenging barrier will be to push the boundaries of technology on the electricity system over the next decade. Today, over 10% of all renewable electrical energy that could be generated in Ireland is lost[29], as there are limitations to the amount of non-synchronous generation that can be instantaneously used by the system. Therefore, it is vital that the System Operators across the island of Ireland can continue their role as world leaders in system integration in the next decade. New technologies and 'system services'[30] will be vital in addition to new network infrastructure and interconnector capacity so that the electricity system evolves, not only to support renewable electricity[31], but also to support electrified heat and transport via heat pumps and electric vehicles respectively.

Boosting the Irish economy with 70% renewable electricity by 2030 (IWEA)

To deliver 70% renewable electricity by 2030, the Climate Action Plan targeted 4,000 MW of onshore wind, 3,500 MW of offshore wind and 1,500 MW of solar. The table below gives an overview of the benefits that the 70% renewable electricity target will bring to the Irish economy if implemented in line with the CAP. Firstly, it will reduce CO2 emissions in electricity generation by 66 per cent by 2030, from approximately 12 Mt per year to 4-5 Mt per year. This is mainly driven by the replacement of fossil fuels with clean electricity, which will save the Irish economy an additional €1 billion on imported fossil fuels each year by 2030. Delivering the renewable generation infrastructure will require approximately €12 billion of investment and will create ~6,000 direct jobs in Ireland, which is estimated here to create an additional ~9,000 indirect jobs.

Research recently completed by the Carbon Trust examining the potential for Ireland's offshore wind energy supply chain found that currently – at best – Irish firms would be able to attract only 22% of the lifetime multi-billion euro investment. The report set out how this could quickly grow to 31-36 per cent and eventually as much as half of the estimated €17.9 billion of investment associated with the 3.5 GW target. Critical to this will be identifying a port on the east coast to facilitate the construction of offshore wind farms, creating an enterprise zone around this port (which has proven effective in the UK) and simultaneously supporting training in the sector via the Skillnets or Future Jobs programmes.

Metric to Achieve 70by30	Onshore Wind	Offshore Wind	Solar	Notes
Installed capacity by end of 2020	4,200 MW	25 MW	0 MW	Initial data for 2020 is promising to meet the 40% RES-E target for 2020
Additional capacity in 2030	4,000 MW	3,500 MW	1,500 MW	Capacities targeted in the Climate Action Plan (CAP)
Total investment (by 2030)	€5 Billion	€6-7 Billion	€500 Million	Based on typical investment costs. Excludes investment in supporting technologies such as batteries and interconnectors.
Carbon savings (per year by 2030)	~3.5 Mt	~4 Mt	~0.5 Mt	CAP found that 70% RES-E will save 7-8 Mt/ year out of a total ambition in the CAP of ~16 Mt
Avoided natural gas import costs (per year by 2030)	~€500 Million	~€600 Million	~€75 Million	Assuming all natural gas for electricity generation is imported and a forecasted gas price of 63 p/therm in 2030
Additional direct jobs (for new capacity only)	2,000	2,500	1,500 (est.)	Onshore & offshore numbers are based on bespoke research in these areas. Solar is an estimate based on international experiences.
Estimated indirect jobs (for new capacity only)	4,000	3,500	1,500	Onshore wind numbers are based on a 2010 study and should be updated. Offshore numbers assume the same rate as onshore and solar is an estimate based on international experiences.

The results of the first renewable auctions on the journey towards 2030 have delivered approximately 20% reduction in costs compared to the previous support scheme[32], although it may be possible to half the price of renewable electricity in Ireland with a more efficient policy and regulatory framework.[33] These RESS1 projects need to be delivered by 2023 with RESS-2 to take place in 2021. It was a seminal moment in the Irish electricity sector as not only did RESS1 include 19 onshore wind farms, but it also included 63 solar farms as they proved to be very competitive in this auction. This has been a very positive signal to the solar sector which will also play an important role in meeting 70% renewable electricity. Achieving this 2030 target could reduce CO2 emissions from Ireland's electricity generation sector by two-thirds, from 12 million tonnes in 2017 to 4 million tonnes in 2030 (see box).

In addition to reductions in carbon emissions from the electricity sector, renewable electricity will also be critical for reducing emissions in heat and transport also due to electrification, particularly heat pumps, electric vehicles, hydrogen and electrofuels. The 8 million tonnes of carbon which will be saved by implementing the 70% renewable electricity target make up almost 50% of all carbon saved in the Climate Action Plan and approximately one-third of the new ambitions in the recent Programme for Government.

The Programme for Government is encouraging and includes an upgraded offshore wind target for 2030 from 3.5 GW to 5 GW. The development of offshore wind has the potential to be a gamechanger in reducing Ireland's carbon emissions. We will need to identify an east or south coast port that can be used as a construction port to support offshore wind development; if not identified soon, it is likely the first new Irish offshore wind farms will be built from ports outside this jurisdiction.

Regarding offshore wind, Kandrot et al (2020) states: that by 2030 "2.5–4.5GW of domestic offshore wind development could create between 11,424 and 20,563 supply chain jobs and generate between €763 m and €1.4bn in gross value added."[34] We should incentivise investment in R&D and early stage development of floating offshore windfarms, to position Ireland as a global leader in this field. The Government should identify a seaport to support offshore wind development (installation, operation and maintenance) based on the criteria set out by the Carbon Trust, particularly port depth (9m+), quay length (200m+) and storage space (8-20ha).[35]

Housing and planning

As is widely recognised by policy makers, the recovery period offers an opportunity to rethink and redesign our cities and communities, including how we travel, how we work and where we live. Ireland will be home to at least one million more people in the next 20 years. The National Planning Framework, supported by the Regional Spatial & Economic Strategies, was a very welcome development and represents a structure for delegation to Local Authorities and Regional Assemblies which are well placed to understand and react to the local/regional economic challenges and the potential for a sustainable recovery. The National Planning Framework must underpin all new capital spending plans (see Section 3) and the Office of the Planning Regulator has recently indicated that the Regional Assemblies have a critical role in delivering Ireland's renewable energy targets.[36]

Housing remains one of Ireland's major challenges and while home completions have increased in recent years, the level is still far below the estimated level of housing demand based on demographic trends. Sustainable communities must include social and economic facilities and complement the natural environment, including green and blue space.

A constraint to delivering housing is often the unavailability of public infrastructure, such as transportation, water and wastewater, telecommunications and energy in the locations chosen. There should be increased funding and coordination of the planning and delivery of public infrastructure to improve stability of supply and affordability of new homes, through for example the Local Infrastructure Housing Activation Fund and Serviced Sites Fund.[37]

State-owned land should be actively managed through the mechanism of the Land Development Agency and/or other means. In so doing, the relationships between various institutional actors should be teased out and clarified, ensuring good governance and a strong legislative framework (including compulsory purchase order powers) and sufficient capacity to coordinate the development of State lands and to assemble strategic land banks from a mixture of public and private lands. There should be an explicit focus on developing sustainable communities and quality homes. This will require adequate resourcing in terms of both funding and expertise to grasp these opportunities for environmental, social and economic transformation.

Analysis by KPMG/FAC[38] and McKinsey[39] has highlighted the need for greater innovation and digital adoption in the construction sector. Modern methods of construction with greatly increased use of off-site construction have the potential to increase housing output, quality and innovation (see box). Also, progress made through the introduction of the Building Control (Amendment) Regulations 2014 could be reinforced by removing the opt-out for one-off dwellings (SI 365 of 2015) and by increasing the resources of local authorities for inspection and enforcement.

The pandemic has shifted consumer behaviour in terms of working patterns and shopping local (see Section 3), indicating the potential for the revitalisation of towns and villages. The delivery of the National Broadband Plan is pivotal for access to basic services in these towns and villages and local digital hubs could be created. Moreover, the masterplanning of residential developments should evolve to deliver communities that are more amenable to increased home working.

A whole-of-government plan should be developed for the revitalisation of existing towns and villages as attractive environments in which to live, work and shop, particularly their main streets – potentially using the Liveable Cities model. This should consider incentivisation and actions at Local Authority level and innovative ways to combine public and private sector finance. A support toolkit for regional towns and communities who wish to develop in a more sustainable away and transition towards a lower carbon future. Lessons from existing innovation projects with local community energy groups could be shared, together with supports from organisations such as the Sustainable Energy Authority of Ireland.

Modern Methods of Construction

Modern Methods of Construction (MMC) is a term used to describe a number of construction methods which differ from 'traditional' construction. Other terms that are commonly used for these methods are: off-site construction, factory-built, industrialised or system building and pre-fabrication. Types of MMC include:

- Volumetric construction - three-dimensional modular units which are produced and fully fitted-out in controlled factory conditions prior to transport to site;
- Panelised systems - panels with timber or light steel framing, structural insulated panels or cross-laminated timber produced in a factory and assembled on-site to produce three-dimensional structures;
- Hybrid techniques that combine panellised and volumetric approaches;
- Pods - used in conjunction with another construction method, e.g. bathroom or kitchen pods;
- Floor or roof cassettes, pre-cast concrete foundation and frame assemblies, pre-formed wiring looms, mechanical engineering composites and innovative techniques such as tunnel form or thin-joint block work;
- Other sub-assemblies and components - larger components incorporated into new homes, including wall, floor and floor assemblies etc.

There are great advantages to be gained from growing the volume of offsite-manufactured homes to significant levels, including better and more innovative design. The key beneficiaries should be those households seeking better value for money, better quality, cheaper cost in use and higher amenity in their home. The general public, as consumers, should be made aware of the benefits of MMC. Successful and innovative projects should be promoted in order to create a climate of acceptance and enthusiasm for homes built using MMC.

MMC can significantly reduce whole-life costs, especially if critical mass is achieved and mass production becomes prevalent. However, at this point in time, the sector is not yet mature enough to offer large cost savings through economies of scale and the use of mass production. For example, companies are working on a project-by-project basis with differing specifications on each scheme.

Implementing the National BIM Council (NBC) Roadmap to Digital Transition of the Irish Construction Industry 2018-2021 is an important step in growing MMC. The four pillars of the NBC Roadmap should remain 'front and centre' when considering recommendations for growing MMC:

1. Leadership – The Irish Government must lead the way through the formation of a Centre of Excellence envisaged in the NBC Roadmap which will support the rollout of MMC in Ireland.
2. Standards – The role of the National Standards Authority of Ireland (NSAI) will be critically important by ensuring appropriate standards are introduced to provide clarity and confidence to insurers and consumers in respect to MMC.
3. Education – All stakeholders need to be educated as to the benefits of MMC and the significant contribution it can made to expatiating housing delivery in Ireland.
4. Procurement – Introduce contractual frameworks that will support the rollout of MMC in Ireland.

Heating

Ireland's heating sector represents around one-third of all primary energy but concerningly, it is an area where Ireland has performed poorly compared to other EU countries in terms of renewable energy share. At present, only the Netherlands has a lower share of renewable heat than Ireland with our current level of 6-7%, which is in stark contrast to EU leader, Sweden, which has a renewable share almost ten times higher at ~68%. Urgent action is vital in the heating sector and while Ireland's performance has been poor to date, there are number of proven technologies in other countries which can be used to kick start action in this area, especially for buildings which are: energy efficiency/retrofitting, heat pumps and district heating.

Buildings consume approximately 60% of all heat in Ireland and the Programme for Government aims to reduce this with a commitment to upgrade 500,000 homes by 2030 in a National Aggregated Model of Retrofitting as part of the EU renovation wave. To implement this, a radical national retrofit strategy is needed which should provide absolute clarity and a roadmap for retrofitting over the next 20 years and including financial incentives and skills programmes. An implementation body should be established, including appropriate governance, to oversee the deep retrofit of Ireland's domestic dwellings and public buildings to reduce energy demand and increase energy efficiency. In the longer term, two million housing units in Ireland will need to be retrofitted to achieve the energy performance levels required. International experience would suggest that retrofitting can reduce the heat demand across the building stock as a whole by 30-50%, so for the remaining 50% of demand, we will need a renewable heat supply.

The Climate Action Plan requires 200,000 heat pumps in new buildings and 400,000 heat pumps to be retrofitted into existing homes. Heat pumps are an ideal solution to replace mainly oil boilers in rural areas and is a well proven solution in other countries such as Sweden. Sufficient qualified installers will be a critical bottleneck so additional training and apprenticeships will be vital. In urban areas, district heating is a well-proven solution for renewable heat, which is evident as the six EU countries with the highest share of renewable heat also have the highest shares of district heating. Countries which also have a very low share of renewable heat such as the Netherlands have started major projects to install district heating networks in urban areas.[40] The Irish Heat Atlas[41] shows that there may be significant potential for district heating in Ireland, with approximately 35% of all heat currently consumed in buildings in areas that have a heat density suitable for district heating development.

Finally, apart from buildings, the other approx. 40% of the heat demand in Ireland is consumed by industry, importantly around two-thirds of industry heat that is for process heat that is >100^{0}C and the other third is for heat that is <100^{0}C. For the demands below 100^{0}C similar proven solutions can be used as for buildings i.e. heat pumps and district heating. However, for demands >100^{0}C other solutions are required which can supply much higher temperatures. To date, bioenergy is the most well-proven solution in this area but there are other solutions developing rapidly such as hydrogen, electrofuels and high-temperature forms of direct electrification.[42]

Transport

There are strong interrelationships between housing and the various other sectors of the built environment, particularly transport. Our current transport system is highly car-dependent with negative impacts on greenhouse gas emissions, air quality and traffic congestion. The promotion of active travel, such as walking and cycling, not only contributes to an efficient and sustainable transport network, these modes can make major contributions to public health policies and significantly expand the reach of public transport. We should re-engineer our towns and cities for public transport, cyclists and pedestrians and invest in sustainable transport solutions that meet the needs of rural and urban communities. For example, the concept of the '15-minute city' is receiving greater attention as a means to reduce congestion, enhance public spaces, revitalise local economies, increase public transport efficiency and improve quality of life.[43]

The Programme for Government commits to major investment in making our towns and cities more friendly for public transport, cyclists and pedestrians and a sustainable rural mobility plan. The public transport projects listed are Metrolink, Luas and other light rail expansion, DART Expansion and interconnector and BusConnects projects in Dublin, Cork, Galway and Limerick. An electric vehicle strategy that ensures that public charging infrastructure stays well ahead of demand, a public procurement framework for electric vehicles and other policy approaches to incentivise use of electric vehicles. These projects are very welcome, and Engineers Ireland is available to assist in any way possible to ensure they are delivered in a timely and cost-effective manner.

To meet carbon emission reduction targets, significant investment is needed in the cost-effective decarbonisation of the transport sector to convert the rail network to electric (overhead electrification or use of hydrogen with fuel cell 'electrification' on board), and to develop the distribution system to cater for the anticipated increased load from the move to electrified heat and transport in the form of electric vehicles and heat pumps. The Government should also consider 'electric roads', such as overhead catenary systems which are being demonstrated in Germany and Sweden to decarbonise heavy goods vehicles.[44] Incentives and charging infrastructure will be required to support increased adoption of electric vehicles. Consumers should be encouraged to switch to electric vehicles through financial and other incentives such as revised taxes and expanding superfast charging infrastructure. Research into battery range, innovative roads, autonomous vehicles and other technologies should also continue.

The rail and bus network should be viewed as valuable national assets with the ability to contribute to wider key policies including climate change, supply chain management to free up bottlenecks on roads, sustainable transport and land-use development. Public transport networks can be improved by eliminating physical bottlenecks and increasing service frequency, capacity, network coverage and connectivity. The development of an extensive metro and light rail network for the Greater Dublin Area is a key element to tackling congestion, enhancing economic competitiveness and ensuring a sustainable, attractive city. The publication of transport strategies for Cork and Galway is welcome as is the development of strategies for Limerick and Waterford. Large-scale public transport investment is needed to reduce car dependency and to accommodate forecasted increases in travel demand, including BusConnects, MetroLink, the DART Expansion Programme and Luas network expansion. Engineers Ireland is also supportive of the National Transport Authority's Greater Dublin Area Transport Strategy 2016-2035 and we would like to see progress on the DART Underground Project.

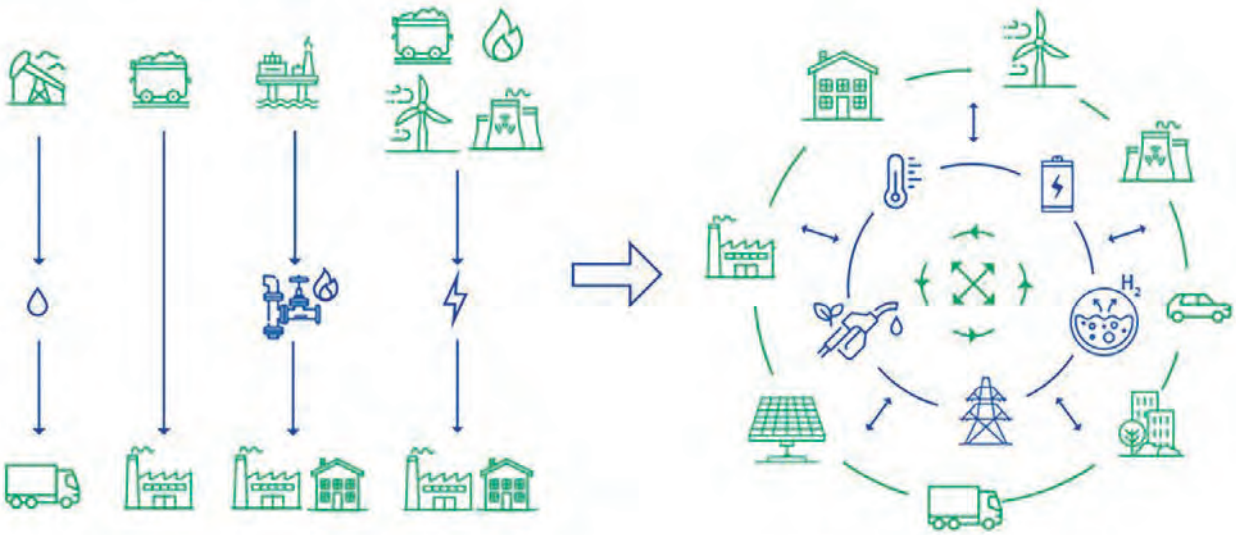
Major investment in public transport is central to achieving more compact and sustainable urban development in accordance with the goals of Project Ireland 2040. However, there is also an opportunity to highlight that major transport projects when supported by a complementary package of policies can also be drivers of major economic and social change. Large-scale projects such as Metrolink or the DART Underground have the potential to unlock land for affordable housing as well as fostering economic development. Adopting a transport-oriented development approach, Metrolink should be seen a key part of a strategy for economic and social development on the northside of the city and not just as a transport enhancement project that can improve journey times from the airport to the city.[45]

Investment in maintenance is sometimes overlooked as a crucial component of any sustainable system and should be explicitly included in the NDP review. The allocation of capital investment in transport infrastructure should be increased to ensure that there are adequate funds for both the maintenance of existing assets and new build projects. The NDP provides for several new major transport projects yet makes little reference to maintenance (although much of the roads spend is targeted on the maintenance and minor upgrade of the regional and local road network).

Energy system integration

Energy system integration is a pillar of the European Green Deal.[46] Energy system integration refers to the planning and operating of the energy system 'as a whole', across multiple energy carriers, infrastructures, and consumption sectors, by creating stronger links between them with the objective of delivering low-carbon, reliable, resilient and resource-efficient energy services, at the least possible cost for society. It encompasses three complementary and mutually reinforcing concepts.

- First, a more 'circular' energy system, with energy efficiency at its core, in which the least energy intensive choices are prioritised, unavoidable waste streams are reused for energy purposes, and synergies are exploited across sectors. This is happening already in combined heat and power plants or through the use of certain waste and residues. There is however further potential, for example, there is currently more waste heat from industrial processes, data centres, wastewater treatment plants and power plants in Ireland than is required to heat (via district heating) every home in our towns and cities.
- Second, greater direct electrification of end-use sectors. The rapid growth and cost competitiveness of renewable electricity production can service a growing share of energy demand – for instance using heat pumps for space heating or low-temperature industrial processes, electric vehicles for transport, or electric furnaces in certain industries.
- Third, the use of renewable and low-carbon fuels, including hydrogen, for end-use applications where direct heating or electrification are not feasible, not efficient or have higher costs. Renewable gases and liquids produced from biomass, or renewable and low-carbon hydrogen can offer solutions allowing to store the energy produced from variable renewable sources, exploiting synergies between the electricity sector, gas sector and end-use sectors. Examples include using renewable hydrogen in industrial processes and heavy-duty road and rail transport, synthetic fuels produced from renewable electricity in aviation and maritime transport, or biomass in the sectors where it has the biggest added value.[47]



Source: EU strategy on energy system integration

A low-carbon, reliable, resilient and resource-efficient energy system at the least possible cost for society in Ireland should be delivered through system integration. Policy should support a more circular energy system as well as continued direct electrification of end-use sectors and meeting goal of 70% of electricity from renewable energy sources. Support for renewable and low-carbon gases will be needed to achieve system integration, including the development of a hydrogen strategy for Ireland.

In Ireland's Competitiveness Challenge 2020, the National Competitiveness Council has called for a clear policy signal and pathway for the gas network to be carbon neutral by 2050, including "an early and detailed assessment of future policy options and cost-efficient renewable energy sources that can be used, with prioritisation for 'no regrets' investments in Ireland's energy infrastructure".[48]

Hydrogen can play a key role in the reduction of greenhouse gas emissions through the replacement of fossil fuels. According to Tim Chapman (Arup & ICE: "We need to create a whole new industry to produce vast quantities of hydrogen [...] That hydrogen may be used for everything from home heating to industrial processes to powering vehicles like trains and ships – the need is vast."[49] The EU Hydrogen Strategy "brings different strands of policy action together, covering the entire value chain, as well as the industrial, market and infrastructure angles together with the research and innovation perspective and the international dimension, in order to create an enabling environment to scale up hydrogen supply and demand for a climate-neutral economy."[50] The UCD Energy Institute has called for a national hydrogen strategy to develop Ireland's hydrogen potential.[51] The production of large-scale green hydrogen from constrained renewable generation should be a key consideration of this strategy.

The energy sector should collaborate to achieve this integrated energy system, as well as increasing public engagement to achieve social acceptance for required infrastructure.

Water and flood risk management

Water / wastewater and flooding infrastructure play a vital role in all three pillars of sustainability. To stimulate the economy and take climate action, the Irish State must continue to plan, invest in and deliver infrastructure and services which meet the needs of its citizens both now and in the long-term. A large body of work has already been carried out by organisations such as the Office of Public Works and Irish Water to identify infrastructure needs and to inform the National Development Plan 2018-2027 and National Planning Framework.

Through the Water Services Act and Water Services Policy Statement 2018-2025, Irish Water is secured as the national publicly-owned water utility. Government must now ensure that adequate, multi-annual funding is made available to achieve the objectives identified in the organisation's Business Plan to 2021 and Investment Plan 2020 to 2024 (which is currently in development). For example, the National Development Plan estimates that €14 billion will be required by Irish Water over the period 2018 to the mid-2030s. The Programme for Government commits to funding Irish Water's capital investment plan for drinking water and wastewater infrastructure on a multi-annual basis and delivering the €8.5 billion funding package committed to in Project Ireland 2040.

Water / wastewater infrastructure must focus on reliably protecting public health, safeguarding the environment and supporting future development. Priorities for the coming years should include reducing leakage to 35% (42% in 2019), eliminating the discharge of untreated effluent, upgrading existing infrastructure such as water supply at Vartry (Wicklow), water treatment at Lee Road (Cork) and wastewater treatment at Ringsend (Dublin) and Cork Lower Harbour. Recent water shortages have demonstrated the extreme pressure on water supply capacity in Dublin. In line with Project Ireland 2040, the projects needed to support the growth of Dublin and the wider region include the Eastern & Midlands Region Water Supply Project and the Greater Dublin Drainage Project.

Holistic flood risk management calls for the protection of public health, critical infrastructure and the natural environment. This will require excellent and maintained flood defences and warning systems and sustainable land-use practices. A strategic plan should be implemented for the efficient delivery of the 118 schemes identified in Flood Risk Management Plans (Flood Plans) and smaller schemes, drawing on international best practice. This would protect 80% of the properties found to be at high risk of flooding. Particular attention should be paid to measuring and designing for the effects of climate change. This should prudentially consider worst case trajectories for global greenhouse gas emissions, and specifically address not just changes in average annual climate indicators, but likely changes in the incidence of extreme, short-term, weather events.

To better understand the impacts of climate change and weather patterns, the network of permanent measurement facilities (e.g. automatic rain gauges, rainfall radar, water level monitoring, satellite / remote measurement and continuous GPS) should be maintained and extended. The development of the National Flood Forecasting and Warning Service and improved local warning systems will assist emergency response.

Recommendations

5 Implement the European Green Deal by accelerating greenhouse gas emissions reductions, enacting the Climate Action (Amendment) Bill 2019 for net zero emissions by 2050 and seeking funds through the European Green Deal Investment Plan.

6 Put communities at the heart of a sustainable recovery by involving local citizens as early as possible in the development of new infrastructure and ensuring local communities benefit directly from it.

7 Ensure the delivery of a low-carbon, reliable and resource-efficient energy system at the least possible cost for society in Ireland through energy system integration, including: direct electrification of end-use sectors, achieving the 70% renewable electricity by 2030 target, a hydrogen strategy for Ireland, and collaboration and public engagement.

8 Ireland's electric grid will need new system services, capacity and interconnectors to be developed as soon as possible to ensure Ireland continues as a world leader in renewable electricity integration, which will also support electrified heat and transport.

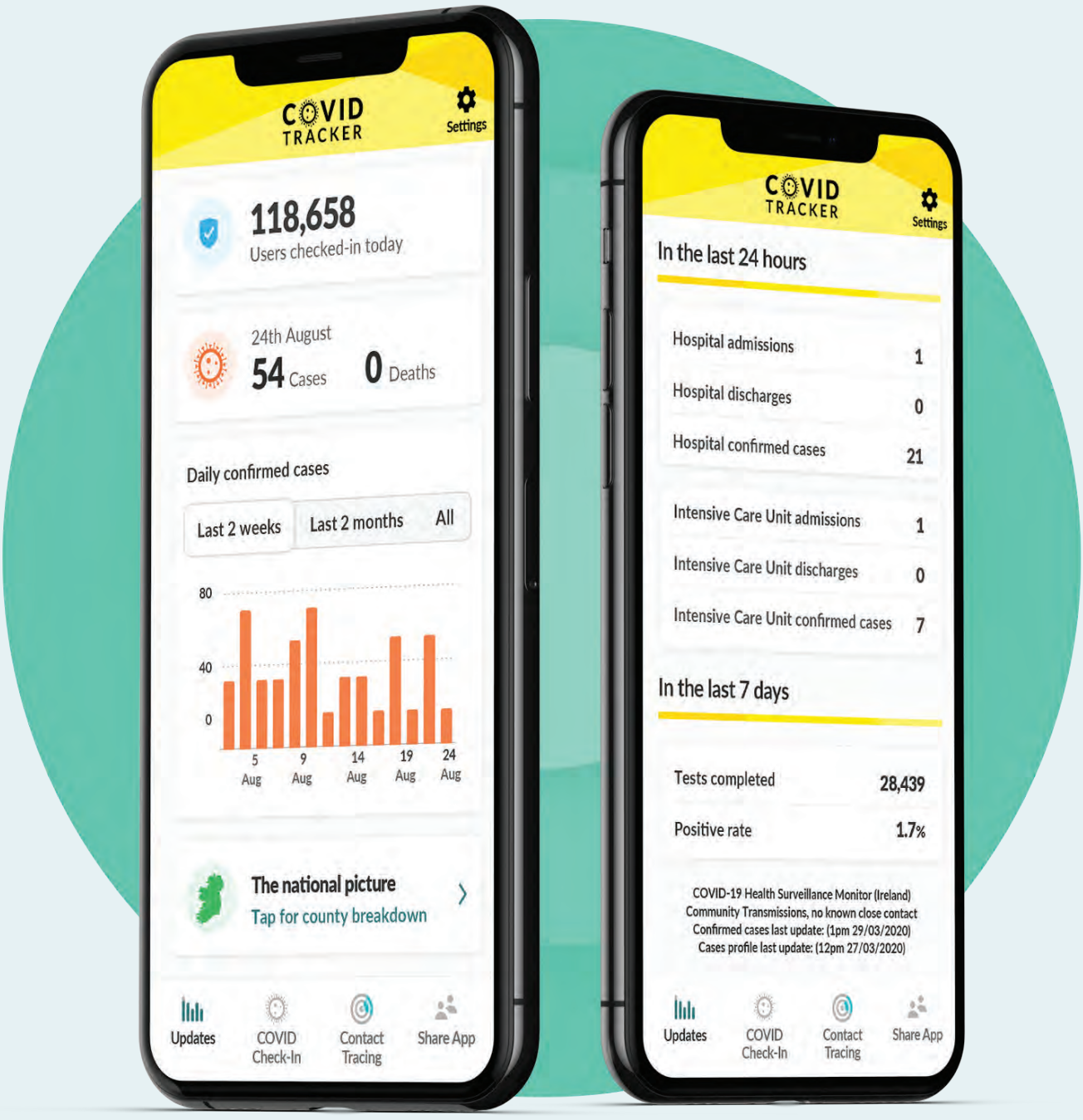
9 Urgently identify a seaport to support offshore wind development. The port will need sufficient port depth, quay length and storage space.

10 Actively manage public land, through the mechanism of the Land Development Agency and/or other means. Ensure there is a strong legislative framework and sufficient capacity to coordinate the development of State lands and to assemble strategic land banks from a mixture of public and private lands.

11 Develop and implement a radical national retrofit strategy, providing absolute clarity and a roadmap for retrofitting over the next 20 years. As well as improving the building fabric, this should include retrofitting the heating supply by replacing oil boilers with heat pumps in rural areas and gas boilers with district heating in urban areas.

12 Re-engineer our towns and cities for walking, cycling and public transport through 'hard' and 'soft' measures and by progressing major projects such as BusConnects, Metrolink, light rail systems and the DART Interconnector.

13 Provide multi-annual funding for the delivery of Irish Water's capital investment plan and for the delivery of the Flood Risk Management Plans.


COVID TRACKER
Settings
118,658
Users checked-in today
24th August
54 Cases
0 Deaths
Daily confirmed cases
Last 2 weeks
Last 2 months
All
80
40
0
5 Aug
9 Aug
14 Aug
19 Aug
24 Aug
The national picture
Tap for county breakdown
Updates
COVID Check-In
Contact Tracing
Share App
COVID TRACKER
Settings
In the last 24 hours
Hospital admissions 1
Hospital discharges 0
Hospital confirmed cases 21
Intensive Care Unit admissions 1
Intensive Care Unit discharges 0
Intensive Care Unit confirmed cases 7
In the last 7 days
Tests completed 28,439
Positive rate 1.7%
COVID-19 Health Surveillance Monitor (Ireland)
Community Transmissions, no known close contact
Confirmed cases last update: (1pm 29/03/2020)
Cases profile last update: (12pm 27/03/2020)
Updates
COVID Check-In
Contact Tracing
Share App

3 A Digital Ireland

Information and communication technologies – computers, networks, algorithms – have revolutionised how we interact and work together and the way we generate, manage, share and reuse data. COVID-19 has accelerated these societal changes with increased remote working, online social interaction and online shopping. It is exacerbating existing digital inequalities and accentuating the geographical digital divide in Ireland.

Remote working and regional development

According to the National Competitiveness Council:

> "The rapid shift to remote working by many has highlighted the benefits from and need for quality, high-speed broadband across the country, and the importance of the continued roll out of the National Broadband Plan."[52]

In July, a survey conducted by Behaviour and Attitudes on behalf of ComReg should that 77% of respondents increased their broadband usage since the start of the pandemic.[53] Prior to the pandemic, 29% of the workforce worked remotely to some extent – during the pandemic, this figure more than doubled to 61%. The survey also demonstrated increased broadband usage for general browsing, streaming video content, shopping online and video-calling. Many studies (such as by the WDC and NUI Galway[54]) have highlighted an appetite for continued remote working or flexible working beyond the pandemic.

The Covid-19 crisis has highlighted the potential for technically enabled remote working and more balanced regional development. At the same time, it has served to highlight the potential costs of an increasing digital divide (regionally and/or between socio-economic groups; or within and between business sectors). It is now evident that the delivery of the National Broadband plan is key to economic and social development including more balanced regional development.

It is important that the state continues to develop ambitious strategies in relation to digitalisation, the future of manufacturing, a modern construction sector, e-government etc., but these have to be founded on a resilient and effective digital infrastructure otherwise they will not be deliverable. A modern and accessible digital/broadband infrastructure is a foundational element of a modern economy and society, and not just something for specific sectors or niche activities.

According to KPMG & Arthur Cox:

> "The success of remote working forced upon the population by COVID-19 provides an opportunity to accelerate the objective of 'Strengthened Rural Economies and Communities" in the National Development Plan. Facilitating the creation of co-working spaces through the use of existing vacant premises in selected towns could be developed in a capital light model – these don't need to be premium We-Work type facilities. This could deliver both knock on multiplier benefits for the local economies whilst also taking pressures off existing facilities in certain Cities. Community Employment programmes could be used for refurbishment activities and on-going limited services provision / facilities management provided through the Local Authorities. A standardised scheme could be rolled out on a simple basis quickly and would tie in with suggestions of bringing forward development of the Broadband Community Point hubs under the National Broadband Plan."[55]

There is an opportunity, therefore, to rethink and redesign our work environment post COVID-19 as a hybrid model of working at home and in the office may emerge. This could give renewed impetus to the towns and cities identified in Project Ireland 2040 that had been earmarked for future growth and development. A benefit of the hybrid model would likely be to encourage a rebalancing of the economy in our country across the regions. This has advantages of reducing congestion in the East of the country for all necessary services (energy, transport, housing, healthcare, schools etc.).

Integrated planning should consider the work environment post-COVID-19 in a more holistic manner and adapt our infrastructure investment to engineer a new future. Digitalisation supports a hybrid model of working from home and office for a larger proportion of the workforce. Therefore, investment in digital infrastructure enables the delivery of traditional infrastructure (housing, roads, public transport) to support regional development, reduce congestion and improve quality of life.

Digital infrastructure

Data is the new asset in the digital economy and having secure reliable and fast access to this asset (data) across the country will contribute positively to the economic development of all regions. Investment in telecommunications infrastructure, including broadband, 4G and 5G, is needed to support the exponential growth in data traffic associated with connected networks and the 'internet of things'. Fast broadband is pivotal for access to basic services in many of Ireland's towns and villages and will enable increased use of 'eHealth' and 'internet of farm'.

Our cities and towns should be well serviced from a digital infrastructure perspective to ensure all citizens on the island have access to high speed broadband. The roll-out of the National Broadband Plan is well underway, despite interruptions due to COVID-19. National Broadband Ireland (NBI) has been conducting surveys in many counties and by July 2020, almost 20,000 premises have been surveyed. According to NBI, by the end of 2020, up to 10,000 homes will be passed with the fibre network and the first broadband connections can be installed. NBI will be building in all counties next year and has stated that the National Broadband Plan will be delivered ahead of time, under budget and that the minimum standard download speed will increase from 150 Mbps to 500 Mbps.[56]

5G is the latest generation of wireless mobile phone technology. 5G will be very important to Ireland's economic recovery and future competitiveness. 5G can enable a range of applications such as virtual classrooms, remote medical consultations and predictive maintenance. Unfortunately, some Local Authorities have passed motions opposing its rollout due to health concerns. According to

the World Health Organisation: "To date, and after much research performed, no adverse health effect has been causally linked with exposure to wireless technologies."[57] Ireland adheres to all relevant World Health Organisation approved standards and the rollout of 5G should continue.

This said, the most important public policy aspect in order to achieve balanced regional development remains the effective implementation of the National Planning Framework. This is the central tool in ensuring a whole of central and local Government approach in supporting sustainable communities. In line with the National Planning Framework, investment should support the smart and compact growth of Ireland's regional cities while providing vital services, such as broadband, for rural areas.

Digitalisation is one of the major pillars of the EU Commission plan for the next five years, together with the Green New Deal. The Programme for Government commits to a public consultation on a National Digital Strategy with a view to completing and publishing the strategy within six months. It is proposed that the Strategy will include further developing Ireland's leadership in new digital technologies including cloud computing, data analytics, blockchain, Internet of Things and AI.

In December 2019 the Department of Business, Enterprise and Innovation published 'Remote Work in Ireland' a report on the prevalence and types of remote working solutions in Ireland, the attitudes towards them and influencing factors for employees and employers when engaging with these solutions.[58] In August 2020, a public consultation was held to develop further guidance for employees and employers on remote working.

A Vodafone & SIRO study showed that a digital hub in every county in Ireland could generate €312 million for the regional economy and create over 8,400 new jobs across over 1,000 new businesses. The report is based on a quantitative analysis of job creation, talent migration, economic activity and outputs of the businesses that operate in six of Vodafone and SIRO's digital hubs.[59] Meanwhile, the AEC Enterprise Hubs Project (see page 32) is a three-year project to create an interconnected community network from the 101 hubs identified as either operating or in development, in the AEC region.[60] The Project is coordinated by the Western Development Commission.

While the research referenced above is very welcome, the lasting impact of COVID-19 on working environments and remote working remains to be seen. Further research and engagement are needed to better understand these trends. In this context, consultation with some or all of the following would be useful: three regional assemblies, Western Development Commission, Atlantic Economic Corridor (see page 32) and Chambers Ireland.

National Smart Metering Programme

ESB Networks is replacing 2.4 million analogue electricity meters with smart meters in homes and businesses. The National Smart Metering Programme will cost approximately €1.2 billion over six years and the European Investment Bank has provided €150 million of financing.

This programme will enable a transformation of the electricity distribution network, paving the way for smarter energy management (for example, off-peak tariffs for consumers to shift energy use to evening and night time, feed-in revenue for households with excess renewable energy (solar PV arrays) and enabling smart devices to optimise charging of EVs. This is an example of where digitalisation can aid decarbonisation of the energy sector, helping to address climate change.

Atlantic Economic Corridor Hubs Network Project

The AEC Hubs Project is a three-year project to create an interconnected community network from over 100 hubs identified as either operating or in development, in the AEC region.

The Project is coordinated by the Western Development Commission (WDC) to deliver on the following key areas:

- Establish a community network between the hubs identified in the region
- Provide a suite of IT systems including an online booking engine and Hub Management System
- Rollout of a Hub Improvement Plan to support hub infrastructure upgrades
- Promotion and Branding
- Training and Business Development
- Promotion of Remote Working

The AEC Hubs Network has the potential to deliver significant achievements under all three of the key pillars of the wider AEC Initiative; developing connectivity, promoting innovation and supporting the growth of a robust and diverse economy in the region.

The WDC has conducted extensive research which indicates that many hubs in the AEC region would benefit from becoming part of a larger hub ecosystem for the following reasons:

- Low occupancy rates in a significant number of hubs
- No centralised ICT systems
- Limited use of collaboration technology
- Limited capacity or strategy to market or promote hubs
- Access to funding
- Establishment of best practise in service provision

Participation in a hub network is a proven driver for hub development; it leads to increased hub occupancy and cross pollination of ideas which drives business development in communities across the region. Hubs have already begun to see the benefits of the emerging network as the WDC and AEC Officers supported 65 with a fund of €300,000 to assist with COVID-19 reopening projects. The categories of hubs funded included Enterprise, R&D, Coworking, Scaling and Community & Enterprise hubs.

The development of a hub network has the potential to bring significant economic value to the AEC. The WDC is ideally positioned to coordinate this project in conjunction with the Department of Community and Rural Development and the AEC Officer Network. The WDC already has a team in place and an initial €1 million of funding from the Dormant Accounts Fund, but success will depend on establishing strong partnerships and collaborative relationships. An interactive map of the emerging network can be found at: www.atlanticeconomiccorridor.ie/hubs-map/

Industry 4.0 and sustainable manufacturing

Ireland is home to world leading manufacturing companies and already boasts more than 4,000 businesses which employ more than 230,000 people and accounts for nearly a quarter of Ireland's economic output. This sector also provides important benefits of stabilising the national economy and security of supply. To remain globally competitive, Irish manufacturing needs to develop a strong strategy to introduce sustainability not only to reduce cost on an ad hoc and unconnected manner, but in a coordinated way while focusing on increased competitiveness and revenues.

New developments, innovations and trends in Information and Communications Technology (ICT) and Digital Technology are disrupting the manufacturing processes and products and forming core foundations of sustainable manufacturing. This new wave of utilising ICT and DT tools for manufacturing is referred to as the fourth industrial revolution, Industry 4.0 or smart manufacturing.

Sustainable manufacturing is also enabled by a wide range of emerging technologies. Additive Manufacturing, collaborative robotics, advanced sensing systems, advanced automatic and autonomous systems, machine to machine communication, artificial intelligence, and big data are a few important and rapidly developing areas to mention. The integration of these technologies enables the formation of truly disruptive technologies that are sustainable and can be used throughout the manufacturing industry value chain.

Sustainable manufacturing brings opportunities and challenges to industrialised countries. Major national policies and initiatives in countries around the globe are addressing these issues to support the industries for digital transformation. EU policies and efforts for sustainable manufacturing inform, guide and implicate Ireland's national strategies, policies and development programmes. The manufacturing sector around the globe has realised substantial commercial, social and environmental benefits from sustainable manufacturing. The industry is creating production processes and products that have minimal negative impacts on the environment.

Sustainable manufacturing enables long term business viability by responding to regulatory constraints and opportunities to new markets, bringing businesses beyond compliance.

The success of the Digitising European Industry (DEI) initiative relies on keeping EU digital industries competitive by further pushing technology barriers and eliminating disparities in digitalisation between industrial sectors by demonstrating innovative applications.[61] DEI is a key driver to solve societal challenges, improve the quality of life and help the EU economy to remain competitive. Sustainable manufacturing promotes the innovative use of digital tools in several industrial sectors. The fundamental challenge for the Irish manufacturing industry is to introduce innovative materials and further advance the manufacturing processes and capabilities for multifunctional components, and to reduce the costs of products and services to make them more widely available. DEI encourages and supports European industries towards use of ICT tools. This necessitates further development and integration of sustainable manufacturing techniques throughout the value chain which characterizes the DEI initiative.

A study by the Department of Business, Enterprise and Innovation highlighted that although Ireland is well-placed in digital transformation of the manufacturing industry, many Irish manufacturers need to develop and implement digitalisation visions and strategies to take advantage and remain competitive. The study outlined five priority policy themes which are focused on: (i) awareness of user needs, (ii) demonstration of application value, (iii) more collaboration between manufacturing and ICT experts, (iv) technical advisory services, and (v) skills for deployment of digital applications. Industry needs-oriented funding mechanisms, policy coordination, and appropriate institutional infrastructure are also highlighted as cross cutting implementation requirements.[62]

'Ireland's Industry 4.0 Strategy 2020-2025: Supporting the digital transformation of the manufacturing sector and its supply chain' sets out a vision that "by 2025 Ireland will be a competitive, innovation-driven manufacturing hub at the frontier of the fourth industrial revolution and at the forefront of Industry 4.0 development and

adoption". Engineers Ireland welcomed the Industry 4.0 Strategy and we are committed to supporting its implementation for the benefit of the manufacturing industry, engineering profession and Ireland as a whole. Engineers Ireland would like to build further collaborations with research and industrial partners to raise awareness of the possibilities of Industry 4.0. The Government should support, through investment and legislation, the evolution of the manufacturing sector to Industry 4.0 exploiting state-of-the art digital technologies.

Ireland's National Enterprise Strategy (Enterprise 2025) laid out strategic actions on the promotion of sustainable manufacturing to address the challenges in further growth and deepening resilience in Irish enterprises.[63] Economic success will be dependent on investment and commercialisation of technologies that drive improvements in energy efficiencies and help deliver on Ireland's sustainability objectives. To facilitate this, the government is taking necessary steps to meet the national objective for RD&I spending of 2.5% of GNP. The government is committed to support energy efficiency improvements by providing range of RD&I initiatives focusing on renewables, materials and smart manufacturing processes to achieve reduced greenhouse gas emissions targets.

Ireland has invested in developing research centres, such as I-Form and IMR that are supporting the Irish manufacturing sector to enable the adoption of the various elements of Industry 4.0. The government is now connecting these centres by a new coordination mechanism, Future Manufacturing Ireland, to fully exploit the sustainable manufacturing opportunities and help companies to access the expertise offered by the research community. The strategy also aims to facilities the current and future workforce to develop the skills required for digital transformation and exploit the opportunities airing throughout the value chain. Another goal is to create an Industry 4.0 friendly business environment by facilitating appropriate regulations, standards for sustainable manufacturing processes and internationally connected ecosystem.

A National Programme for Digital Transformation

Addressing the twin priorities of climate change and digitalisation is now accepted at a European level as key to delivering a better quality of life, social well-being, new jobs and sustainable economic growth. Many countries have already placed digitalisation at the centre of their government's efforts to address these unprecedented challenges. In Spain, for example, the Third Vice-President of the Government is the Minister for the Economy and Digital Transformation.

An Irish national digital strategy would not start from scratch since Ireland has achieved much in the digital domain. Ireland is ranked 6th in the latest annual Digital Economy and Society Index published by the European Commission.[64] This index tracks the evolution of EU Member States in digital competitiveness across a range of indicators: connectivity; human capital and digital skills; use of internet services by citizens; integration of digital technology by businesses; digital public services. Ireland is singled out as the country with the most significant progress over the last five years. In addition, several initiatives which are fundamental for Ireland's digital transformation are bearing fruit: National Broadband, Public Service Data Strategy and the Technological Universities Act.

In addition, faced with the urgency of the COVID-19 crisis IT departments everywhere scaled up their infrastructures and moved them to the cloud where appropriate. They adapted their applications for remote use by staff and developed new online, real-time digital services for their customers while simultaneously addressing issues of trust, data protection, security, and interoperability.

The HSE for example rolled out in record time its COVID-19 application for remote monitoring of patients and a COVID-19 tracker application for contact tracing. Developed using open source software and agile development techniques, these are characteristic of the innovative, user-centric, data-driven digital public services which can transform the user experience (see page 36).

Over time they could form part of a common data

space for health which would provide fast, reliable access to trustworthy information for evidence-based medical decisions by citizens, administrations and businesses.

Building on these solid foundations, digitalisation should be declared a government priority with an overarching vision for a Digital Ireland including targeted outcomes and benefits for all of our citizens. To rise to the challenge, a National Programme for Digital Transformation should be prepared. This would provide a blueprint for an orderly, equitable, secure and sustainable transition to a digital society underpinned by trusted digital platforms and fuelled by data, the reusable raw material of the 21st century.

The programme should address the twin challenges of climate change and digitalisation identifying actions to achieve a post-COVID-19, post-Brexit Ireland that's green, digital, sustainable, safe for all, and empowered by data. The Government should mandate the Ministers for Enterprise, Trade and Employment, and for Public Expenditure & Reform to be jointly responsible for this Programme reflecting the interdependence of the public and private sectors and the need for actions transforming both.

The programme should consider, amongst others, the need for: digital autonomy, digital resilience, business continuity and the protection of critical infrastructures and digital services from unexpected events and cyberattacks; digital literacy, data skills and applied R&D to support innovative knowledge-based firms; and the management of the state's information assets and citizens' personal data so as to ensure they are secure and that unauthorised access or use is prevented.

The programme should also identify essential investments to build the digital infrastructure to support this transformation including: high speed 5G connectivity; secure high performance data infrastructures including carbon neutral data centres; and the development of interoperable data spaces with data-sharing tools, systems and processes to facilitate the digitalisation of specific sectors and domains. Financial incentives should be identified to reduce the digital divide with training programs, grants for equipment and investments in infrastructure.

A primary objective should be the establishment of a Common Data Space for the island of Ireland with a legal framework, shared data, trusted platforms, shared infrastructure, and all-Ireland governance structures including interoperability agreements. Particular emphasis should be placed on cross-border digital services facilitated by the free flow of data.

The modernisation of the public sector should be a particular priority with a digital-first culture, collaborative working practices, transparent processes and algorithms, and the sharing and reuse of data becoming the norm. It should be characterised by a new generation of user-focused, cross-departmental, open, secure, interoperable, and data-driven digital public services.

Legal and regulatory frameworks, financial incentives and training packages should be developed to facilitate the emergence of sustainable knowledge-based SMEs, supported by a network of local digital enterprise hubs, and fit for purpose for the data economy.

Given the profound nature of the changes that will accompany digitalisation the programme should include proposals for a new social contract so as to reinvent social democracy for the digital age, provide the impetus for a more just digital society and increase trust in digital platforms through legislation.

Education is key to adapting to this cultural shift, acquiring digital skills, combating fake news and disinformation, and raising awareness of surveillance capitalism and the abuse of personal data. See Section 4 for recommendations on digital literacy and STEM education.

The proposed National Programme for Digital Transformation would launch the transition to a Digital Ireland. There is a need to involve a wide range of stakeholders across government, industry, and academia. Engineers Ireland can play a major role in developing such a programme and building the trusted services, systems, and infrastructure that will make Ireland's digital transformation a reality.

Building the gold-standard COVID-19 contact tracing app within 3 months

HSE COVID Tracker Ireland App by NearForm

As the COVID-19 pandemic swept the globe and hard-hit countries across Europe took increasingly bold measures to 'flatten the curve', the HSE explored new tools and resources to help manage the disease and bolster the health system in Ireland. The HSE began looking for a partner to develop a contact tracing app for Ireland, one that would be reliable, secure and easy for the public to use. And it needed to be built in just weeks. The sun was shining the afternoon of Sunday, 22 March, when NearForm got a call from the HSE. A broad, collaborative team including NearForm, the HSE, Department of Health, Office of the Government Chief Information Officer (OGCIO), An Garda Síochána and more quickly identified the user needs and data concerns for the app, and got to work. The team pushed hard into the night and Monday morning presented a prototype with a full user journey and onboarding sequence.

Everyone across the broader team agreed that this app needed to be built quickly, but more importantly it needed to be built right. Protecting the privacy and anonymity of users was paramount, and the reliability of close contact data was the focus. The app had to benefit the Irish contact tracing team and provide real support to the overall effort to protect Ireland's residents. The initial solution worked on the centralised data model, in which app data was stored in a central database. However, the team met with obstacles that could not be resolved, both technical and privacy-related. A joint Apple-Google application programming interface (API) overcame these challenges by allowing governments and health authorities to build apps according to a decentralised data model and specifically enable Bluetooth proximity detection on locked phones as long as users had Bluetooth turned on. The team decided to switch models and secured beta access to the new technology from Apple and Google. Moving as quickly as ever, the team redesigned the user onboarding flow and created a new working prototype. Dublin-based quality assurance firm Expleo worked with the HSE and An Garda Síochána to conduct user testing of the app, focusing especially on testing the Exposure Notification System (ENS) within the Apple-Google solution.

Within three months of that first phone call from the HSE, the team had a secure, tested, user-friendly, reliable contact tracing app that worked and was ready to be deployed on a national scale. User setup consists of four steps, and the app does not request access to any of the user's phone data. All contact data is stored in the app on the user's phone and is deleted after 14 days. Close contacts are recorded only when two phones running the app are within close proximity of each other for a minimum duration of time — this is currently within two metres for at least 15 minutes, but can be changed according to health authority guidelines. If a user tests positive for Covid-19, they will be asked to share their app data with the national contact tracing team and given a one-time use code to upload that data via encrypted transfer.

Designed for ease of use by all demographics, the user interface is simple and clean, with minimal navigation and plain language. Within 36 hours of the official launch, Ireland's COVID Tracker app had more than one million downloads, representing more than 20% of the population of Ireland and over a quarter of all smartphone users in the country. The speed and volume of adoption made it the most successful launch of a contact tracing app in the world and bodes well for the potential of the app to make a real impact in Ireland's effort against Covid-19.

NearForm, www.nearform.com

Recommendations

14 Adopt a National Programme for Digital Transformation setting out a vision for an equitable, secure, and sustainable transition to a digital society.

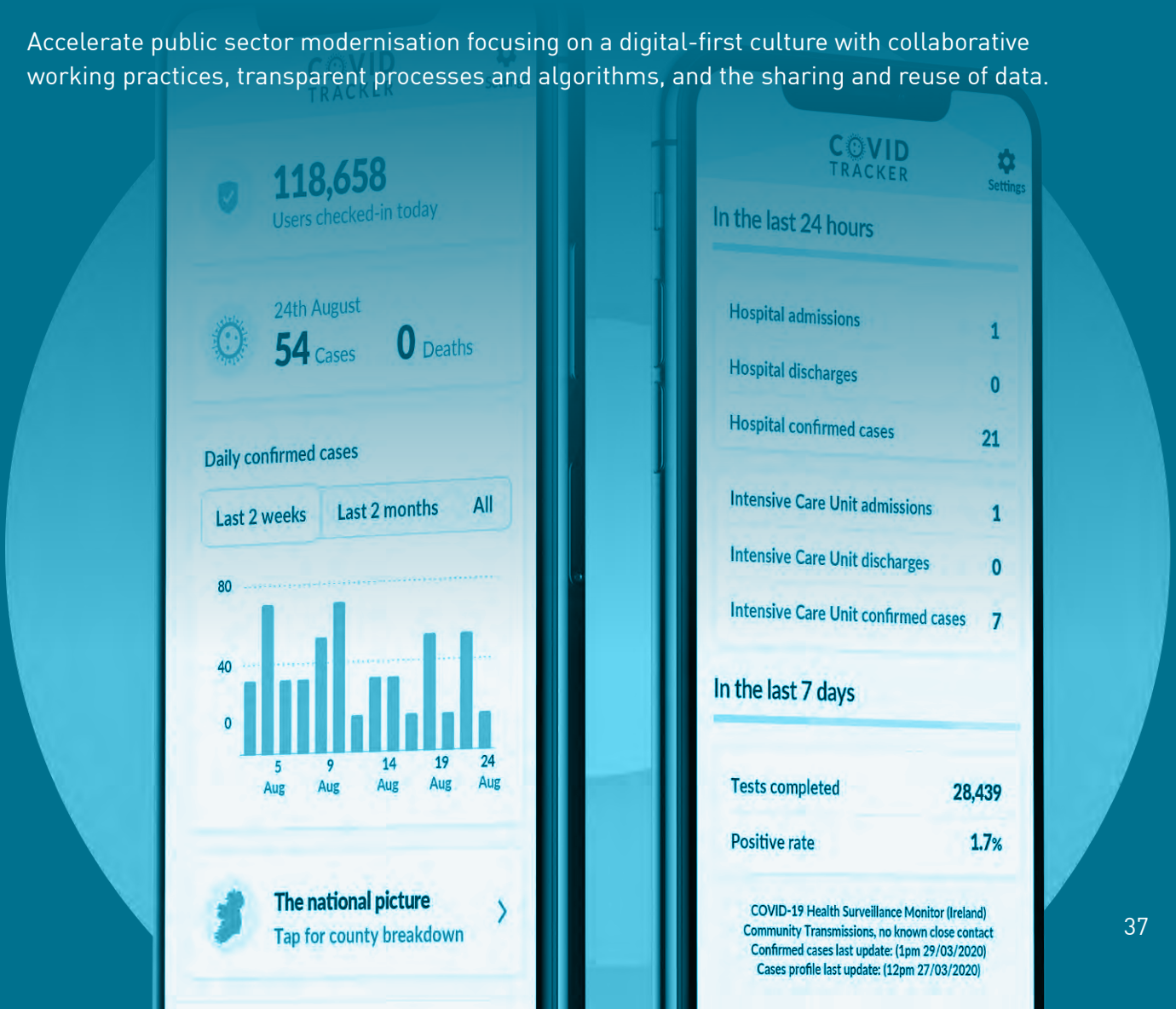
15 Accelerate the rollout of the National Broadband Plan and 5G mobile networks.

16 Adopt an all-island approach to physical, digital and social connectivity and support the development of connected digital enterprise hubs.

17 Legislate for a post-Brexit Common Data Space for the island of Ireland and prioritise its implementation so as to underpin the emergence of an all-Ireland data economy.

18 Review the security of the State's critical infrastructures and digital services and reinforce their protection from cyberattacks.

19 Accelerate public sector modernisation focusing on a digital-first culture with collaborative working practices, transparent processes and algorithms, and the sharing and reuse of data.




PSU

4 Education for a green and digital future

Scientific literacy and STEM education

The World Economic Forum has highlighted how Covid-19 is helping to make the case for scientific literacy for all:

> "Many of the problems resulting from the COVID-19 crisis have a root cause in science literacy. The immediate and global need for understanding science in the face of a pandemic has never been more urgent. Until a few months ago, most people not specialized in a STEM field would not remember the difference between a virus and a bacteria; antigen vs antibody; DNA vs RNA; linear vs exponential growth. [...] Now that the burden of mitigating the pandemic relies on our collective responsibility, this knowledge can be a matter of life and death, for yourself and others. We are living through a collective realization of how understanding science has tangible, practical, and immediate applications for our daily lives. This is why STEM skills must be included in the basic definition of literacy if we want to empower the next generation to address global challenges."[65]

Science, Technology, Engineering, and Maths (STEM) skills are vital for green and digital future for Ireland. In an era of digitalisation and climate action, a wide range of technical skills are needed. Data is a key asset for many businesses and the right mix of skills must be developed to meet that need. Leveraging the fact that data centres are choosing Ireland to locate their businesses can encourage related data analytics industries to also locate here, requiring data analytics engineers, software engineers, cybersecurity specialists. Digital and technology literacy will also have to be increased amongst the traditional technical trades, e.g. electricians and smart meters, smart EV chargers, smart controllers for homes and domestic microgeneration.

Engineers Ireland asked engineering leaders and a sample of engineering academics the question: 'Over the next 10 years, what skills will engineers need to develop?'.[66] Two of the main areas were:

- Digitalisation: BIM, data management and analytics, programming, AR/VR, AI, IoT
- Sustainability: environmental impact, energy-efficiency, green construction, renewable energy

The 'Attracting diverse talent to the engineering professions of 2030' project[67] found that engineers of the future will be presented with complicated, complex problems and will need to consider multi-perspective views, whilst being conscious of long-term effects, risk and the impacts of decisions on society. These engineers will most certainly need fundamental technical skills, but as the rate of change in technology increases, engineers must also become highly flexible lifelong learners, capable of adapting their practices to new technologies and developments. Student engineers of the future will need to master technical tools such as mathematics, as well as a broad palette of cross-functional and professional skills that will allow them to find ways of applying fundamental tools to the practice of achieving sustainable engineering projects.

Considering the skills required in the offshore sector over the next decade, there are shortages of engineers, economists, data scientists, skills relating to the procurement and manufacturing supply chain, tradespeople and technicians.[68] Additional funding should be allocated to the Government's Skillnets programme to provide the training required to create the workforce that will deliver the Climate Action Plan, particularly in areas such as the Midlands where the impact of the transition is being acutely felt.

In an era of rapidly-changing skills needs, lifelong learning is becoming increasingly important and should be promoted and supported. To ensure that the Irish economy provides high-value employment and growing exports, a culture of lifelong learning

should be engrained – embracing technical competences in combination with emotional intelligence, creativity, communication and ethics.

Engineers, as technically competent professionals committed to ethical practice, lifelong learning and leadership are well placed to help to future-proof our economy and society. On joining Engineers Ireland, all members make a fundamental commitment to ongoing self-improvement. It is this underpinning ethos – the professional obligation to learn – that is a decisive contributor to the credibility in society of the engineering profession. Lifelong learning should not only include new technical competences, it should explore skills in emotional intelligence, creativity, communication, ethics and leadership.

The World Economic Forum has also referred to a 'reskilling imperative' and has described the jobs of tomorrow as both 'digital' and 'human':

> "Demand for both "digital" and "human" factors is driving growth in the professions of the future. [...] On the one hand, these reflect the adoption of new technologies—giving rise to greater demand for green economy jobs, roles at the forefront of the data and AI economy as well as new roles in engineering, cloud computing and product development. On the other hand, emerging professions also reflect the continuing importance of human interaction in the new economy, giving rise to greater demand for care economy jobs; roles in marketing, sales and content production; as well as roles at the forefront of people and culture."[69]

Indeed, Engineers Ireland research demonstrates that the in-demand engineering skills over the next ten years range from transversal (such as communication and management) to technical (such as in digitalisation to sustainability).[70]

The Programme for Government commits to improving awareness of STEM career paths beyond purely technical careers and examine the scalability of existing pilot projects to encourage diversity in STEM subjects in line with the STEM Education Policy 2017-2026. The Programme also mentions developing a long-term sustainable funding model for Higher Level education in collaboration with the sector and supporting research and researchers.

There is a target to increase lifelong learning rates from 9% currently to 18% by 2025 and increasing the total number of new apprentice registrations to at least 10,000 per annum.

Engineers Ireland welcomed the STEM Education Policy Statement 2017-2026 which includes targets such as: increasing by 20% the total students taking Chemistry, Physics, Technology and Engineering for Leaving Certificate; increasing by 40% the number of females taking STEM subjects for Leaving Certificate; and building robust and sustainable partnerships between schools, business and industry, public sector bodies, research organisations, further and higher-level institutions and the arts. Progress made against these targets should be continued by the new Government.

Skills needs

STEM graduates will be needed to deliver the projects outlined in this report and Government policy. According to the 'Build 2020' report:

> "In order to deliver on Project Ireland 2040, Ireland needs a competitive, dynamic, and sustainable construction sector that delivers high quality physical infrastructure for all our citizens. As flagged in last year's report, labour supply has remained subdued. Employment growth in the construction sector decreased to 2.8 percent in the year to Q1 2020 to stand at 148,700. Employment of non-Irish workers in the construction sector had increased to 25,600 in Q1 2020, although this source of labour may be impacted by Covid-19. Skills supply is likely to continue to be a constraint in the medium term"[71]

A ready supply of engineers will be crucial for the delivery of the revised NDP and the Green New Deal. However, the number of students taking up engineering and technology courses needs to be much larger to meet current and future needs. For example, as a result of the last recession and cut to capital investment, Civil & Building Engineering graduate numbers fell by 50% in the five years to 2017. Almost all (94%) engineering employers consider a shortage of experienced engineers to be a barrier to growth and the National Skills Bulletin recognises shortages in almost all engineering

occupations. There is a significant gender gap in the engineering profession and we need to encourage women to enter and remain in engineering.

The Expert Group on Future Skills Needs examined the demand for skills in Ireland's built environment to 2030 to deliver on ambitions around housing, infrastructural development and climate change mitigation, as set out in strategies such as Project Ireland 2040 and the Climate Action Plan. The report notes how the changing technological and environmental factors, such as the increasing importance of building information modelling and nearly zero-energy buildings regulations, create a need for additional upskilling and retraining.[72]

Meanwhile, core funding per student at higher level has decreased detrimentally in the recent period and, in some institutions, laboratory equipment and other facilities have almost become obsolete. Inadequate resourcing undermines teaching, learning and research and the ability of our higher education institutions to be globally competitive. A sustainable funding model for higher education is urgently needed, including core funding, programmatic funding, infrastructure investment and industry-academic collaboration. In order to fund higher education in STEM and other areas adequately, a sustained level of funding will have to be committed by government over a medium to long term period. This should include apprenticeships, BIM technicians, and the development of specific skills in a variety of emerging technologies areas.

Professional engineering apprenticeships

New forms of apprenticeships have been developed in the past five years, led by industry consortia with higher education institution partners. These apprenticeships are flexible in delivery, including on-the-job learning (approx. 70%) and on-campus learning (approx. 30%). Apprentices are employed under a formal contract and are paid for the duration of their apprenticeship. Four of these new apprenticeships relate to the engineering profession:

- Industrial Electrical Engineering (see page 42)
- Manufacturing Technology
- Manufacturing Engineering
- Polymer Processing Technology

These apprenticeships are generally placed at Level 7 on the National Framework of Qualifications with a B.Eng. award upon completion after 2-3 years. There are 242 apprentices registered on these programmes and the first cohort graduated in 2018. Further professional engineering apprenticeships have recently been launched or are currently in development, including Principal Engineer (Level 10 - Professional Doctorate), Equipment System Engineer (Level 9) and Manufacturing Data Integration Engineer (Level 7).[73]

There is a major shortage of craft apprentices, numbers of which declined dramatically during the last economic recession. While these apprentices do not qualify as engineers, many become engineering technicians or progress to study engineering. These apprentices play a vital role in the wider engineering and construction sector and the decline in apprentice registrations is a key component of skills shortages in the sector. The role of apprentices in climate action could help to attract workers and the unemployed from other sectors of the economy to the engineering/construction sector and this form of learning.

Brexit and international mobility of engineers

The globalised nature of the engineering profession requires the supply of professional engineering talent in all government and industrial sectors across the globe. Engineers Ireland is a member of the International Engineering Alliance, a global not-for-profit organisation, which comprises members from 41 jurisdictions within 29 countries. Through educational accords and competence agreements members of the International Engineering Alliance establish and enforce internationally benchmarked standards for engineering education and expected competence for engineering practice. Engineers Ireland is a signatory to the Washington Accord, Sydney Accord and Dublin Accords, which means that accreditation decisions of Engineers Ireland are accepted in the signatory countries on the same basis as their "home" graduates.

Engineers Ireland is also a member of the European Network of Accreditation for Engineering Education, which licenses Engineers Ireland to award the EUR-ACE® label for first and second cycle engineering programmes. The EUR-ACE® labels is internationally recognised and is awarded by Engineers Ireland to HEIs for accredited progammes. Engineers Ireland is also member of the European Federation of National Associations of Engineering (FEANI), which publishes the European Engineering Education Database including Engineers Ireland accredited programmes. These international affiliations support graduate mobility in Europe and certain other countries.

In response to Brexit, Engineers Ireland reached an Access Pathways Agreement with the UK Engineering Council to guarantee that engineers who apply, are assessed and achieve a registered professional title from Engineers Ireland, will continue to have that registered title recognised if they seek work in the UK post-Brexit. Correspondingly, engineers in the UK, that receive a professional title from one of their 35 professional engineering institutions, will have that title recognised if they wish to come to work in the Republic of Ireland. This Agreement provides certainty to engineering professionals from the Republic of Ireland, Northern Ireland and Great Britain to support trade, the development of critical infrastructure and economic development regardless of the outcome of Brexit.

BEng in Industrial Electrical Engineering

(Apprenticeship) at Limerick IT

A Generation Apprenticeship is a third-level degree programme where the learner is primarily based in the workplace. Academic learning takes place for the full duration of the apprenticeship; blocks of learning on campus at Limerick Institute of Technology (LIT) combined with academic modules delivered while the learner is gaining hands-on training in a relevant setting.

Apprenticeships are paid employment allowing the apprentice to "earn while you learn", they provide an excellent opportunity to gain an undergraduate degree while at the same time gaining on-the-job experience relevant to your chosen career. The Bachelor of Engineering (BEng) in Industrial Electrical Engineering at LIT is the first of its kind to be accredited by Engineers Ireland.

The Apprenticeship in Industrial Electrical Engineering leading to the award of a Level 7 Bachelor of Engineering (BEng) Degree has been specifically designed as a progression programme for qualified electricians who wish to upskill and to acquire the advanced knowledge needed to enable them to move into engineering roles in Industry. The apprenticeship is a 2-year programme, with an approved employer. 70% of the time is spent on the job and the remaining 30% of the time is spent in LIT.

This two-year programme was developed in collaboration with the Electrical Engineering, Automation and Manufacturing Sectors who identified a need for qualified Industrial Electrical Engineers to address the skills gaps in these sectors. Apprenticeship contracts of employment are with a registered employer. The application for entry to the course are submitted by the employer.

Class contact hours

The programme involves a 24 month apprenticeship contract with an employer with 70% of the time spent on the job and with two 15 week blocks spent at the LIT. Contact hours while on the job will take up to 4 hours per week, which can be done in apprentice's own time or partly at work, depending on the relevance of the project to their daily work.

The LIT BEng in Industrial Electrical Engineering Apprenticeship produced the first graduates in Ireland on a Generation Apprenticeship programme. Some of those graduates are featured here with Professor Vincent Cunnane, President of LIT and Dr John Cosgrove, Section Head for Electrical Apprenticeships at LIT.

Career profile

The Industrial Electrical Engineer is required to design, plan, risk assess, trouble-shoot, program and commission a wide range of industrial electrical systems safely and in line with all relevant Irish and EU standards. These systems include electrical machines and motor controls, networked industrial controls (PLCs/SCADA), pneumatic actuated equipment, process and instrumentation (P&I) sensors/actuators, power protection equipment, industrial facilities and energy systems, production monitoring & tracking systems and any other electrical systems relevant to industry.

The Industrial Electrical Engineer is required to compile system and customer documentation, present proposals & analysis both within and without the company, co-ordinate work teams to achieve project success on-time and within the resources available, demonstrate systems operation, train system operators, carry out analysis & investigation, maintain, repair and constantly assess the needs for upgrading of industrial electrical systems.

Recommendations

20 Introduce a sustainable funding model for higher education, including core funding, programmatic funding, infrastructure investment and industry-academic collaboration.

21 Increase the number and range of professional engineering apprenticeships through industry-led consortia and expand Skillnets to fill skills gaps for the sustainable recovery.

22 Invest in a culture of lifelong learning, targeting digital skills (such as data analytics, AI and cybersecurity) and 'human' skills (such as communications, management and critical thinking).

23 Launch a nationwide digital literacy programme to combat disinformation, to foster the uptake of digital technologies, to raise awareness of the abuse of personal data and to counteract the socio-economic and geographical digital divides which have been exacerbated by COVID-19.

References

1. www.engineersireland.ie/About-Us/Our-Strategy/Sustainability
2. www.competitiveness.ie/publications/2020/ireland%20s%20competitiveness%20scorecard%202020.pdf
3. www.ey.com/en_ie/covid-19/how-infrastructure-spending-help-economies-return-strength
4. www.greenparty.ie/wp-content/uploads/2020/06/2020-06-15-ProgrammeforGovernment_Corrected-Final-Version.pdf
5. www.fiscalcouncil.ie/pre-budget-2021-statement-2/
6. www.ibec.ie/connect-and-learn/media/2020/05/11/ibec-launches-major-new-reboot-and-reimagine-campaign
7. www.irishtimes.com/opinion/economic-recovery-and-climate-action-must-be-aligned-1.4249820
8. www.housing.gov.ie/sites/default/files/legislations/2019_12_09_mpdm_general_scheme.pdf
9. https://www.housing.gov.ie/sites/default/files/public-consultation/files/consultation_paper_-_general_scheme_of_the_water_environment_abstractions_bill_2018.pdf
10. www.housing.gov.ie/sites/default/files/public-consultation/files/2019_1030_general_scheme_hpd_bill.pdf
11. www.dccae.gov.ie/en-ie/climate-action/legislation/Documents/5/Heads_of_Climate_Amendment_Bill.pdf
12. www.housing.gov.ie/sites/default/files/legislations/general_scheme_of_the_land_development_agency_bill_2019.pdf
13. www.ibec.ie/influencing-for-business/ibec-campaigns/better-lives-better-business/planning
14. http://ogp.gov.ie/wp-content/uploads/Table-1-Grant-Recipients-including-Revised-Thresholds-2018.pdf
15. www.p13.org.uk/
16. blogs.worldbank.org/climatechange/for-a-sustainable-recovery-from-covid-19#?cid=SHR_BlogSiteShare_EN_EXT
17. www.iea.org/commentaries/put-clean-energy-at-the-heart-of-stimulus-plans-to-counter-the-coronavirus-crisis
18. http://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
19. http://data.oireachtas.ie/ie/oireachtas/libraryResearch/2020/2020-05-14_l-rs-note-the-european-green-deal-and-its-implications-for-ireland_en.pdf
20. www.competitiveness.ie/publications/2020/ireland%20s%20competitiveness%20scorecard%202020.pdf
21. www.gov.ie/en/publication/4221c-waste-action-plan-for-a-circular-economy/
22. https://iwea.com/images/Article_files/6._11.45_Pat_OSullivan.pdf
23. www.engineersireland.ie/Engineers-Journal/More/Editors-choice/the-importance-of-stakeholder-and-community-engagement-in-engineering-projects
24. http://iae.ie/publications/lessons-from-the-covid-19-experience/
25. www.seai.ie/publications/Energy-Emissions-Report-2020.pdf
26. www.ren21.net/wp-content/uploads/2019/05/gsr_2020_full_report_en.pdf
27. http://iwea.com/latest-news/4138-ireland-on-track-for-2020-target-after-strong-second-quarter-for-wind-energy
28. http://iwea.com/latest-news/2948-new-poll-confirms-overwhelming-majority-back-wind-energy
29. www.eirgridgroup.com/site-files/library/EirGrid/2020-Qtrly-Wind-Dispatch-Down-Report.pdf
30. www.eirgridgroup.com/how-the-grid-works/ds3-programme/
31. www.iwea.com/images/files/iwea-saving-power-report.pdf
32. www.eirgridgroup.com/site-files/library/EirGrid/RESS-1-Final-Auction-Results-(R1FAR).pdf
33. www.iwea.com/latest-news/3554-wind-industry-urges-government-to-cut-power-prices
34. www.tandfonline.com/doi/abs/10.1080/15435075.2020.1791874
35. www.iwea.com/images/files/final-harnessing-our-potential-report-may-2020.pdf
36. www.opr.ie/co-ordinated-approach-at-regional-level-can-help-meet-local-authorities-reach-renewable-targets-planning-regulator-tells-wind-energy-conference/
37. www.engineersireland.ie/LinkClick.aspx?fileticket=SHtzZx9nDDg%3d&portalid=0&resourceView=1
38. www.gov.ie/en/publication/94929-pre-covid-19-productivity-research-in-construction-sector/
39. www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/beating-the-low-productivity-trap-how-to-transform-construction-operations
40. http://energypost.eu/a-revolution-the-netherlands-kisses-gas-goodbye-but-will-it-help-the-climate/
41. www.districtenergy.ie/heat-atlas
42. www.sciencedirect.com/science/article/abs/pii/S0360544216310295
43. www.dublinchamber.ie/DublinChamberofCommerce/media/banners/Dublin_The-15-Minute-City.pdf

44. www.csrf.ac.uk/2020/07/white-paper-long-haul-freight-electrification/
45. http://files.nesc.ie/nesc_reports/en/148_TOD.pdf
46. http://ec.europa.eu/energy/topics/energy-system-integration/eu-strategy-energy-system-integration_en
47. www.climatecouncil.ie/media/CCAC_AnnualReview2020FINALWEB.pdf
48. www.competitiveness.ie/publications/2020/ireland%20s%20competitiveness%20challenge%202020.html
49. www.ice.org.uk/news-and-insight/the-civil-engineer/august-2020/a-systems-approach-to-net-zero-targets
50. http://ec.europa.eu/energy/sites/ener/files/hydrogen_strategy.pdf
51. http://energyinstitute.ucd.ie/wp-content/uploads/2020/06/UCD-Energy-Institute-The-need-for-a-Hydrogen-Strategy-for-Ireland.pdf
52. www.competitiveness.ie/publications/2020/ireland%20s%20competitiveness%20scorecard%202020.pdf
53. www.comreg.ie/survey-highlights-the-growing-reliance-on-telecommunications-as-77-say-usage-has-increased-due-to-covid-19/
54. www.wdc.ie/wp-content/uploads/2020/05/Remote-Working-National-Survey-Report-May-2020-final.pdf
55. http://assets.kpmg/content/dam/kpmg/ie/pdf/2020/07/ie-accelerating-the-ndp-july-2020.pdf
56. http://nbi.ie/news/latest/2020/05/18/first-phase-of-national-broadband-plan-nbp-well-underway/
57. www.who.int/westernpacific/news/q-a-detail/5g-mobile-networks-and-health
58. http://dbei.gov.ie/en/Publications/Remote-Work-in-Ireland.html
59. http://digitalmagazines.online/Vodafone_Gigabit_Hub_Report.pdf
60. www.atlanticeconomiccorridor.ie/aec-hubs-project/
61. http://ec.europa.eu/digital-single-market/en/policies/digitising-european-industry
62. http://dbei.gov.ie/en/Publications/Publication-files/Study-on-digitalisation-of-manufacturing-sector-and-policy-implications-Ireland.pdf
63. http://dbei.gov.ie/en/Publications/Publication-files/Enterprise-2025-Renewed.pdf
64. http://ec.europa.eu/digital-single-market/en/desi
65. https://www.weforum.org/agenda/2020/08/science-education-reset-stem-technology/?utm_source=sfmc&utm_medium=email&utm_campaign=2729072_Agenda_weekly-21August2020&utm_term=&emailType=Newsletter
66. http://www.engineersireland.ie/LinkClick.aspx?fileticket=QIJJmhwkgSs%3D&portalid=0&resourceView=1
67. http://www.astep2030.eu/en
68. https://iwea.com/images/files/final-harnessing-our-potential-report-may-2020.pdf
69. https://es.weforum.org/reports/jobs-of-tomorrow-mapping-opportunity-in-the-new-economy
70. http://www.engineersireland.ie/LinkClick.aspx?fileticket=QIJJmhwkgSs%3D&portalid=0&resourceView=1
71. http://www.gov.ie/en/publication/c19a5-build-2020-construction-sector-performance-and-capacity/
72. http://egfsn.ie/all-publications/2020/final-building-future-skills-report.pdf
73. http://www.apprenticeship.ie

Image credits

Page 6: Rose Fitzgerald Kennedy Bridge, Arup and Mott MacDonald, ACEI Engineering Excellence Awards Project of the Year 2020 winners. Photo: Royston Palmer Photography

Page 28: NearForm

Page 32: Western Development Commission

Page 43: Limerick Institute of Technology

ENGINEERS IRELAND

Engineers are people who design, create, explore and innovate, working to solve some of the world's greatest challenges.

Supporting our organisations

- Engineers Ireland Jobs Desk
- Corporate Partner membership
- CPD accreditation
- Registered training providers
- Policy development representation
- Professional registers
- School and college programmes

Supporting our professionals

- Knowledge
- Recognition
- Community
- Professional development
- Career guidance
- Advocacy
- Networking

Further details at www.engineersireland.ie

Membership Team, Engineers Ireland, Tel: (01) 665 1334, Email: membership@engineersireland.ie, Web: www.engineersireland.ie

ENGINEERS IRELAND

Engineers Ireland, 22 Clyde Road, Ballsbridge, Dublin, Ireland. D04 R3N2
Tel: +353 (0) 1 665 1300 | Email: info@engineersireland.ie | Web: www.engineersireland.ie