



Rialtas na hÉireann
Government of Ireland

Focus on Energy, Sustainability & Natural Resources

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Energy, Sustainability & Natural Resources

Description

Energy, sustainability and natural resources encompass a range of goods and services that fall within the scope of environmental and natural-resource use, management and protection. For the purposes of this brief, the 'sector' is categorised in terms of:

Energy renewables and efficiency:

- The pursuit of lower emissions nationally from a combination of increased renewable energy generation and use, and the achievement of greater efficiencies in the reduction in use of fossil fuels (coal, oil, peat and gas). Enterprises have emerged that exclusively focus on renewable energy including builders/operators of energy utilities, services companies that operate nationally as well as internationally, technology developers and companies who export energy.

Sustainability

- The need to transition to a sustainable industry with a sustainable energy supply and a circular economy with reduced waste, is pervasive across various sectors, e.g. manufacturing, construction, agri-food, smart cities, transport etc. It has a cross cutting impact within the economy driven by climate disruption environmental pollution and degradation and customer preferences for more eco-friendly choices. Enterprises have emerged or transformed to exclusively focus on the growing demand for more environmentally-friendly products and services. These include eco-building and construction materials; water/wastewater treatment; waste management; environmental consultancy, green ICT applications and software; and smart grid development.

Bioeconomy and Circular Economy

- The bioeconomy covers all sectors and systems that rely on biological resources (animals, plants, micro-organisms and derived biomass, including organic waste), their functions and principles interlinking land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products such as chemicals, materials, energy and services¹.
- In a circular economy, growth is centred around production models based on long life products that can be renewed, reused, repaired, upgraded or refurbished.

¹ https://ec.europa.eu/research/bioeconomy/pdf/ec_bioeconomy_strategy_2018.pdf; nova paper #9 on bio-based economy 2018-01 The "Circular Bioeconomy" – Concepts, Opportunities and Limitations.

- Circular economy systems are designed to keep products in use for as long as possible and aim to design out and eliminate waste and regenerate natural systems.

Geosciences

- Geoscience is multidisciplinary and provides knowledge and understanding of earth systems, including potential future resources and the adaptations needed to support sustainable development.
- The Geoscience sector supports a range of economic services and activities, including extractive industries (quarrying and mining), geo-energy, groundwater resources and education and research and helps to minimise the economic and social cost of natural hazards.²

Snapshot

		Market Size	Growth Forecast
Global	Renewable Energy ⁱ	\$726 billion (2017)	\$1,204.9 billion by 2022, CAGR 10.6% (2017-2022)
	Metals and Mining ⁱⁱ	\$2,330.8bn (2017) ⁱ	-1.5% CARC ³ (2013-2017)
Europe	Renewable Energy ⁱⁱⁱ	\$247.4 billion (2017)	\$384.1 billion by 2022, CAGR 6.9% (2017-2022)
	Gas Utilities ^{iv}	\$555.9 billion (2017)	\$609 billion by 2022, CAGR 1.8% (2017-2022)
	Power Generation ^v	\$316.3 billion (2017)	\$369.1 billion by 2022, CAGR 3.1% (2017-2022)
	Electricity Retailing ^{vi}	\$614.6 billion (2017)	\$629.1 billion by 2022, CAGR 0.5% (2017-2022)
	Metals & Mining ^{vii}	\$317.2 billion	\$326.9 billion (2022) CAGR 0.6% (2017-2022)
Ireland	Power Generation ^{viii}	Market value \$3.6 billion Market volume 29.3TWh (2017)	\$4.1 billion by 2022 CAGR 2.6% (2017-2022) 33.1 TWh by 2022
	Energy Consumption	Renewable energy 11% of gross final consumption (2018) ^{ix}	Ireland has a binding target of 16% by 2020
	Geoscience	Economic impact 2016 [*]	Employment 2016

² An Economic Review of the Irish Geoscience Sector, Indecon International Economic Consultants, November 2017

³ Compound annual rate of change

	€1,790 million (Direct)	15,110 FTE (Direct)
	€3,277.9 million (Overall)	24,237 FTEs (Overall)
Fuel Exports ^{xi}	€886.1 million, 2019	

- i. Global Renewable Energy, Marketline, July 2018
- ii. Global Metals & Mining: Marketline, October 2018
- iii. Renewable Energy in Europe, Marketline, July 2018
- iv. Gas Utilities in Europe, Marketline, August 2018
- v. Power Generation in Europe, Marketline, August 2018
- vi. Electricity Retailing in Europe, Marketline, November 2018
- vii. Metals & Mining in Europe: Marketline October 2018
- viii. Power Generation in Ireland, Marketline, August 2018
- ix. Energy in Ireland 2019, SEAI (Target 16% 2020)
- x. An Economic review of the Irish Geoscience Sector, Nov 2017, Indecon Economic Consultants for DCCAE; Overall Economic impact & employment includes direct, indirect and induced impacts and employment and comprises contributions of €661m/8,767 FTE from Geotourism & Geoheritage, €65m/745FTEs Groundwater collection, treatment & supply, €1,656/7,822FTEs Extractive industries, €53m/724FTE Geosciences Research, €844m/6,681FTEs Natural Hazards.
- xi. CSO External Trade, figure includes exports of: Mineral fuels, lubricants and related materials; Coal, coke and briquettes; Petroleum, petroleum products and related materials; Gas, natural and manufactured; Electric current

Note: This Sectoral Report refers to the broad area relating to Energy, Sustainability and Natural Resources including Bio-economy and Circular economy considerations. In the strictest sense, it is not a discrete sector but refers to a range of activities across many sectors, which have the common characteristic of being aimed at reducing negative impacts on the environment. It highlights opportunities arising from Ireland's natural resources, e.g. in the geosciences sector. The Brief has focused primarily on the enterprise perspective in terms of opportunities and actions. The reader should also refer to the Agri-food & Beverages, Marine & Maritime, Biopharmachem and Financial services sectors for which separate reports have been completed.

Pre-COVID-19 Position

A global challenge posed by climate change – driving renewables, energy efficiencies and waste/emissions reductions

- Global drivers of growth include climate action and emissions reduction targets, diminishing natural resources, environmental legislation and consumer preferences. The imperative for sustainability is driving behavioural change, technology development and policy as world economies seek to transition to low carbon, bio and circular economies.
- EU countries have agreed on a framework for climate and energy, including EU wide targets to reduce greenhouse gas emissions by 40% by 2030 compared to 1990 levels. 2030

targets have also been set for the EU to achieve at least a 32% share of renewable energy consumption and at least 32.5% increase in energy efficiency.⁴

- The estimated share of renewables in global electricity generation was more than 26% by the end of 2018. However, as in previous years, renewables saw far less growth in the heating, cooling and transport sectors than in the power sector.⁵
- Many energy providers traditionally focused on fossil fuels are now expanding their portfolios to include renewable energy in response to greenhouse gases emission targets, climate change and consumer demand.
- The EU Commission published the European Green Deal⁶ in December 2019 which outlines measures towards mainstreaming sustainability in all EU policies, supplying clean energy, mobilising industry for a clean and circular economy, building and renovating in an energy and resource efficient way, accelerating the shift to sustainable and smart mobility, designing a fair, healthy and environmentally friendly food production system, preserving and restoring ecosystems and biodiversity, sustainable use of resources and improved human health. The EU Industrial Strategy aims to address the twin challenge of green and digital transformation, in conjunction with a new circular economy action plan which will include a sustainable products policy to support circular design and reduce waste. While the circular economy action plan will guide the transition of all sectors, action will initially focus on resource-intensive sectors such as textiles, construction, electronics and plastics.
- The 2018 update of the Bio-economy Strategy and its Action Plan⁷ which is part of the new circular economy action plan aims to accelerate the deployment of a sustainable European Bio-economy to address ensuring food and nutrition security, managing natural resources sustainably, reducing dependence on non-renewable, unsustainable resources whether sourced domestically or from abroad, mitigating and adapting to climate change and strengthening European competitiveness and creating jobs, maximising its contribution towards the 2030 Agenda and its Sustainable Development Goals (SDGs), as well as the Paris Agreement.
- *Closing the Loop*: An EU Action Plan for the Circular Economy contains 54 measures covering a range of areas concerning consumption and production processes and products across priority sectors including plastics, food waste, critical raw materials, biomass and bio-based products, and construction and demolition. The EU also plans to establish a €100 million Circular Bio-economy Thematic Investment Platform to bring bio-based innovations closer to the market and de-risk private investments in sustainable solutions.
- Initiatives spanning the Raw Materials Group (DG Grow) and DG Environment, European Innovation Partnership on Raw Materials, EU COSME Geothermal Energy Research,

⁴ EU Targets only. Targets for Member States yet to be agreed. European Commission, 2030 Energy Strategy, (2016): <https://ec.europa.eu/energy/en/topics/energy-strategy/2030-energy-strategy>

⁵ Ren21, Renewable Energy Policy Network for the 21st Century, Renewables 2019 – Global Status Report (2019)

⁶ The European Green Deal

⁷ https://ec.europa.eu/research/bioeconomy/pdf/bioeconomy_line_actions.pdf

demonstrate EU objectives to reduce dependency on imports; make the EU a leader in raw materials capabilities and mitigate environmental, social and health impacts.

- Technology development and adoption to address economic and societal challenges was a key focus for the geoscience sector, including more extensive use of sensors, UAVs, AUVs and satellites as well as enhanced imaging, telemetering and data analytics.⁸

A sector at the heart of climate transition, focused on increasing renewables and transitioning to a circular economy. Energy forms a key aspect of all enterprises' cost base, driving the need for improved efficiencies by suppliers, enterprises and consumers and for internationally competitive costs.

- The energy market in Ireland consists of fossil fuels and renewable energy. Ireland has excellent renewable energy resources, which is a critical and growing component of Irish energy supply. Renewable energy sources include:
 - Wind: The vast majority of renewable wind energy generation in Ireland is on land. It is anticipated that available sites on land for wind energy generation will be reduced in the next decade. However, Ireland is in an advantageous position to exploit offshore renewable wind energy generation, off the west coast. Ireland's marine territory extends to 10 times our land mass (880,000km²). This industry is growing fast and there will be a significant ramp up in global deployment of offshore renewable wind energy generation over the next 5-10 years. On the west coast, Ireland has one of the best coastal/marine wind resources in Europe.
 - Biomass: Ireland has one of the best climates for growing biomass and supports the forest sector in developing this market. Companies are investing in biomass plants fuelled by local sustainable forestry and waste wood. Our agriculture sector is a growing supplier of bioenergy and provides opportunities for biogas production through anaerobic digestion for energy generation and transport fuel; Biomass has a wide geographical distribution and is located across all counties in Ireland. Supply and mobilisation is dependent on the availability of local markets and a number of large scale industrial processors. Significant amounts of forest biomass is forecasted to double in the next 10 years and availability of supply will depend on mobilisation of forests from over 23,000 forest owners. Biomass in general has a number of competing uses with limited resource for both bio-based products, nutrients and energy. Competing uses and uncertainty around feedstock availability and costs can impact biomass supplies nationally.
 - Offshore Marine Renewables (ocean): Ireland has unrivalled wave energy in Europe and has test and multiple demonstration facilities;

⁸ An Economic Review of the Irish Geoscience Sector, Indecon International Economic Consultants, November 2017

- Solar & Geothermal: Ireland has considerable potential with untapped deep geothermal opportunities, as are being exploited now elsewhere in Europe. Geoscience Ireland is engaged in an COSME study of opportunities for EU SMEs to develop enterprises in the geothermal sector.
- Energy supply in Ireland in 2018 was dominated by oil which accounted for 48.8% of primary energy supply, natural gas 30.6%, coal and peat 10.6%, renewables 10%.⁹
- 36% of Ireland's electricity was from renewable sources in 2019 with the rest sourced from gas (52%), coal (2%), and peat (6%).¹⁰
- Ireland was 12th out of the EU-28 for renewable electricity in 2018 with the share of renewable electricity (RES-E) at 33.2%.¹¹
- Ireland will miss the target for cumulative emissions set for the period 2013 to 2020 by a little under 5%. The expectation is that recent growth in emissions, particularly from industry, agriculture, and transport will put us on a trajectory to be over 25% off target for the 2021-2030 period.
- The single electricity market (SEM) on the island of Ireland covers Ireland and Northern Ireland and involves cross-border flows of power between the two jurisdictions in a single bidding zone wholesale market.
- The Geosciences sector in Ireland had an overall economic impact, in terms of the economy-wide value of output supported, of €3.28 billion in 2016. The sector contributed approximately €676 million directly to Irish economy GVA/GDP. Taking account of both indirect and induced activity, the overall GVA contribution is estimated to be €1.47 billion. Employment in the Geosciences Sector is estimated at 15,000 FTEs, (25,000 including indirect and induced multiplier impacts).¹²
- Companies in the Geoscience Ireland business cluster which is sponsored by DCCAE's Geological Survey Ireland and Enterprise Ireland had a combined turnover of €1.025bn 2018, €300m by the SME cohort. Total employment in these companies reached 4,262 in 2018, of which 2,172 are employed by SMEs. 60% of employment was outside Dublin.¹³
- In terms of mining, Ireland still maintains significant status for zinc production in Europe, due to operations at the Navan Mine, the largest underground zinc mine in Europe and by far the most significant mining facility in the State. Approximately 600 people are directly employed at the mine along with additional contract staff. In 2019, Ireland produced 10.8% of European zinc mine output (4th in Europe). Zinc has significant potential as a battery mineral as part of the transition to EVs.

⁹ SEAI, Energy in Ireland 2019

¹⁰ SEAI, renewable energy statistics

¹¹ Renewable Energy in Ireland 2020 Update- SEAI

¹² Indecon analysis, 2017. Note this figure includes a contribution of €661m from Geotourism and Geoheritage

¹³ Geoscience Ireland

- In terms of mineral exploration in Ireland, in April 2020, 47 exploration companies held a total of 517 Prospecting Licences while total mineral exploration expenditure in 2018 was approximately €21m.

Impact of COVID-19

GLOBAL

- The COVID-19 pandemic represents the biggest shock to the global energy system in more than 70 years, with demand this year set to contract by 6%, the largest in 70 years in age terms and result in a record annual decline in carbon emissions of almost 8%.¹⁴
- Government policies during the COVID-19 pandemic drastically altered patterns of energy demand around the world. With many international borders closed and populations confined to their homes, transport was reduced, and consumption patterns changed. Daily global CO2 emissions decreased by 17% by early April 2020 compared with the mean 2019 levels, just under half from changes in surface transport. At peak restrictions, emissions in individual countries decreased by 26% on average. Government actions and economic incentives post-crisis will likely influence the global CO2 emissions path for decades.¹⁵
- Restrictions have resulted in a major shift towards low-carbon sources of electricity including wind, solar PV, hydropower and nuclear. After overtaking coal for the first time ever in 2019, low-carbon sources are set to extend their lead this year to reach 40% of global electricity generation – 6 percentage points ahead of coal. Demand for electricity from coal and natural gas is declining driven by low overall power demand and increasing output from renewables. As a result, the combined share of gas and coal in the global power mix is set to drop by 3 percentage points in 2020 to a level not seen since 2001.¹⁶

NATIONAL

- Electricity, gas and fuel supplies have continued uninterrupted in terms of international markets (gas, oil, fuels) and national distribution channels (electricity, gas and fuels).
- The average daily electricity demand from week 3 to week 12 of 2020 was around 90 GWh. The first week of the stay-at-home restriction was week 14 when demand dropped to an average of 76 GWh. In week 21, May 18th-24th, demand averaged 71 GWh, a 21% reduction on pre-restrictions.¹⁷

¹⁴ Global Energy Review 2020. International Energy Agency, 28 April 2020.

¹⁵ <https://www.nature.com/articles/s41558-020-0797-x>

¹⁶ <https://www.iea.org/news/global-energy-demand-to-plunge-this-year-as-a-result-of-the-biggest-shock-since-the-second-world-war>

¹⁷ Tracking effect of COVID-19 on energy supply and demand- SEAI

- Newest available figures from the Sustainable Energy Authority of Ireland (SEAI) shows that deliveries of fuel for air travel sank by 84% in April while deliveries of petrol and diesel were down 55% and 52% respectively due to Covid-19 lockdowns.¹⁸
- In terms of air pollution, data from the Environmental Protection Agency showed levels of air pollution in Ireland from solid-fuel burning have not changed and are generally in line with the monthly average. However, there has been a significant decrease of up to 50pc in concentrations of the greenhouse gas nitrogen oxide from a reduction in road traffic.¹⁹
- Based on a 12-week lockdown and a 12 week return to recovery MaREI forecast that Irish transport emissions will fall from 12.4 to 9.4 million tonnes of CO₂ in 2020.
- A survey completed by the Geoscience Ireland business cluster in late April 2020 reflects the severe impact of the COVID-19 pandemic on its 40 member companies. 74% of members noted that they had experienced projects being delayed or cancelled.²⁰ The situation has improved somewhat since then.

Issues, Opportunities and Challenges for the Sector

- Renewable energy sources supplied 11% of overall energy use in 2018 with the remainder coming from fossil fuels. This data suggests that Ireland is not on track to meet its binding EU target of 16% of energy to come from renewable sources by 2020.²¹
- Ireland had an installed solar photovoltaic (PV) capacity of 29MW in 2018. It is estimated that 1,500MW is achievable by 2022, representing 5 per cent of Ireland's electricity demand. The Irish Solar Energy Association (ISEA) estimates that 2GW solar power could create over 7,000 jobs whilst meeting 7 per cent of the country's electricity demand.
- The current levels of emissions reductions caused by COVID-19 cannot be sustained but there are learnings that can enable long term changes to the energy system. By exploring the impact the restrictions are having on Ireland's pollution levels, we can pursue feasible actions to mitigate climate change.
- In 2019, approximately 24,700 households received support under SEAI schemes to improve the energy efficiency of their homes.
- Challenges are expected in scaling up retrofitting work to the levels anticipated in the Climate Action Plan (500,000 retrofits to a BER of B2/cost optimal equivalent and 400,000 heat pumps to replace existing heating systems). These include:
- demand side issues (e.g. reductions in demand due to loss of income/consumer confidence; concerns about accessing homes); and

¹⁸ Tracking effect of COVID-19 on energy supply and demand-SEAI (Currently oil supply data is available up to the end of April).

¹⁹ The Pandemic and Ireland's Energy System – what are the impacts for greenhouse gas emissions?" MaREI

²⁰ Geoscience Ireland Membership Survey

²¹ Renewable Energy in Ireland 2020. SEAI

- supply side issues (e.g. contractors no longer available; productivity issues arising from social distancing requirements).
- High risk and large capital expenditure required for demonstration and deployment of pilot, demonstration and large scale biorefineries results in the reluctance of private investors to bear the entire financial burden required to build the first key facilities without public support. Alignment of biorefinery and renewable energy facilities.
- Bio-based is multi-sectoral with fragmented value chains and untried or non-existent industrial ecosystems. The development of successful and widely implementable bio-based value chains needs to identify and exploit cross-sectoral synergies to be based on inclusive patterns with all different private and public actors involved: from primary producers to end users and brand owners, and from regional and local authorities to civil society. Embracing this broad range of stakeholders will enable the necessary spill over effect for the whole bio-based sector and will increase the coherence and robustness of its value chains.
- As 35% of GI member companies revenues (€360M in 2018) derive from overseas operations, a major concern is the uncertainty surrounding reopening of international travel allowing access to projects abroad.²²
- The July Jobs Stimulus 2020 includes €10 million will be provided to support businesses engaging in green research, development and innovation, capital investment, and capacity building, through the first phase of a new Green Enterprise Fund.

²² Geoscience Ireland