LAPSE OF TIME

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INTERNATIONAL MONETARY FUND

IRELAND

SELECTED ISSUES

May 25, 2021

Approved By
European Department

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CONTENTS

CONSIDERATIONS FOR CLIMATE CHANGE MITIGATION IN IRELAND[1]

Ireland has adopted an ambitious and far-reaching climate action plan, which will require strong and sustained policy efforts to meet the new emission reduction targets consistent with the EU climate goals. Complementing a gradually increasing carbon price with a wide range of sector-specific policies will help reduce the transition costs and protect vulnerable groups in the shift to a greener, more sustainable, and fairer economy. The post-COVID recovery provides an opportunity to accelerate the adoption of climate-friendly policies in sync with EU-level initiatives, including by boosting public investment in transportation networks and electricity grids for clean energy, subsidizing building renovation to achieve greater energy efficiency, and supporting R&D in new low-emission technologies and carbon sequestration, including through agronomic measures and the restoration of peatlands.[2]

1. In March 2021, the Irish government has approved the Climate Action and Low Carbon Development (Amendment) Bill 2021, which once passed, will legislate a target to halve greenhouse gas (GHG) emissions by 2030 and to achieve net carbon neutrality no later than 2050. Building on earlier commitments under the Climate Action Plan 2019, this will make Ireland's climate action agenda one of the most ambitious worldwide. Ireland has already committed to a long-term trajectory of annual increases in the carbon tax rate leading to a rate of €100 per ton in 2030. Budget 2021 has increased the rate by €7.50 to €33.50 as an important first step towards making carbon pricing more effective and places Ireland above the EU average (Figure 1)[3] and boosting investment in low-emission public transport, energy-efficient housing, and renewable energy production. The law also introduces a legal requirement to adhere to five-year carbon budgets, consistent with the Paris Climate Agreement and sets emission ceilings on all sectors. The Climate Change Advisory Council is expected to propose to the Government the country's first five-year carbon budget later this year.

2. However, progress in climate change mitigation over the past two decades has been slow and uneven due to high economic and population growth and the sectoral specificity of

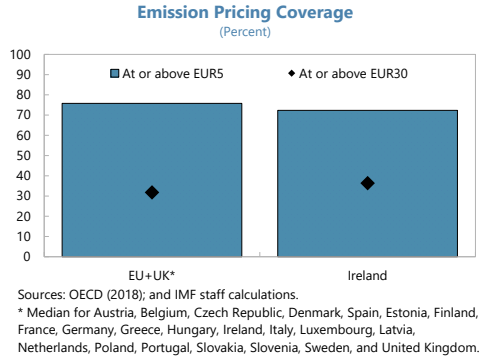
[1] We thank members of the EUR Climate Working Group as well as staff at the Department of Finance, the Department of Public Expenditure and Reform, the Department of the Environment, Climate and Communications, as well as the Central Bank of Ireland for their helpful feedback and suggestions. We are also very grateful for the insights from Prof. Peter Thorne (Maynooth University Department of Geography).

[2] In fact, peat bogs capture more CO_2 than forests, and they act like sponges absorbing excessive rainfall.

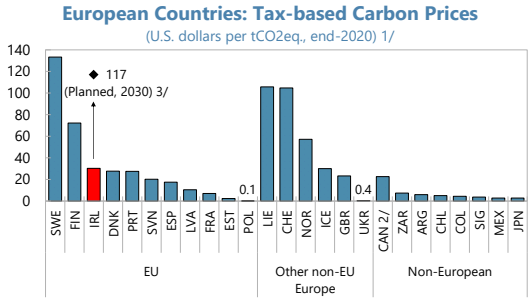
[3] Ireland's planned increase in carbon taxation is in line with that of other countries—for example, Sweden, Finland, and Denmark have robust carbon taxes for sectors subject to the EU Effort Sharing Regulation. Germany and Canada have also announced ambitious plans, and the EU pledged to cut emissions from 40 percent to 55 percent below 1990 levels by 2030.

emissions. Ireland has missed 2020 EU climate targets [4] by a significant margin. High economic growth since 2005 and sectoral specificity of the emissions (with one-third of emissions coming from agriculture) largely explain the limited progress in emission reduction. So far, the strong emissions reductions have come from the power and industry sectors, which are, for the most part, already subject to carbon pricing via the EU Emissions Trading System (ETS). Other sectors, where the emission reductions remain a national competence, have seen less progress (Figure 2). Challenges are particularly large in the buildings and agricultural sectors, which together contribute three times as much to emissions in Ireland than they do in other EU countries.[5] In housing, population growth and smaller households partially offset emission reduction from higher energy efficiency and improved energy mix (Figure 7). The projected GHG emissions in 2019 were merely about 15 percent below 2005 levels, and strong mitigation policies are needed to meet the proposed pace of emissions reduction at an average of 7 percent a year to 2030 (and net zero emissions by 2050). Ireland's high share of biogenic emissions from agriculture makes effective abatement particularly challenging and calls for innovative solutions, including incentivizing carbon sequestration through the agronomic measures and the restoration of peatlands.

Figure 1. Ireland: Carbon Pricing in the EU and Ireland



Sources: OECD (2018); and IMF staff calculations.
* Median for Austria, Belgium, Czech Republic, Denmark, Spain, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Latvia, Netherlands, Poland, Portugal, Slovakia, Slovenia, Sweden, and United Kingdom.



Sources: national authorities; World Bank; and IMF staff calculations.
1/ Applies mostly to transport fuels and excludes ETS for the energy sector.
2/ Canada has also regional carbon taxes that are higher (British Columbia) or lower (Newfoundland, Labrador) than the national rate.
3/ At the USDEUR exchange rate of 1.17 (as of end-March 2021).

3. There is also growing awareness of the significant climate change-related physical risks in Ireland (and their uneven impact across the country), which has made policy discussions on effective climate policies more pressing. Some of these risks from extreme events, like heatwaves, landslides, floods, or storms, as well as long-term, progressive shifts include:

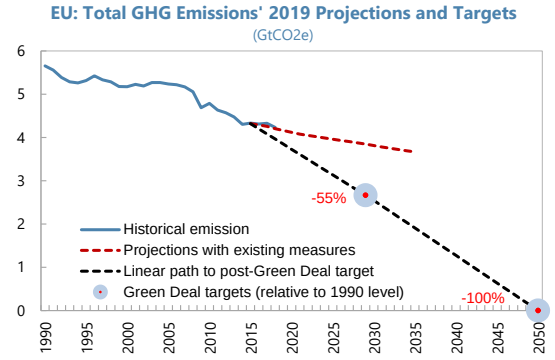
[4] In its European Semester Country Report for Ireland 2019, the European Commission observed that Ireland has so far failed to decouple its economic growth from GHG emissions and air pollutants. The EU Effort Sharing Regulation target required a 20-percent GHG emissions reduction by 2020 relative to 1990; however, GHG emissions in Ireland declined by merely 4 percent. According to EPA projections, Ireland is currently not on the right trajectory to meeting the 2030 or 2050 EU emission reduction targets (prior to the adoption of recent measures in March 2021).

[5] According to the Sustainable Energy Authority of Ireland (SAIE), the country also still relies excessively on fossil fuels for transport, heating and electricity production, with over 90 percent of all energy used in 2017 coming from fossil fuels.

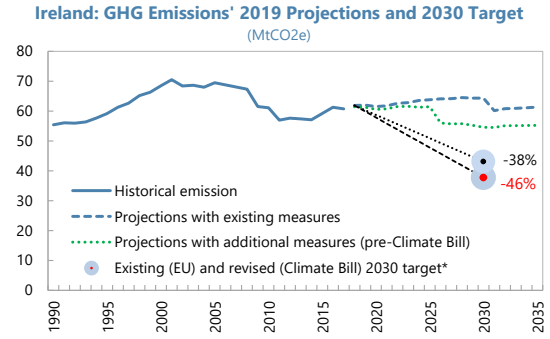
- *Severe coastal flooding* due to rising sea levels, which make it more likely that storm surges and spring high tides coincide in the near future, especially in Dublin and Cork, which are built on reclaimed saltwater marshes,[6] and
- *Growing weather variability*, including more frequent extreme rainfall, which could increase the severity of river flooding and exacerbate the water overflow in combination with storm surges, and a re-emergence of droughts (together with a higher volatility in rainfall) adversely affecting the crop cycle (Figure 3).

Figure 2. Ireland: Climate Change Mitigation—Overview of GHG Emissions

Over the last decade, EU GHG emissions have decreased noticeably but have remained largely unchanged in Ireland.

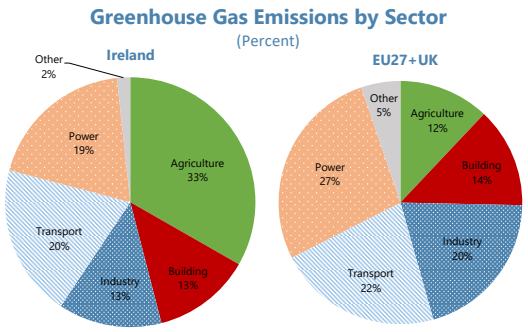


Sources: European Environment Agency; European Commission; and authors.

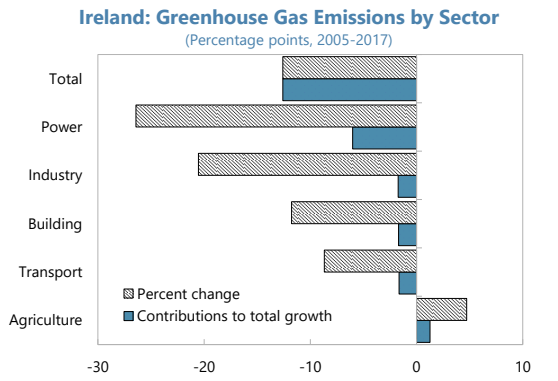


Sources: European Environment Agency; European Commission; and authors.
Note: Reflects the emission-weighted average of the 43-percent reduction target for energy (subject to ETS) and the emission reduction in other sectors by either 30 percent under the EU Effort Sharing Regulation or 50 percent under the Climate Action Bill 2021.

Most of the domestic emissions in Ireland are from agriculture and buildings where the emission reduction was the smallest.



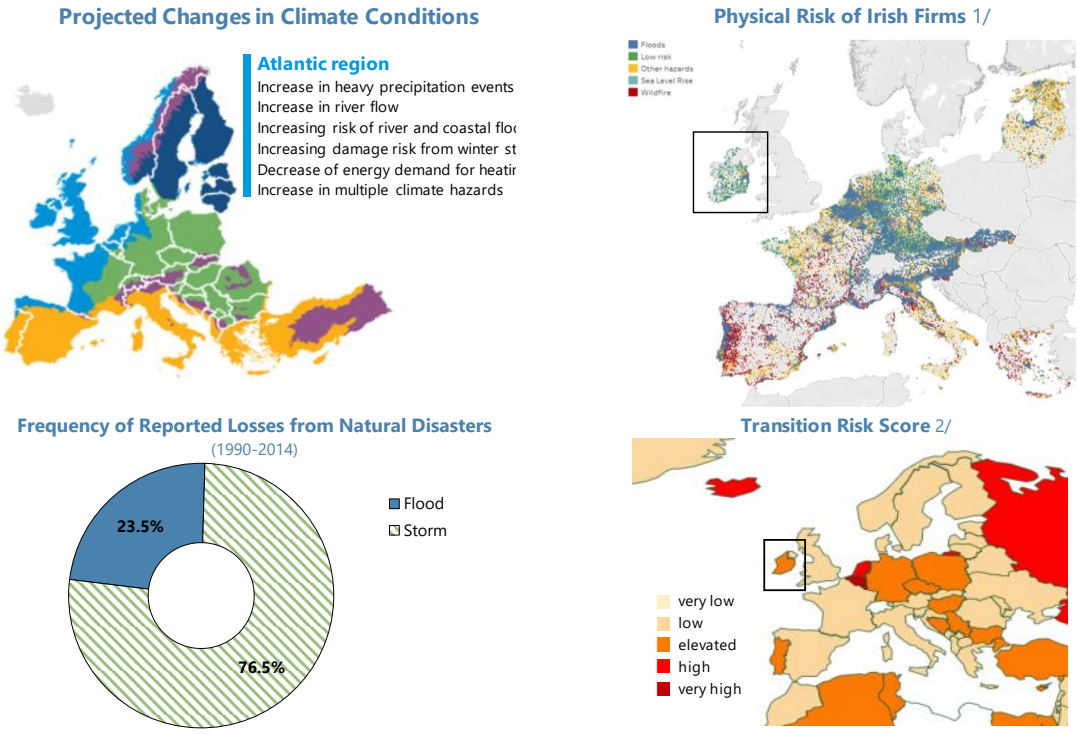
Source: United Nations Framework Convention on Climate Change.
Note: Excluding international aviation and shipping.



Sources: United Nations Framework Convention on Climate Change and IMF staff calculations.
Note: Excluding international aviation and shipping.

[6] An average sea level rise of between 0.5 to 1 meter by the end of the century, in combination with storm surge events, could result in as much as 1,000km^2 of coastal lands around Ireland being inundated by the sea if no protective measures are undertaken.

Figure 3. Ireland: Climate Change—Overview of Physical and Transition Risks



Sources: European Central Bank; European Environmental Agency (https://www.eea.europa.eu/data-and-maps/figures/key-past-and-projected-impacts-and-effects-on-sectors-for-the-main-biogeographic-regions-of-europe-5/map-summary-climate-change-2008.eps/image_large); OFDA/CRED—International Disaster Database (Université catholique de Louvain Brussels); European Investment Bank; and authors.

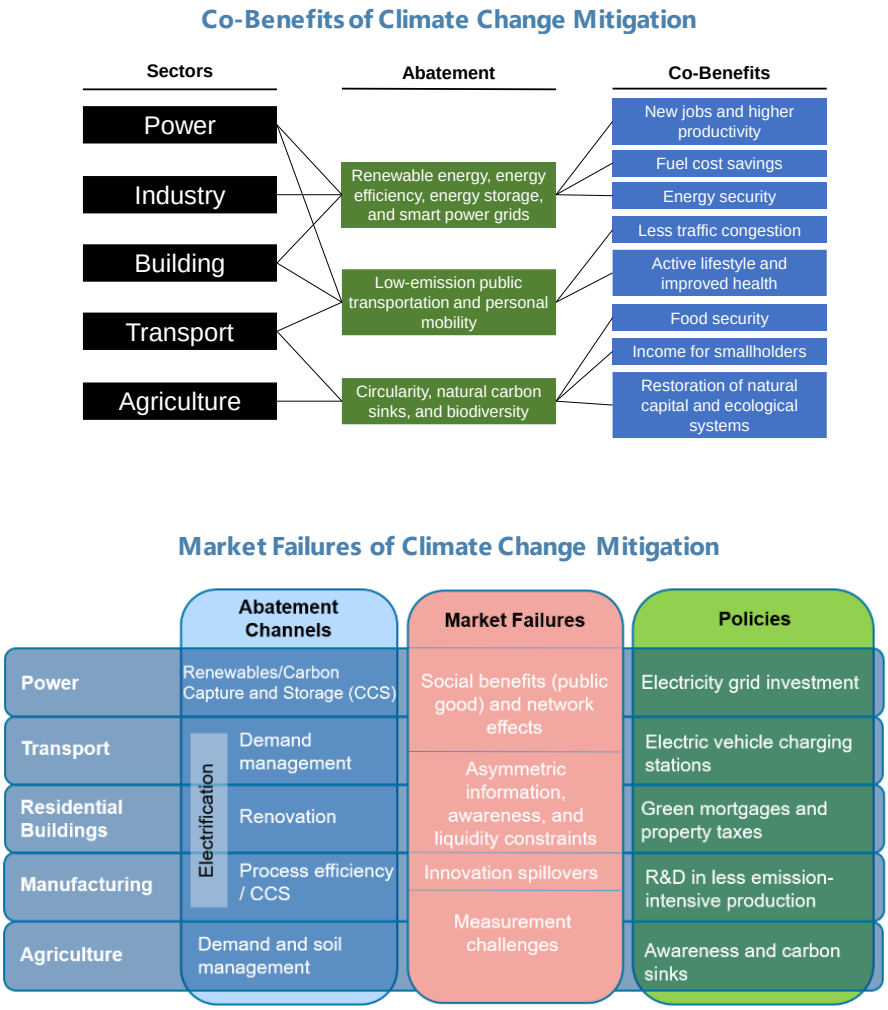
1/ Forward-looking climate change-related physical risk score (for different natural disasters) based on ECB calculations (Alogoskoufis and others, 2021; de Guindos, 2021) using the Four Twenty Seven dataset. Each dot corresponds to a firm in the sample. Gaps in the mapping are due to (1) economic activities being concentrated in specific industrial areas in some countries, and (2) unavailable data for companies located at latitudes above 60 degrees for flood risk. Other hazards include water stress, heat stress, hurricanes, and typhoons.
2/ Based on the Climate Risk Country Score developed by the European Investment Bank (Ferrazi and others, 2021).

4. Continued effort is needed to meet the ambitious National Development and Climate Action plans. The recently legislated higher carbon tax, with a trajectory to 2030, will help finance this effort, and sector-specific policies will help reduce the costs and protect vulnerable groups in the transition to greener and more sustainable growth. In addition, many co-benefits of climate change mitigation are likely to further boost public support, especially if effective resource reallocation associated with a just transition helps engender a more sustainable and inclusive economic model (Figure 4).

5. Credible carbon pricing within a well-designed package of mutually reinforcing policies needs to be at the heart of Ireland's climate policy, consistent with the current EU climate agenda (Chen and others, 2020). The predictable and progressive carbon price path will create incentives for households and firms to reduce their emissions and steer consumption and

investment toward sustainable activities and green technologies, which could result in significant economic gains (IMF, 2020). It will also provide additional revenues, which will help fund the just transition by supporting vulnerable groups and allow the government to cut labor and other distortionary taxes, bolster public transport, energy-efficient housing, and renewable energy.

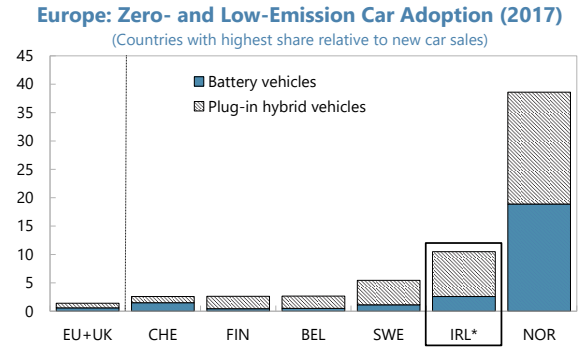
Figure 4. Ireland: Co-Benefits and Market Failures of Climate Change Mitigation



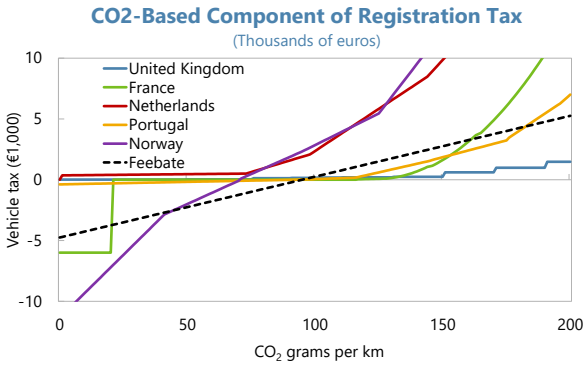
Sources: Climate Diplomacy; Grantham Research Institute on Climate Change and the Environment (London School of Economics); and authors.

6. Complementary sectoral policies will be needed where there are other market failures, carbon taxation is difficult to implement, or emissions are difficult to measure (Arregui and others, 2020; Arregui and Jobst, 2020; Jobst and Arnold, 2020). This is particularly relevant for abatement efforts aimed at reducing the high contribution of emission-intensive agriculture to total emissions in Ireland (Figure 4):

- In the *transport* sector, evidence suggests that countries with CO_2-differentiated vehicle taxes have typically achieved a greater reduction in emissions. The motor tax and vehicle registration tax changes favoring electric vehicles and hybrids introduced in Ireland's Budget 2021 represent a move in the right direction and usefully complement existing financial support for the purchase of electric vehicles (Table 1 below) but could be made more progressive compared to other countries.[7] While more than 10 percent of new car sales are already electric or hybrid vehicles (Chart), a comprehensive strategy is needed to achieve the government's objective of increasing the number of electric vehicles on Irish roads to one million by 2030. It should encompass phasing out fossil fuel allowances (Figure 7),[8] tighter emissions standards for vehicles, and incentives for clean vehicles, such as "feebates," which combine higher taxes on emission-intensive vehicles and subsidies for low-emission ones (Chart).



Sources: ACEA 2018; European Environment Agency; ICCT 2019; and IMF staff calculations. Country list uses International Organization for Standardization (ISO) country codes.
* as of end-2019.



Sources: European Automobile Manufacturers Association; and IMF staff calculations.
Note: France includes maximum €6k bonus scheme for low emissions cars. United Kingdom does not reflect grants for low emissions.

- In the *residential building* sector, more than 95 percent of all buildings in Ireland are energy inefficient. However, new construction will take too long to improve their energy efficiency consistent with the required trajectory of emission reduction, even though according to estimates in Arregui and others (2021), the required investment would be self-financing in about 12 years (for a total cost of 20 percent of GDP to achieve optimal energy efficiency of all private

[7] There is a wide range of existing support measures that are available already, including purchase and home charger installation grants, vehicle registration tax (VRT) relief, toll incentives, and reduced motor tax rates. Expenditure on all these schemes has accelerated rapidly especially since 2015 (Kevany, 2019).

[8] Note that Irish fossil fuel subsidies are low by international standards and are mainly concentrated on the taxation side. On the expenditure side, most payments are in the form of fuel allowance, which are critical to protecting the most vulnerable households. Thus, phasing out these subsidies requires careful consideration to safeguard a just transition towards more sustainable growth without adverse distributional consequences.

dwellings).[9] The Program for the Government and the Climate Action Plan therefore set ambitious goals to reduce GHG emissions from buildings, including homes, with targets to retrofit 500,000 homes to a Building Energy Rating (BER) of "B2" (or cost optimal equivalent) and to install 400,000 heat pumps in existing buildings over the next ten years. Currently committed exchequer funding would cover part of the investment costs. The scale and pace of current renovation are nonetheless held back by liquidity constraints of poorer households and lack of consumer demand, including due to limited information on potential energy cost savings (Figure 5).[10,11] The Government's plans to subsidize retrofitting loans and increase the energy efficiency of public buildings are welcome, but more action is needed to achieve the government's ambitious plan of retrofitting half a million houses by 2030. A key policy lever would be the introduction of binding targets for energy efficiency improvements to accelerate the renovation rate and/or making the availability of energy efficiency ratings mandatory for real estate transactions.[12] Designing energy-dependent property taxes[13] and options for "on-bill financing" of efficiency investments could help overcome owner-renter cost-benefit mismatches, but the impact of such mechanisms on rental accommodation supply must first be fully assessed and understood.

Table 1. Ireland: Personal Incentives for the Purchase of Low-Emission Vehicles (2019)

Sustainable Energy Authority of Ireland (SEAI) Grant Scheme	Grant of up to €5,000 for the purchase of a new BEV or PHEV (since 2011)
VRT Relief	Tax relief of up to €5,000 for new BEVs until end-2021 (and up to €2,500 for new PHEVs until end-2019)
Charging Supports	Grant of up to €600 for the installation of home charger points for buyers of new and second-hand Evs
Toll Incentive Regime	Under the Electric Vehicle Toll Incentive Scheme, BEVs and PHEVs qualify for 50 and 25 percent toll reductions, respectively, up to a maximum of €500 and €1,000 as annual threshold for private and commercial vehicles, respectively. Higher discounts of 75 and 50 percent for BEVs and PHEVs, respectively, apply to off-peak travel on the M50.
Low Motor Tax	Electric vehicles qualify for the lowest motor tax band available.
Fuel Excise / Carbon Tax	No fuel excise duties applied to electricity consumption (whereas these duties represent a significant proportion of diesel and petrol prices).

Sources: Kevany (2019) and authors.

Note: Battery Electric Vehicles (BEVs) and Plug-in Hybrid Vehicles (PHEVs). This table covers central Government incentives only. Local Authorities also provide incentives, including free parking, in certain instances.

[9] Estimates by the Irish authorities suggest a somewhat higher amortization period of about 15 years.

[10] Given the high household savings rate, most Irish households do not face liquidity constraints.

[11] The European Commission has published in October its Renovation Wave Strategy, which aims at improving the energy performance of buildings in the EU. By strengthening standards and regulations while also providing access to well-targeted funding, the strategy intends to at least double renovation rates in the next ten years.

[12] This would require introducing legislative or other regulatory requirements regarding energy efficiency levels, whose implementation is likely to be faster and more effective for the commercial building stock.

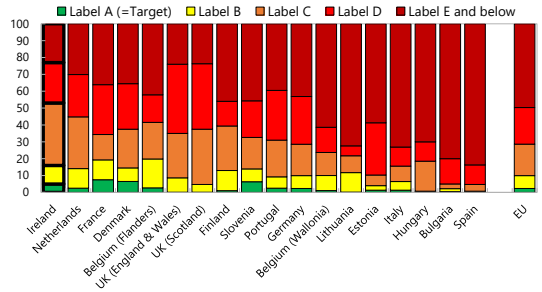
[13] However, energy-dependent property taxes are likely to have significant adverse distributional consequences.

Figure 5. Ireland: Climate Change Mitigation—Residential Buildings

Enhancing the energy efficiency to the highest level (EPC=A) through retrofitting and renovations would cost about 20 percent of GDP.

EU+UK: Distribution of Building Stock by EPC Class 1/

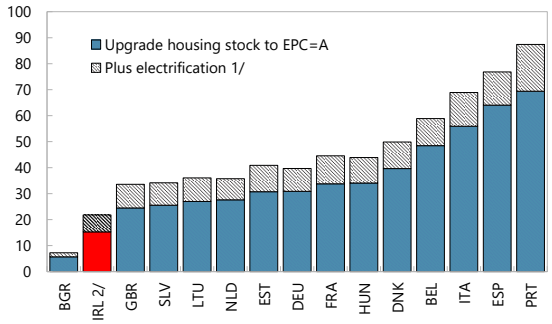
(Percent of dwellings)



Sources: BPIE; CSO (Ireland); European Environment Agency; Eurostat (EU Building Stock Observatory); and IMF staff calculations.
1/ Countries with no central database (e.g., Poland) or with limited information (Czech Republic, Romania, Slovak Republic) are not included.

EU+UK: Total Investment Needs for Retrofitting and Electrification

(Percent of GDP)

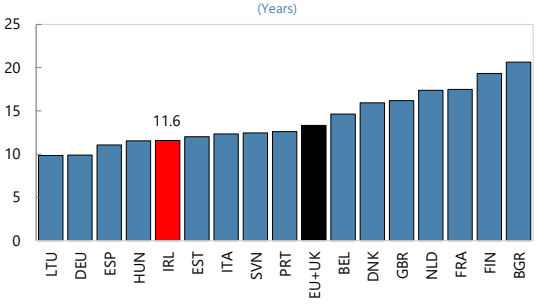


Sources: CSO (Ireland); European Environmental Agency, Eurostat; and IMF staff calculations.
1/ Includes cost for electric heatpump only
2/ percent of GNI*

On average, such investment would amortize in less than 12 years due to significant energy cost savings and could reduce GHG emissions from buildings in Ireland by more than two-thirds.

EU+UK: Amortization Time of Investment in Energy Efficiency Renovation (EPC=A)

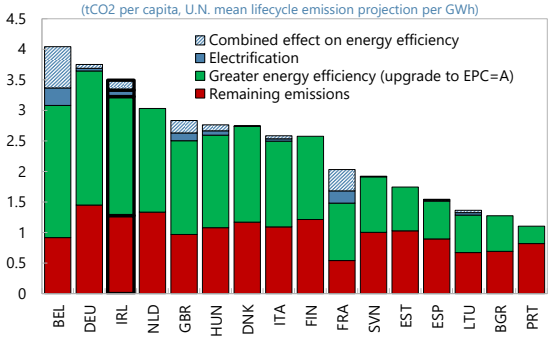
(Years)



Sources: BPIE; Central Statistics Office (Ireland); European Environment Agency; Eurostat (EU Building Stock Observatory); and IMF staff calculations.
Note: Median income level for each country is assumed.

EU+UK: Potential Emission Reduction from Renovation/Retrofitting (EPC=A) and Electrification

(tCO2 per capita, U.N. mean lifecycle emission projection per GWh)



Sources: European Environment Agency; Eurostat; UNFCCC; and IMF staff calculations.

- In *agriculture*, biogenic emissions are difficult to reduce and have a relatively higher contribution to global warming over the near term. At the same time, given its high exposure to changing weather patterns, agriculture stands to benefit most from effective climate change mitigation. The impact is highly specific to crop selection and varies by location, with potential knock-on effects on agricultural supply chains and food security. Land use and management in agriculture offers significant potential for carbon sequestration via agronomic measures (i.e., "negative emissions"), such as non-tilling to support roots growth, maintaining permanent pasture, and protecting grassland.[14] Methane emissions (mostly from livestock production through enteric fermentation and manure management) could be reduced by diversifying away from beef production toward non-ruminant animals (such as pigs and poultry), and to some extent, by applying enhanced farm management practices and expanding the use of new technologies, such as food additives, breeding programs, barn modernization, and animal healthcare, which have proved very effective in Ireland (Figure 6).[15] Methane digesters can turn manure into biogas to substitute the energy use of farms; and, if implemented at scale, could also contribute to more sustainable overall energy generation. Finally, rewetting and rewilding peat bogs across the country (and making them more anaerobic) together with protecting (and restoring) forests (which creates co-benefits from greater biodiversity) offers an equally safe and effective way to achieve meaningful carbon dioxide removal from the atmosphere and provides a permanent carbon sink. These abatement measures would ideally be complemented by demand-side policies aimed at shifting consumer choices away from emission-intensive products, such as dairy and beef. Policies could include removing preferential VAT rates and introducing GHG emissions footprint labels on food, which is consistent with the EU's Farm to Fork Strategy make food systems fair, healthy and environmentally-friendly.[16]

[14] Even though sequestering carbon in soil is relatively safe and economical, it is also slow, potentially reversible (due to changes in temperature and the extent to which carbon is stored near the surface), and significantly depends on soil type. Also, more time is needed to better estimate the soil carbon sink potential as precise measurement remains challenging.

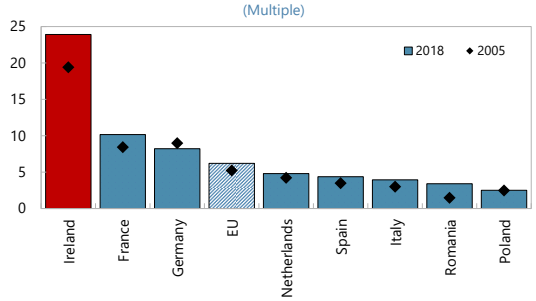
[15] Recent research indicates significant potential of food additives in reducing methane emissions from ruminant animals. For instance, adding red seaweed *(asparagopsis)* as a feed supplement can lower methane emissions by more than 80 percent without affecting meat quality. However, there is a lot of uncertainty around the specific impact such additives may have, including resource availability, sustainability, and impact on human health.

[16] For Ireland, the concept of "ocean farming" sounds naturally attractive conceptually, but the gradual increase of ocean acidification has also affected fisheries, which means that hyper-mobile sea fauna could be a challenge for any serious planning in this area.

Figure 6. Ireland: Climate Change Mitigation—Agriculture

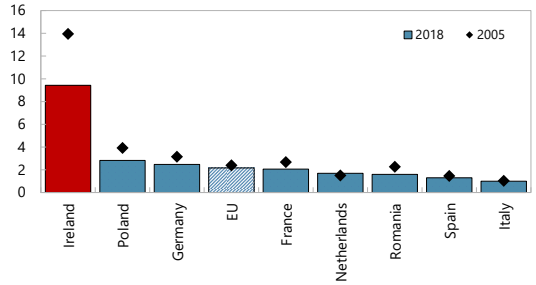
Irish continues to have the most emission-intensive agricultural sector due to the high share of livestock, but it has also made the largest progress in reducing the emissions intensity…

Agriculture: Ratio between Share of Emissions and Share of Value Added
(Multiple)



Sources: FAO; UNFCCC; World Bank; and IMF staff calculations.
Note: Includes forestry and fisheries.

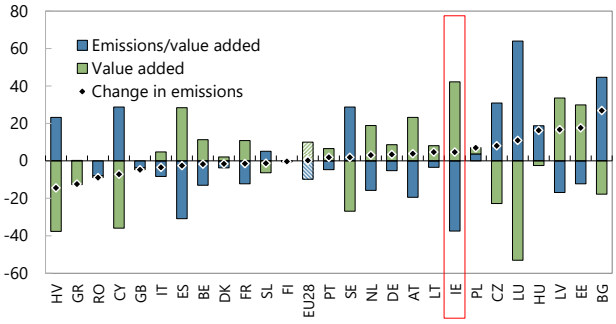
Agriculture: GHG Emissions Per Value Added
($MtCO_2$ equivalent)



Sources: FAO; UNFCCC; World Bank; and IMF Staff Calculations.
Note: Includes forestry and fisheries.

… which has not translated into a commensurate decline in total emissions due to higher productivity.

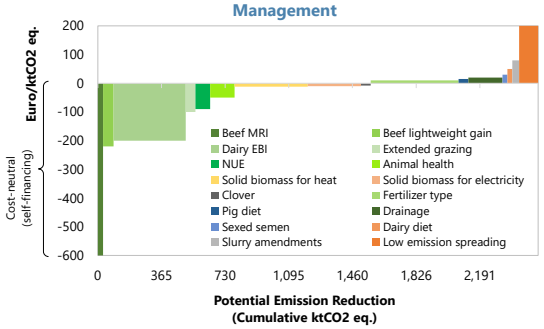
Agriculture: Decomposition of Change in Emissions (2005-17)
(In percent)



Sources: Eurostat and staff calculations.
Note: Includes forestry and fisheries.

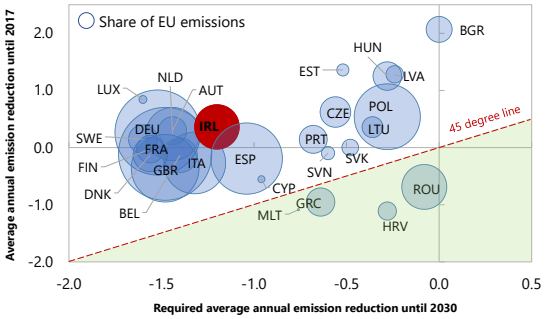
Despite several self-financing abatement possibilities in livestock production, there has been no meaningful reduction in emissions from agriculture since 2005.

Ireland: Agriculture—Marginal Abatement Cost from Livestock and Soil Management



Source: Lanigan et al. (2019), SEAI (2017); Schulte et al. (2012), and IMF Staff Calculations.
Note: MRI=Meuse-Rhine-Issel (MRI) is a breed of cattle, EBI=economic breeding index, NUE=nutrient use efficiency.

Agriculture: Actual vs. Required Emission Reduction for 2030 Target 1/
(Percent; relative to 2005 target)



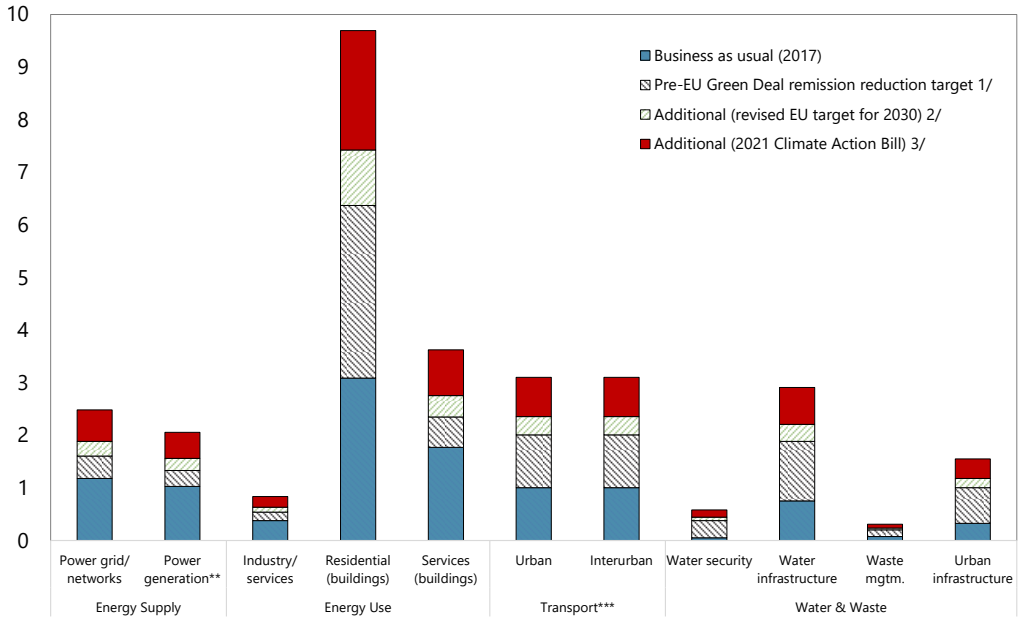
Sources: Eurostat, UNFCCC database, and IMF Staff Calculations.
1/ Includes forestry and fisheries (80.9 $MtCO_2eq.$).

Box 1. Investment Need for Climate Policies (2021–30)

Meeting the envisaged emission reduction target in Ireland's Climate Action and Low Carbon Development (Amendment) Bill 2021 is estimated to require significant investment of close to €20 billion (or 5 percent of GDP)[1/] annually over the next 10 years (Chart), of which about one-third would be public capital spending on climate-sensitive infrastructure (energy supply, transport, water & waste).

Ireland: Average Annual Investment Need for Climate Policies (2021-2030)

(EUR billions, 2013 prices)*



Sources: Central Statistics Office (Ireland); European Commission; European Investment Bank; and IMF staff calculations.

* Estimates do not include additional sectors/activities contributing to climate mitigation: industry (manufacturing and process-driven emissions, including cement), non-infrastructure-related changes in mobility (vehicles), agriculture, and some social infrastructure (if relevant for climate change mitigation, e.g., public buildings).

** Including boilers.

***Includes storage, refueling and recharging infrastructure in transport sector.

1/ Based on a share of renewable energy generation of at least 32 percent and an increase of energy efficiency by 32.5 percent until 2030.

2/ Total emission reduction of 55 percent relative to 1990.

3/ The Climate Action and Low Carbon Development (Amendment) Bill 2021 set a national emissions reduction target of 50 percent until 2030 (beyond the required 30-percent reduction under the EU Effort Sharing Regulation).

Box 1. Investment Need for Climate Policies (2021–30) (concluded)

These estimates have been derived based on a two-step approach:

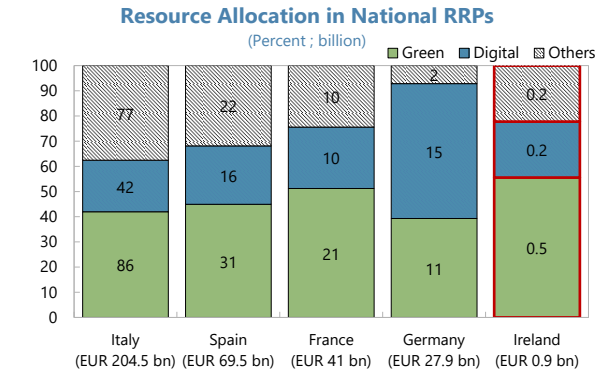
- First, we obtained the projected sectoral investment needs published by the European Commission (2019, 2018 and 2016) for achieving the EU's original 2030 emission reduction target (-40 percent relative to 1990) consistent with the EU commitment to the Paris Agreement (COP21) under the *Clean Energy for All Europeans* (EC, 2019) package using the PRIMES model (E3MLab/ICCS, 2013).[2] The 2030 target implies raising the share of renewable energy in the EU energy mix to at least 32.0 percent and an improvement in energy efficiency of at least 32.5 percent at EU level.
- We then updated the results for a more ambitious emission reduction target of 55 percent (according to the EU Green Deal) and a reduction of national emissions outside ETS coverage subject to Ireland's 2021 Climate Bill, with a focus on investment in (economic) network infrastructure (clean personal mobility, public transport infrastructure that facilitates modal shift to clean transportation, energy transmission/distribution, smart energy systems and grids, CO_2 transportation and storage, refueling and recharging infrastructure in the transport sector).[3]

1/ Based on projected GDP in 2021 (IMF WEO April 2021).

2/ We combined these estimates with findings from the EIB (2019) on investment needs in the water and waste sectors.

3/ See also Ari and others (2020).

7. More broadly, across all sectors, carbon pricing revenues could help fund some of the essential public investment and financial support for greening Ireland's economy (Table 2).[17] The average capital spending for climate change mitigation and adaptation through 2030 is estimated to be about 1.5 percent of GDP per year (Box 1). Most of the spending would need to be directed to public goods and in areas where market failures make carbon taxes less effective in setting price incentives. The remainder of the total required investment of about 5.0 percent of GDP per year would need to come from the private sector. The gradual increase in the domestic carbon price will help catalyze the necessary private investment to complement public sector support as well as provide financing to support vulnerable groups and businesses.[18]



Sources: Darvas and Tagliapietra (2021); and authors.
Note: RRP=Recovery and Resilience Plan (for allocation of EU funding under the Next Generation EU recovery package).

[17] Carbon tax revenues are likely to generate additional revenues of about 2.5 percent of GDP until 2030.

[18] This would also include improving the interconnectivity of the energy infrastructure for renewable energy sources and ensuring sufficient storage capacity to accommodate renewables' intermittency in electricity production.

8. Over the near term, recovery policies should prioritize green investment that facilitates Ireland's transformation to a low-carbon economy. The green transition will require substantial capital spending, which could boost growth and jobs during the recovery phase and help achieve EU emission reduction targets.[19] While funding from the Next Generation EU (NGEU) recovery package for capital spending will provide helpful additionality, Ireland's cumulative share of the NGEU's Recovery and Resilience Facility (RRF) grants of 0.2 percent of GDP is small relative to projected investment needs; however, its disproportionately high share of capital spending on green projects (Chart) provides an important signal of Ireland's commitment to the climate agenda.

Table 2. Ireland: Options for the Use of Carbon Tax Revenues

Instrument		Metric		
		Impacts on Income Distribution	Impact on Economic Efficiency	Administrative Burden
General Revenue Uses	Environmental investment	May disproportionately benefit low-income households (for example, if reduces their vulnerability to natural disasters)	Risk that may be less efficient than broader uses of revenue	Modest
	General investments	May disproportionately benefit low-income households (for example, if provides basic education, health, infrastructure)	Potentially significant	Modest
	Universal transfers	Highly progressive (disproportionately benefits the poor relative to income)	Forgoes efficiency benefits[1]	New capacity needed (but should be manageable)
	Payroll tax	Benefits are largely proportional across working households	Improves incentives for formal work effort	Minimal
	Personal income tax	Typically benefits are skewed to higher-income groups	Improves incentives for formal work effort and saving, reduces tax-sheltering	Minimal
	Consumption tax	Largely proportional to household consumption	Reduces incentives for untaxed goods and activities	Minimal
	Corporate income tax	Benefits skewed to higher-income groups	Improves incentives for investment	Minimal
	Deficit reduction	Benefits accrue to future generations	Lowers future tax burdens and macro-financial risk	Minimal
Targeted Assistance	Means-tested cash, in-kind transfers	Effective at helping low-income groups if social safety nets are comprehensive	Efficiency impacts unclear but likely modest[1]	Low if builds on existing capacity, otherwise significant
	Assistance for household energy bills	Provides partial relief for all households (for example, does not help with indirect pricing burden)	Modest reduction in environmental effectiveness	Low if builds on existing capacity, otherwise significant

Sources: IMF Fiscal Monitor; authors.
Note: Green areas indicate current use of carbon taxes in Ireland; 1/ Transfers to low-income households could lead to a small increase in human capital investment.

9. In particular, the post-COVID recovery provides an opportunity to accelerate the adoption of climate-friendly policies in the following areas:

- *Physical infrastructure*. The government would need to boost public investment in transportation and climate-friendly network infrastructure, such as smart power grids for cleaner energy (especially offshore wind power) as well as water and waste management (Box 1).[20]

[19] See also Zhang (2020).

[20] The Government already funds 65 percent of the cost of home electric vehicle charging, provides 90 percent funding for on street chargers via local authorities, and has provided grant support for the rollout of fast chargers on public roads.

- *Green finance*. Current means-tested grants for energy efficiency improvements and electrified heating in residential buildings are essential but can cover only a fraction of the required capital spending on required renovation and retrofitting of the housing stock. Increasing the availability of low-interest rate "green mortgages"[21] (consistent with the principles developed by the Energy Efficiency Mortgage Initiative) and "green home equity loans"[22] will be necessary (and may prove a more cost-effective and fiscally more responsible means of) boosting private investment in energy efficiency improvements where liquidity constraints are less binding; this would place a premium on the availability of comprehensive and consistent data on energy efficiency and development of active strategies for monitoring financial risks from such financial instruments to mitigate the risk of "greenwashing" (Alogoskoufis and others, 2021), anchored to the EU Taxonomy on Sustainable Activities.

- *Public support*. It would also be necessary to promote R&D in early-stage technologies, such as hydrogen generation through renewable energy (water and wind), encourage the adoption of low-emission agronomic technologies, and support carbon capture (including through peatland restoration and re-forestation), and new forms of energy storage.

- *Just transition*. Finally, climate mitigation policies involve a structural transformation, with unequal impacts across segments of industry and population. Concerns about the international competitiveness of businesses and the burden of higher energy prices on households should be taken into consideration by recycling some of the carbon tax revenues to support de-carbonization efforts, including through business restructuring, active labor market policies, as well as subsidies and grants with a focus on encouraging greater use of renewable sources of energy.

10. Given the still low borrowing costs currently, it would be beneficial to make such investments now (in line with prudent fiscal policies), even before sufficient revenues from carbon pricing become available. The gradual increase of the carbon tax, accompanied by the reduction in fossil fuel allowances, will further boost private investment. Greater private sector participation in infrastructure projects might be required over time as fiscal consolidation is likely to constrain budget outlays for public investment.

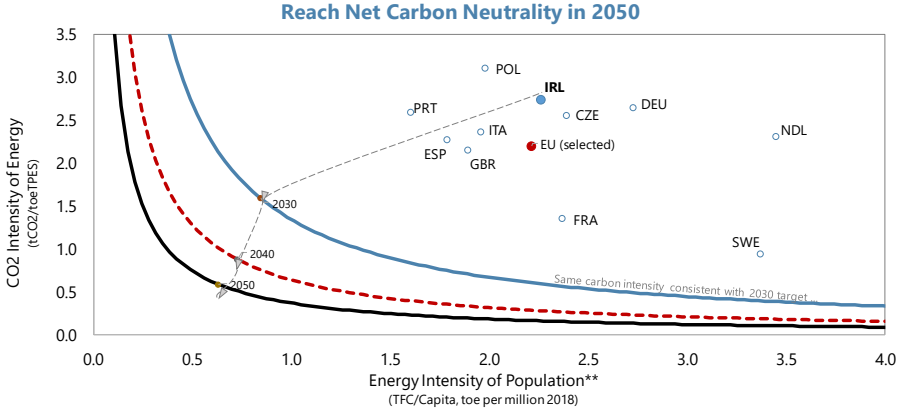
[21] For our analysis above, homes with an energy performance certificate (EPC) rating of lower than "A" are deemed energy inefficient. However, some banks in Ireland also offer reduced-rate "green mortgages" for buildings with an energy efficiency rating of as low as EPC="B3."

[22] The National Home Retrofit Scheme provides grants covering 35 percent of the overall cost of home improvements for private and local authority housing and 50 percent for approved housing bodies. 100 percent grants are available for households at risk of energy poverty under the Better Energy Warmer Homes Scheme. These grants are provided from the Sustainable Energy Authority of Ireland (SEAI) as a key support measure under of the Irish government's Climate Action Plan 2019 and the recent Climate Action and Low Carbon Development (Amendment) Bill 2021.

Figure 7. Ireland: General Indicators for Climate Change Mitigation Policy

The energy consumption and emission intensity of energy is still far too high for Ireland …

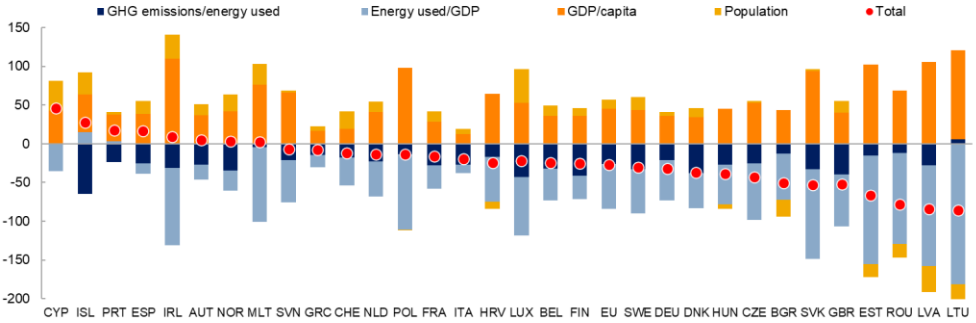
Ireland and Selected EU Countries: Emission/Energy Intensity and Required Path* to Reach Net Carbon Neutrality in 2050



Sources: European Commission (EDGAR); Enerdata; IEA; OECD; United Nations; and authors.
* Consistent with the IEA's 66% 2°C Scenario (https://ieefa.org/wp-content/uploads/2018/11/IEEFA_Reviewing-global-energy-scenarios-_13-Nov-2018.pdf)
** Projected population based on constant fertility rate.

… which is largely due to high growth, which has offset higher energy efficiency of production.

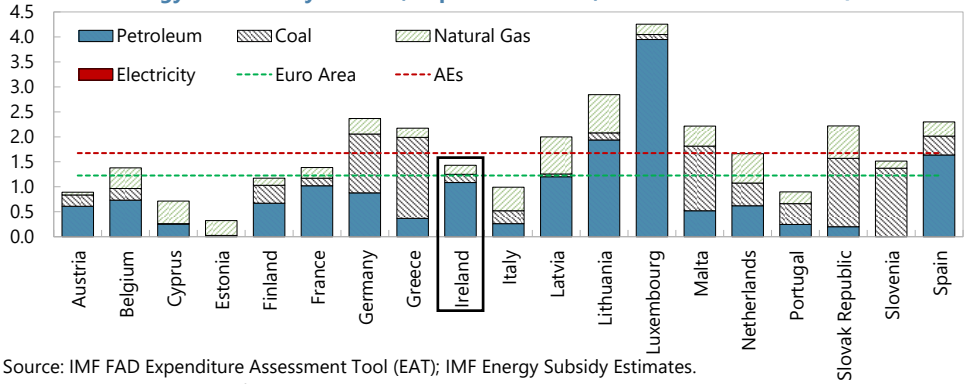
EU27+UK: Factors for GHG Emissions Reduction, 1990-2017
(Pecent change; GHG emissions include total emission withouth LULUCM & indirect CO_2)



Sources: Eurostat; UNFCCC database; IMF, *World Economic Outlook*, and IMF staff calculations.

The effective use of carbon pricing requires gradually phasing out significant fossil fuel allowances in Ireland.

Energy Subsidies by Product, in percent of GDP, Latest Value Available 1/

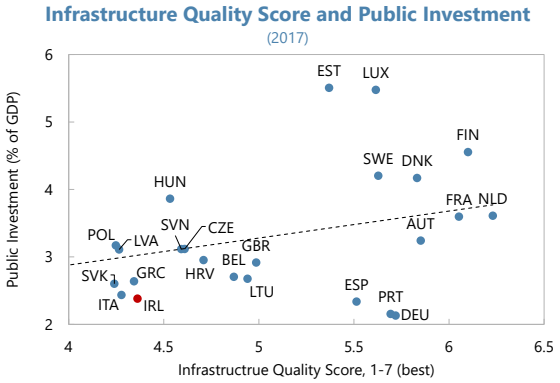


Source: IMF FAD Expenditure Assessment Tool (EAT); IMF Energy Subsidy Estimates.
1/ Dashlines are the median for countries in the region.

Box 2. Low-Carbon, Climate-Resilient Infrastructure (LCCR)

Effective climate change mitigation and adaptation requires greater investment in low-carbon, climate-resilient (LCCR) infrastructure. Public investment programs create infrastructure that is bound to shape carbon emissions for decades. Hence, the cost-benefit analysis of any viable infrastructure project should include environmental, social, and governance (ESG) considerations and be guided by a sense of shared, long-term responsibility to avoid locking in carbon-intensive growth. Since more than half of total global greenhouse gas (GHG) emissions are directly or indirectly attributable to infrastructure, making infrastructure projects "climate-friendly" would help Ireland (i) transition towards a low-carbon, more environmentally sustainable economic model, notably in renewable energy generation and low-emission transport, and (ii) mitigate the potentially long-lasting effect of more pervasive natural disasters as a result of climate change. Such an investment will not only provide a major boost to short-term growth and enhance the longer-term resilience but also reduce the carbon footprint of economic progress.[1]

Investment in climate-sensitive infrastructure is costly but carries significant long-term benefits, which reduce the net cost overall. Infrastructure in Ireland has suffered from chronic under-investment for decades (resulting in low infrastructure quality relative to most other European countries), so most investment will be in new projects (Chart). However, lower cost from renewable energy sources and greater energy efficiency are likely to offset these investment cost over time. Some spending must also be allocated to accelerate the retirement of legacy carbon-based infrastructure and ensure that the adaptation and the structural transition to a more resilient and sustainable economy is socially fair and inclusive (Jobst and Pazarbasioglu, 2018).



Sources: World Economic Forum, IMF and IMF staff calculations.

Since the impact of public investment is usually measured based on economic aggregates, climate change risks affecting infrastructure remain insufficiently factored in public policy. The Government should adopt a strategic approach to public investment consistent with the National Development and Climate Action plans, with a view to accounting systematically for the contribution and vulnerability of infrastructure projects to climate risks in project identification, prescreening, project appraisal and selection.[2] These approaches would need to be robust given the uncertainty surrounding climate changes effects at local and regional levels and require an understanding of the (i) climate impact of large projects (GHG emissions), (ii) the sources, types, and sizes of damage/economic losses, (iii) the project resilience to the size or strength of different natural hazards ("resilience score"), and (iv) the capacity to predict frequency/impact of future disaster shocks ("climate damage function").[3]

1/ This objective is also consistent with the current focus of the Italian G20 Presidency goals on financing more resilient, sustainable, and inclusive infrastructure as main objective of the G20 Infrastructure Working Group.

2/ The Irish government is working with the European Commission (DG REFORM) and the OECD to better incorporate climate impacts into the appraisal of infrastructure and a project to better incorporate climate risks to infrastructure within the appraisal framework.

3/ Le, Leow and Seiderer (2020) provide guidance on how to integrate considerations of climate-related risks into infrastructure governance, focusing on the planning, design, appraisal, selection, and financing of public investments.

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