1 Introduction

1.1 Climate Action Plans context

The Climate Action Plan 2019 set out a pathway to reduce Ireland's GHG emissions by ~30-35% by 2030, relative to a 2018 baseline. This represents a 3-4% p.a. emissions reduction from 2021 to 2030.

The Climate Action and Low Carbon Development (Amendment) Bill 2021 increased Ireland's climate ambition and committed to a "reduction of 51 per cent in the total amount of greenhouse gas emissions over the course of the first two budget periods ending on 31 December 2030 " (as illustrated in Figure 1) **and committed to a target to be net zero by 2050[1].** This represents a ~7% p.a. reduction from 2021 to 2030. To deliver the bill, the Government has clarified that carbon budgets will be **"**proposed by the Advisory Council, finalised by the Minister and approved by the Government for the period of five years"[2]. Carbon budgets will seek to consider "the need to maximise employment, the attractiveness of the State for investment and the long term competitiveness of the economy"[3].

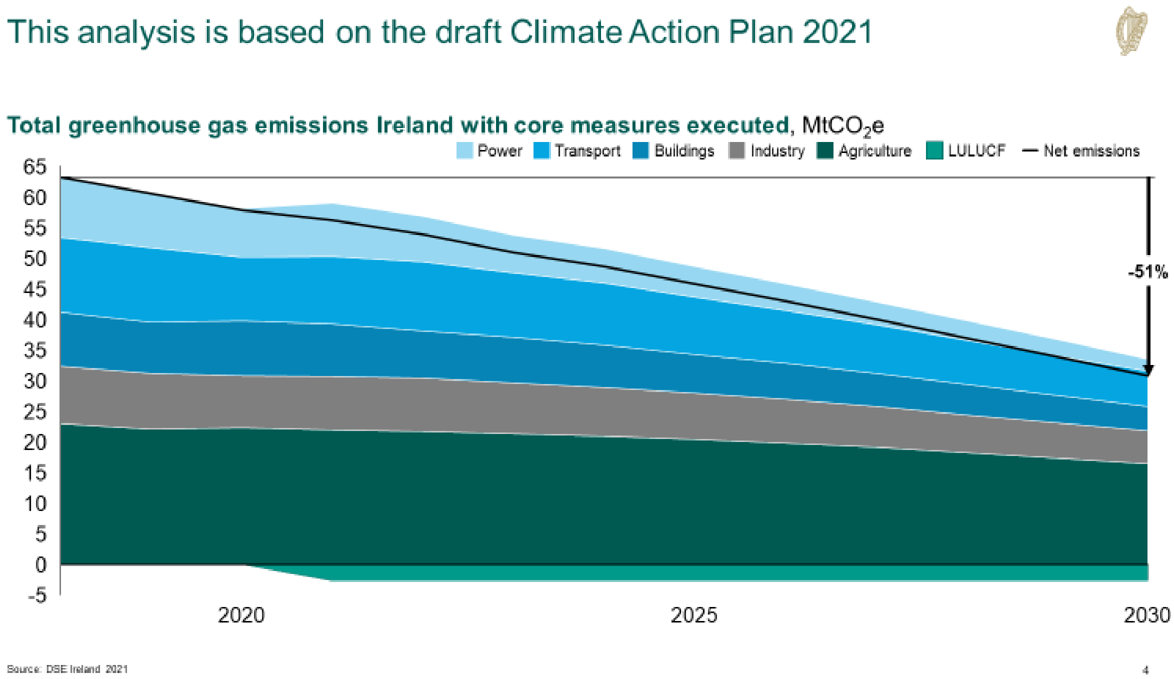

Figure 1: Irish annual greenhouse gas emissions in MtCO2e

This document is designed to inform the Council's carbon budget preparation by providing a fact-based assessment of the potential socioeconomic implications associated with delivery of the draft Climate Action Plan 2021 measures.

In order to assess the potential socioeconomic implications, the Department of the Environment, Climate and Communications (DECC) has coordinated the development of a menu of potential policy options in the draft Climate Action Plan, 2021 (hereafter CAP21). These have more ambitious abatement targets relative to 2019 (shown in the appendix figure 1). Example measures are: (i) to accelerate the adoption of passenger EVs (reach ~45% of new vehicle sales by 2025, >90% by 2029) and

[1] Irish Government (2021) Climate Action and Low Carbon Development (Amendment) Bill 2021
[2] Ibid
[3] Ibid

(ii) to meet ~10% of heating demand through district heating roll-out in urban areas. This draft Climate Action Plan, 2021 has been developed in advance of the publication of the regulations on land use/ LULUCF which could result in changes to the draft plan.

1.2 Summary of findings

This analysis (spanning financing, employment, competitiveness and household bills) suggests that delivery of CAP21 could have significant net positive socioeconomic implications, contingent on careful management. However, it also highlights that there could be variation in impacts.

Delivery of CAP21 could benefit Irish businesses and households in various ways. For example, by increasing job needs for higher-skilled roles (e.g., offshore wind installation engineers) and by positioning Ireland well to seize new high-growth green export opportunities (e.g., alternative proteins).

However, this analysis also highlights that these impacts could be unevenly distributed. For example, certain sectors and associated occupations could decline, households with certain characteristics could incur higher than average costs and energy prices are likely to increase, impacting particular industrial groups more than others.

1.3 What this report is and is not

This report is a high-level analysis to assess the major potential implications of CAP21 at the societal level. It looks at effects in aggregate and it is important to acknowledge that there are disparities within those aggregates. Some of these disparities are examined, for example in section 2.4.2, but this has not be done exhaustively throughout.

This report is exclusively focused on one of many potential decarbonisation pathways for the period 2021-30 in Ireland, specifically the draft CAP21 measures that DECC has been coordinating. It is not an evaluation of various potential decarbonisation pathways for Ireland. If the draft CAP21 measures change, this analysis would require updating to be consistent. In addition, socioeconomic implications for beyond 2030 have not been assessed.

This is an analysis on the possible implications of delivery of the draft CAP21, including both Core Measures and Further Measures. The draft CAP21 measures are split into Core (accelerating no or low regret options) and Further (larger system choices that are technically and/or socially more challenging). CAP21 requires the implementation of all Core Measures to meet its target, but only some Further Measures. This analysis covers all Further measures and doesn't make any suggestions on which of the Further measures should be prioritised.

The figures used in this report are derived from analysis conducted for the Climate Change Advisory Council. Short summaries of methodologies used are provided at the end of the report.

This report is not a full cost-benefit analysis of individual projects or the collective CAP21. These would need to be done on a case by case basis: projects would be required to follow the Irish Public Spending Code, which includes a business case assessment.

There is a high degree of uncertainty associated with these analyses because ultimate outcomes are contingent on an array of factors, particularly including any policy interventions taken, which would shape the outcomes.

1.4 Structure of report

This analysis explores socioeconomic impacts of the net zero transition the delivery of draft CAP21 measures along 4 dimensions in section 2 of this report:

- Financing need (section 2.1)
- Employment impacts (section 2.2)
- Investment / competitiveness attractiveness (section 2.3)
- Household bills (section 2.4)

2 Analyses deep dives

2.1 Financing

Capital expenditure projections suggest that delivery of CAP21 would require ~€45 billion additional investment compared to if Ireland took no climate action at all. This figure is purely investment, and does not include the operational savings that could follow, for example, the operating costs of renewables are expected to be much lower than those for coal or peat generation. Of the additional €45 billion in capital expenditure, €~25 billion (~55%) is estimated to be invested in the buildings sector, €~15 billion (~35%) in the power sector, and €~5 billion (~10%) in transport.

Delivery of CAP21 would require a further ~€80 billion of reallocated funds that would otherwise be invested in incumbent technologies, based on a comparison of investment associated with a pathway consistent with CAP21 and a "no climate action" baseline. Figure 4.5 shows that this results in a total of ~€125 billion – summing additional and reallocated – capital investment in low-carbon technologies and infrastructure in the period 2021 to 2030. The measure of "total capex" includes the total up-front investment required (e.g. the cost of buying a battery electric vehicle) and is agnostic of (i) the operational savings that may follow and (ii) the investment that would have otherwise been invested in incumbent technologies (which is considered only in the additional figure above). As shown below, investment requirements during this decade are expected to be driven by transport (€51 billion) and buildings (~€35 billion). These are two sectors that are expected to transition earlier than others, such as buildings and industry. For example, industry emissions are harder to abate and most investments are expected to come only post 2030. The analysis suggests that the most significant share of capital would flow into EV passenger cars (€38 billion), renewables (€22 billion), and building insulation (€14 billion). For calibration, the incremental investment for 2021-30 per head is broadly comparable, once scaled, to that of the UK's Climate Change Committee equivalent projection for the UK[4].

[4] Climate Change Committee (2020) UK Sixth Carbon Budget

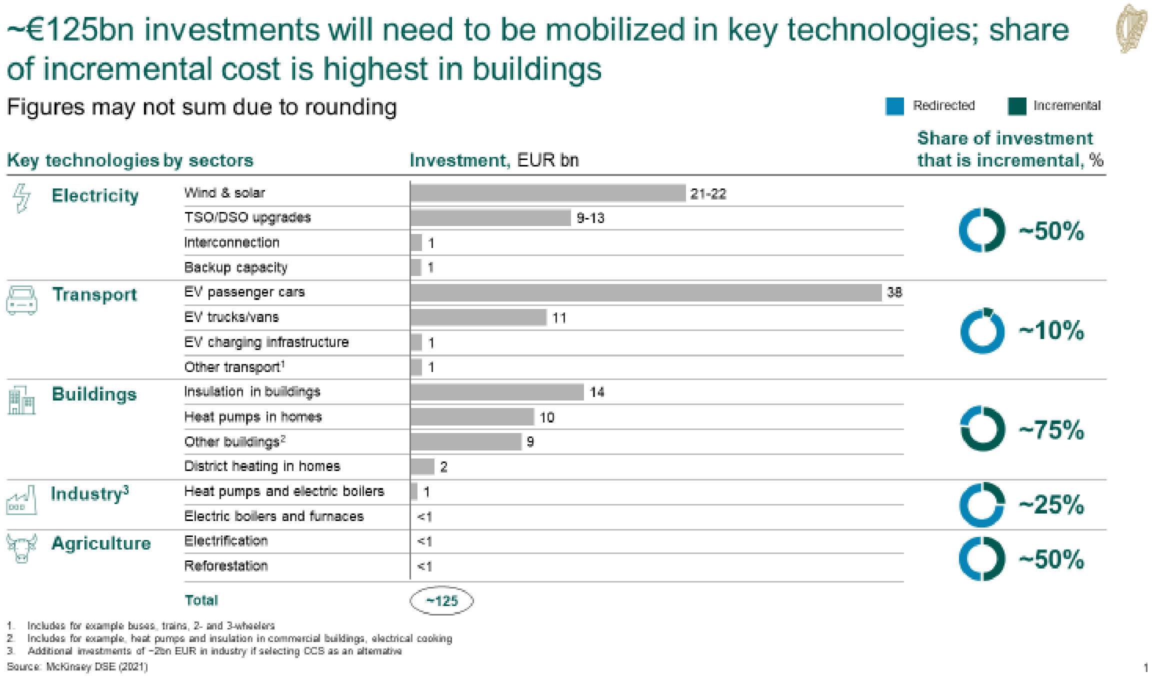

Figure 2: Total investment by key technology in EUR bn together with share of total investment that is incremental, %

Figure 2 highlights that the share of total investment that is additional could vary substantially by sector. For example, comparison of required investment in a decarbonized scenario versus a "no climate action" scenario suggests that the buildings sector has a particularly high share (75%) of its total investment that is additional because most of the retrofits would not be implemented in a no climate action scenario. Whereas, power has a moderately high share (50%) of its total investment as additional and this is driven by the higher capex of renewables versus fossil fuel power generation together with the need to expand the grid capacity as electrification occurs. By contrast, a relatively low share (10%) of total transport investment is expected to be additional because vehicles are replaced regularly and the price difference between electric vehicles and internal combustion vehicles declines over the decade.

Annualising the total capital expenditure figure assessed above suggests that delivery of CAP21 could require a total of €14bn p.a., on average, over nine years between 2021-30. This translates to requiring redirection of ~9% of annual total Irish investment (public and private), which was €160bn in 2018[5].

Business case analysis suggests that ~€75bn (~60%) of identified investments could have positive standalone investment cases. However, remainder of ~€50bn (40%) includes measures that are expected to pay back sometimes, dependent on context, and others that are not expected to every pay back. As shown in figure 2, the analysis showed that the share of investments with a positive investment case could vary significantly by sector. For example, most of the transport, power and agriculture investments have standalone business cases. Battery electric vehicles are an example of a technology that is expected to have a standalone business case, with a payback of ~9 years without a carbon price if purchased in 2025 (lowering to ~7 years with the Irish carbon price trajectory). This works because the higher initial price (compared to a diesel car) will then be recouped through lower operating costs over time.

For buildings and industry there may not be a standalone financial business case, there will be associated co-benefits, such as cleaner air and comfort that are important and could drive the transition.

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[5] Eurostat (2021) Investment share of GDP by institutional sectors

Technologies that do not come with operational savings – for example CCS – do not pay back without very high carbon prices.

2.2 Employment

2.2.1 Net gains

Analysis of the employment impacts associated with the draft CAP21 measures indicates that its delivery could lead to net total job needs of ~77k FTEs in 2030, relative to a baseline of 2020 (see methodological note 2)**.** Demand for the new FTE roles falls into three categories: new direct job needs (+32k, ~40%), such as designing and manufacturing heat pumps; indirect jobs (+25k, ~35%) that support an industry, such as making components for those heat pumps; and induced jobs (+19k, ~25%), such as higher demand for grocery store and restaurant workers because direct and indirect employees spend their wages[6].

Figure 3 illustrates that the draft CAP21 measures could lead to net new direct job needs of ~32k FTEs in 2030, relative to a baseline of 2020 in sectors directly affected by the decarbonisation trajectory (see methodological note 2)**.** The estimated net increase in +32k job needs in 2030 equates to a per capita figure that is within ~10% of the UK's Committee for Climate Change estimate for the equivalent net increase projected for the UK. This constitutes a ~1% increase relative to today's labour force. As figure 3 shows, the ~32k figure is value is the net of +43k new direct FTE job needs and -11k declining FTE job needs. The increase in job needs is predominantly driven by buildings heating and insulation retrofits (~25k) which are highly labour intensive, and renewables in power generation (~13k) where a large amount of spending needs to take place. Most job needs expected to be developed are in industries that already exist, but there are some that do not exist today in Ireland (for example, offshore wind). For the sectors that do exist today, the analysis shows that the largest relative increases in employment, relative to 2019, could be in heat pump manufacture (~7X) and solar (~5X).

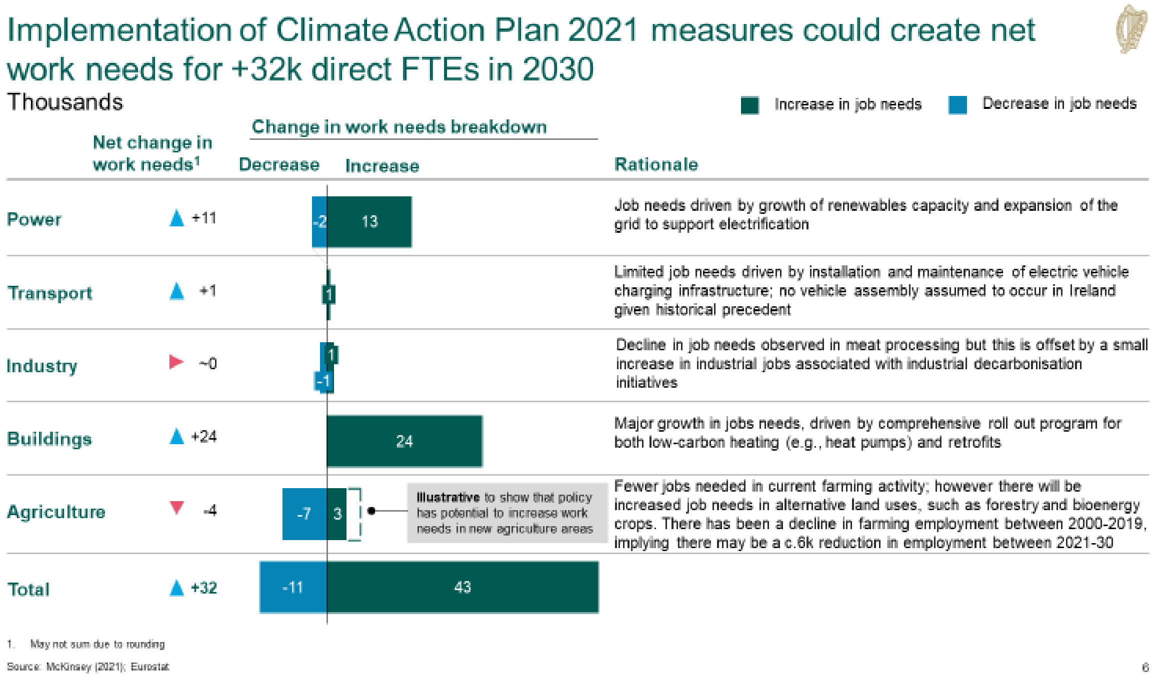

Figure 3: Projected direct employment changes by sector, 2021-30

[6] Does not sum owing to rounding

Although delivery of CAP21 is expected to increase overall job needs, there could be impacts on individual workers in occupations where there are expected to be declines in job needs, particularly those associated with high-carbon technologies. This could create a need for workers to be supported through upskilling, reskilling and redeployment. Net declines in job needs are expected in both agriculture, driven by declines in current farming activity implied by draft CAP21 inputs, and industry, driven by decline of meat processing. In the agricultural sector[7] there has been an approximately linear decline in employment between 2000 and 2019: a linear regression shows that the reduction is ~0.7k jobs per annum (approx. -0.7% CAGR) over those two decades[8]. If extrapolated, this implies ~6k jobs may have otherwise declined in agriculture. This suggests the majority of expected agricultural declines may be met by the existing trend. In addition, there would likely be opportunities to transition into other adjacent employment where job needs have increased as a result of the net zero transition. For example, alternate land uses such as forestry (further detail in section 2.2.2). It is important to note that this analysis is based on draft CAP21 inputs and is agnostic of further employment policy interventions, including the Common Agriculture Policy which could sustain greater job needs in agriculture than the above numbers show.

This analysis has not undertaken a granular regional analysis (at a NUTS 2/3 level) **of employment impacts.** Sectors for which there are large increases in job needs projected will be distributed in different ways. Firstly, offshore wind job needs are expected to initially develop on the East before transitioning to the West Coast longer-term. Secondly, retrofitting job needs are expected to largely follow distribution of population (although rural areas may require a high labour intensity given the reduced likelihood that district heating can be used).

2.2.2 Skills implications

There are three different categories of skills implications that are associated with delivery of CAP21:

- **Developing new skills to meet demands of job needs in new occupations**: the employment impacts analysis suggests that many of the low-carbon jobs created are expected to be mid- and high-skilled jobs, sometimes with new skillsets that are currently uncommon in Ireland today. For example, there is not currently an offshore wind industry in Ireland but the draft CAP21 plan targets to scale capacity to 5GW by 2030. As a technology, offshore wind requires a relatively high share (~40%) of high skilled labour. Development of sufficient appropriately skilled labour could require a large scale up in the provision of end to end reskilling programmes and the development of low-carbon specific training opportunities (e.g., apprenticeships, degree qualifications).
- **Upskilling those in existing jobs where nature of work changes**: some occupations are expected to remain similar in size but will require varying degrees of skills shifts. Figure 4 summarises occupations in which upskilling is expected to be required. One example is car mechanics, who are expected to require upskilling in the new electric powertrains.

[7] NACE rev. 2 crop and animal production, hunting and related service activities
[8] Eurostat (2020)

Wide-ranging occupations require skills shift to adapt to low-carbon world

NOT EXHAUSTIVE

Scale of skill shift: High / Medium / Low

Sector	Occupation	Scale of skill shift	Description of upskilling requirement
Transport	Passenger and commercial vehicle mechanics	High	New expertise required in electric powertrains, rather than conventional ICE powertrains
Buildings	Plumbers	High	New expertise required in range of new heating technologies i.e. district heating, heat pumps, electric boilers
	Construction	Medium	New expertise required in low-carbon design and implementation (e.g., using new materials like CLT)
Agriculture	Extensification	Low	New expertise required for how to reduce farming inputs (e.g., fertilizer) and the alternative techniques that can be used
Power	Grid operators (TSO/DSO)	Medium	New expertise required in the new technologies that are increasing their share of energy generation (e.g., renewables) and balancing technologies (e.g., batteries)
Other	Professional services	Low	New expertise on ESG topics in range of professional services (e.g., knowledge of new regulations for lawyers and knowledge of green finance for financial professionals)

7

Figure 4: Occupations expected to require substantial skill shifts

- **Transition of skills from jobs with declining job needs:** CAP21 includes measures that will reduce demand for certain products and services, such as labour needs for peat power generation. There could be skills overlaps between declining occupations and growing occupations. One such example is that there is a high degree of skills overlap between a STEM professional in fossil fuel power generation (e.g., coal or peat) and those STEM professionals in renewables energy generation (e.g., wind). A further example is of beef farmers, who could convert their land use to services that will see increased demand from the net zero transition, such as bioenergy crops. This transition could be compelling because similar assets and skillsets are required whilst a higher income per hectare could be achieved.

2.3 Investment / competitiveness attractiveness

If managed carefully, CAP21 could be implemented in a way that has a net positive impact on competitiveness (see methodological note 3)**.** The analysis in section 2.3.1 shows that disruption to current economic activity could be small for the majority of users, considering the cost increases associated with low carbon heat and electricity (although high heat transitions will need to be carefully considered). Furthermore, the analysis in section 2.3.2 highlights that new market opportunities could be substantial. Ireland is well positioned to capture new export growth, particularly around themes of meat and dairy substitutes and offset-compatible land-use changes; both could become material before 2030.

2.3.1 Competitiveness in a net zero world

Delivery of CAP21 would put Ireland on a decarbonisation pathway that could have short and long term impacts on the competitiveness of Irish business. Irish businesses are facing a changing world. Businesses may have to transition just to keep up with both changing stakeholder expectations and changing market environments, as detailed in Figure 5 below. Businesses that act early have the opportunity to manage an orderly transition. This reduces the need a more sudden (and likely costly) decarbonisation correction in the future.

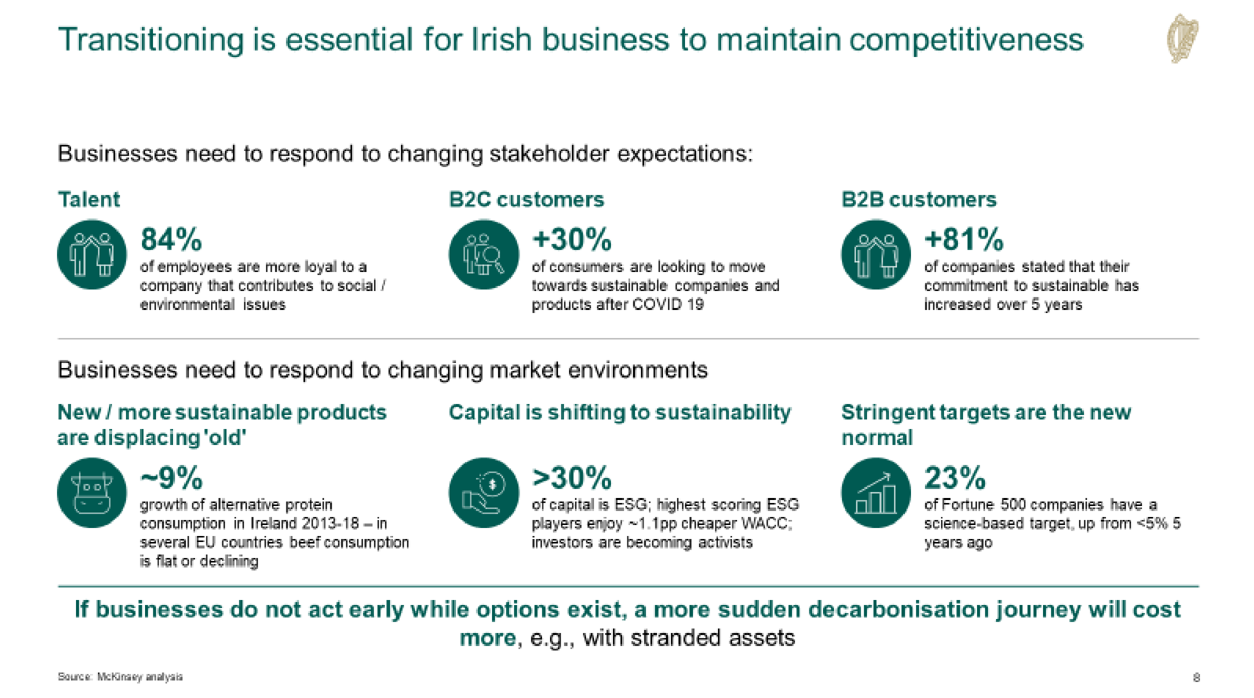

Figure 5: Overview of changing stakeholder expectations and market environments

From a system view, the impacts of decarbonisation on business manifest in two ways, as demonstrated in figure 6. First is the perspective of current economic activity maintaining its competitiveness in light of decarbonisation transitions, for example higher cost structures. The second is the perspective of entirely new economic activity that could become valuable as the world decarbonises. These two perspectives will structure the following analyses.

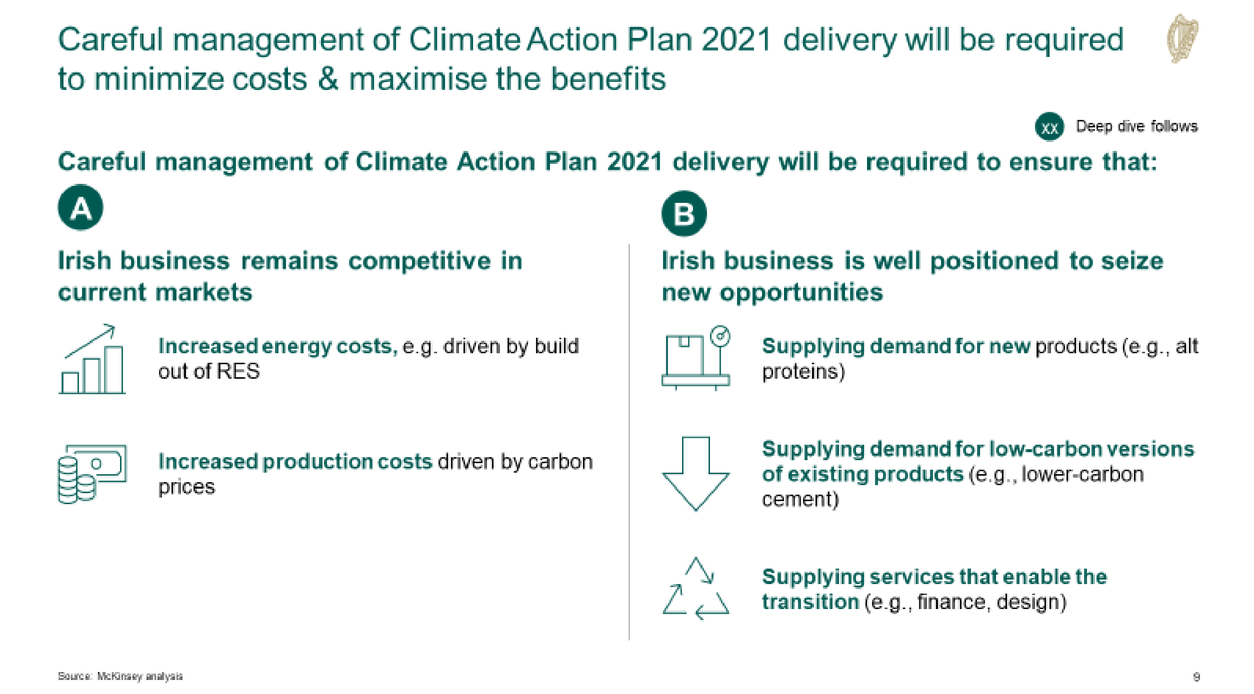

Figure 6: Two perspectives for effect of transitioning on businesses

2.3.2 Energy costs

For current economic activity, one of the most important disruptions to consider is the changing cost of energy, particularly electricity. Based on GVA, it is estimated around ~50% of the Irish economy is particularly sensitive to changing costs of energy[9]. Due to large manufacturing (~35% of GVA) and information and communication (~15% of GVA) sectors, the most relevant cost changes are in the decarbonisation of grid electricity, and to a lesser extent, the electrification of low temperature heat.

If Ireland transitions according to the CAP21, Irish business electricity rates are expected to increase at 2-3c/kWh (1.6% p.a.), which is broadly in line with European peers, such as UK, Germany and Spain (1.3%, 2.1%, 1.0% p.a., respectively; see methodological note 3a). Therefore, while Ireland already has one of the most expensive business rates for electricity in Europe, it is not expected to become comparatively more expensive. This effect is the net of two factors. Firstly, a higher increase in wholesale power price than peers, driven by lower quality solar resources, less interconnection and fewer existing lower cost assets in nuclear and hydro. However, in mitigation, the Irish electricity price currently has a higher proportion of other costs – overheads, transmission and margin – that are likely to stay constant, diluting the wholesale increase. The impact of transmission cost changes are difficult to predict, but while there is a need for transmission spending, this is mitigated by increasing demand, which spreads the cost.

More important for competitiveness is understanding the impact changing energy costs have on final end products. This is best explored through examples. For pharmaceuticals manufacturing (one of the largest manufacturing subsectors in Ireland), changing electricity prices could add ~0.2% to the cost of end goods (or ~0.4% if a produce also electrifies their gas use). These imply small relative changes, but disruptions may be more significant in other manufacturing subsectors with single digit margins. For example in food manufacturing, electricity prices may add 0.7-1.5% to the cost of a unit of production (or 1.2-2.5% if a producer also electrifies their gas use). On average for these sectors, capex impacts of electrifying gas (if they do so) are likely to be an order of magnitude smaller than operational cost impacts when distributed over the lifetime of the asset. However, the exact cost may depend on scale of plant and utilisation level. In any case, this may result in more sudden capex impacts on balance sheets if the cost cannot be spread over time.

For the most intensive users of electricity, including some in information and technology, cost increases may be higher. Data centres, as major uses of electricity, are projected to have unit costs increase by 7-9% due to electricity price changes. However in general, those with higher electricity use may notice smaller impacts as they have already chosen to locate in Ireland despite its low power price. In this example, the impact is expected to be attenuated by non-financial motivations such as a need to demonstrate sufficient activity in certain geographies, a need to maintain data operations in certain countries legally, and a desire to pay for decarbonisation to maintain a social license to operate.

2.3.3 New export opportunities

Figure 7 highlights that Ireland has an opportunity to become a leader in certain low-carbon technologies, and access new export markets. On the basis of three dimensions (existing adjacent industry, natural resources and relevant skills) that assess Ireland's intrinsic competitive advantage,

[9] NACE 64 (2018) GVA national accounts

eleven export opportunities are identified in figure 7. An estimation of the timeframe by which these could materialise is also provided.

This analysis shows that Ireland is fundamentally well-equipped to develop export markets in alternative proteins, dairy and the bioeconomy in the short-term, heat pump manufacture in the mid-term, and carbon credits and carbon management longer term (see methodological note 3b)**.** Whilst Ireland is assessed as intrinsically well placed, realisation of these opportunities could be highly contingent on strategic actions taken by Irish businesses and policy makers.

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Ireland is well placed to export emerging agriculture products in the near-term as well as energy, buildings end products longer term

NOT EXHAUSTIVE

▲ Estimated start date ● Highly relevant ○ Moderately relevant

		Possible export timeline			Competitive strengths			
	Export opportunities	2021-25	2025-30	2030-35	Existing ad-jacent industry	Natural resources	Relevant skills	Target customers
Agriculture	Alternative proteins end product and ingredients	▲			●	●	●	Global
	Low-carbon dairy end product	▲			●	●	●	Europe
	Carbon credits	▲			●	●		Global
	Bioeconomy products		▲		○	●		Europe
Energy	Green hydrogen end product			▲	○	●		Europe
	Green electricity end product			▲	○	●		Europe
Buildings	Heat pumps end product		▲		●			UK
Industry	Lower-carbon cement know how		▲		●		●	Global
Transport	Sustainable aviation fuels end product and know how[1]			▲	●	●	●	UK
Professional services and IT	Green finance products and services	▲			●	n/a	●	Europe
	Low-carbon data management	▲			●		●	Global

1. Contingent on there being sufficient available land for bioenergy crops, which may require further land uses changes given the competing needs for bioenergy crops

Source: McKinsey analysis

8

Figure 7: Qualitative framework evaluating potential export opportunities for Ireland

As one export example, Irish companies are well placed to compete in the alternative proteins market (9% CAGR in Ireland 2015-19), which is already outgrowing that of conventional meat products (-2% CAGR in Ireland 2015-19)[10]. Major Irish agriculture players are already making moves in alternative proteins, for example, Kerry's Radicle plant-based meat range[11].

As another example, Ireland could ramp up its heat pump manufacturing capacity to serve its own domestic demand as well as the UK and European markets that are expected to grow quickly. The UK appears to be an attractive export opportunity because it currently imports most of its heat pumps (92% in 2018) and aims to ramp heat pump installations up by >10X this decade[12].

2.4 Household bills

Section 2.4.1 shows that delivery of CAP21 could cause the average household only minor household bills increases in 2030, but section 2.4.2 highlights that cost and saving impacts could be unevenly distributed, particularly in the case of transport and buildings (see methodological note 4)**.** To avoid

[10] Euromonitor (2020) Market Size – Meat
[11] Kerry (2021) Plant-based Meat Alternatives
[12] EurObserv'ER (2018) and UnComm TradeMap (2018)

localised negative impacts, considerations for policy makers include identification of localised impacts and ensuring that the distribution of costs and savings is fair.

2.4.1 Aggregate household bills impacts

Figure 8 illustrates that delivery of CAP21 could increase the aggregate household bills of an average household by 0.5-1% in 2030 (see methodological note 4a). The analysis suggests that higher costs are driven by housing and utility because building improvements are not expected to collectively not pay back by 2030 on average, although certain types of properties retrofit investments may pay back in some circumstances but in others they will not. By contrast, road transport costs are expected to reduce the average household's bills in the next decade because the total cost of ownership of an electric vehicle is expected to breakeven with that of an internal combustion engine by mid-2020s.

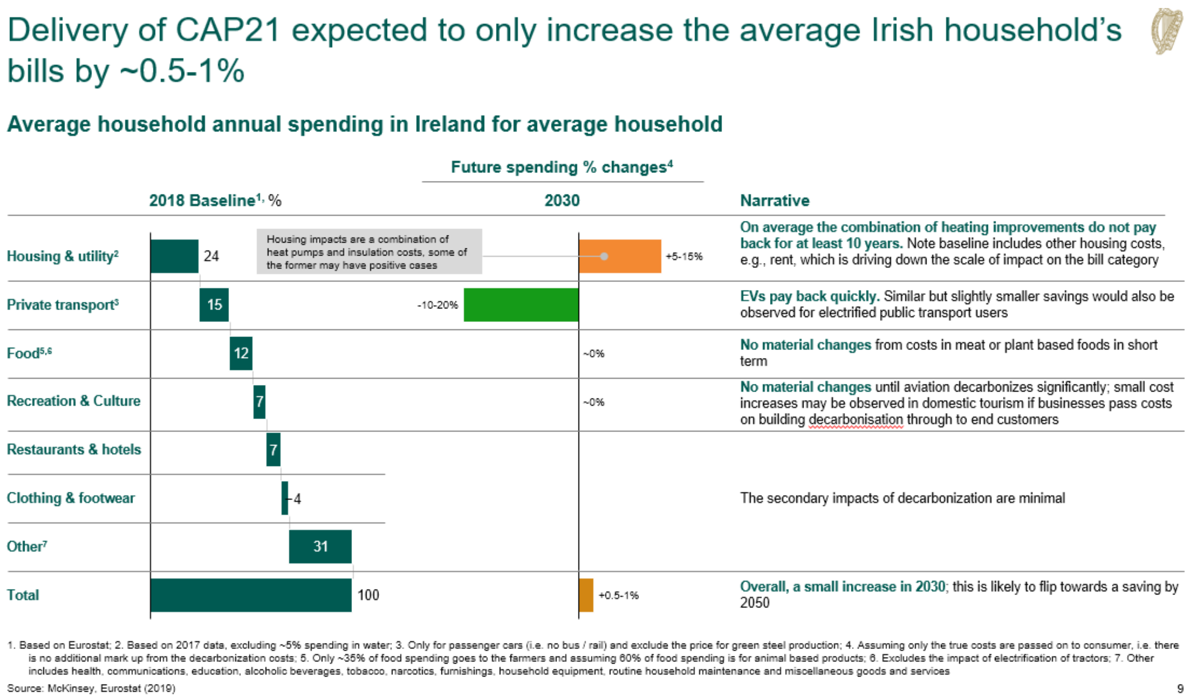

Figure 8: Future spending changes relative to average household spending in 2018

The private transport component of this analysis considers the household bills impact of buying a new electric vehicle versus a new petrol/ diesel vehicle. It does not examine the impact of buying a new electric vehicle instead of a second hand petrol / diesel vehicle. It is important to note that the CAP21 measures do not accelerate vehicle disposal and the targets regarding increased share of electric vehicle sales only apply to the new vehicle market, not the secondary market. Those that usually buy second hand internal combustion engines vehicles may continue to do so, although are expected to face higher fuel costs as a result of the carbon price increase. It is believed that a second hand EV car market will develop in time to meet demand from these buyers. Depending on when exactly a second hand car buyer purchases an EV, the size of this emergent market may influence levels of competition, and thus degree of mark-up on these cars.

The projected average costs changes to housing and utility combine two types of intervention – insulation and heat source changes. While the average household is likely to experience a net increase in costs by 2030 as a result of combination of these solutions, the individual solutions themselves could have different implications. Shallow retrofits are expected to pay back quickly, giving cost savings by 2030. Heat source changes – for example heat pumps or district heating – are expected to return either cost savings or cost increases by 2030, depending on the exact context. Deep retrofits are unlikely to pay back by 2030, resulting in cost increases. However, these are essential to enable heat source changes and also bring considerable co-benefits.

2.4.2 Distribution of household bills impacts

Although section 2.4.1 suggests that the average impact on household bills could be relatively small, figure 9 describes how these cost and saving impacts could be unevenly distributed (see methodological note 4b)**.** There are certain circumstantial factors that can drive the household bills impact higher. Transport and buildings were identified as being the most likely areas to drive differentiation in net impact on household bills. Figure 9 displays a list of characteristics associated with higher building and transport cost impacts. For example, 70% of homes in Ireland are privately owned (either owned outright or with a mortgage) and in these cases, the owner would be responsible for paying the upfront cost of the retrofit in the absence of other policy interventions[13]. Similarly 42% of Irish private households are detached, which typically cost more to retrofit because there are not communal walls or roofs that can be retrofitted together, reducing the cost per household[14]. Policy considerations may include identification of a comprehensive list of differential cost impact drivers and support for those with the highest cost burden.

Impact on household bills will be unevenly distributed: certain transport and housing circumstances can materially affect the net household bill impact

NON-EXHAUSTIVE

High Medium Low

Mitigation area	Characteristic associated with higher cost impact	Magnitude of cost impact	Rationale
Buildings	Home ownership	High	Home owners will face investment cost of retrofitting whilst renters will often be able to benefit from operating cost savings without investment (which is paid by land lord)
	Old housing stock & low insulation	High	Those living in old housing stock with low insulation will face higher costs of retrofitting.
	Detached property	Medium	Those living in detached houses typically have larger houses and less shared surface area (e.g., walls) so the cost per retrofit is typically higher than for smaller, connected properties
	Later retrofitters	Low	Those who retrofit later may incur higher costs associated with using the gas grid as the cost of managing the gas grids might be distributed over fewer billpayers.
Transport	2nd hand car buyer	High	In the short-term, those that buy 2nd hand cars will have less choice on a BEV because there is a less developed resale market. This may mean they keep an ICE and bear additional cost of fuel from carbon price.
	No access to parking	Low	Those with access to private parking benefit from easier and often cheaper at-home vehicle charging.

Source: McKinsey analysis

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Figure 9: Qualitative overview of characteristics that are expected to lead to higher costs than average

Similarly, this is also dependent on identifying possible positive socioeconomic benefits and orchestrating their delivery.

[13] CSO (2021)
[14] CSO (2021)

APPENDIX

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A set of Core Measures have been identified for inclusion in Climate Action Plan 2021 (1/2)

Measures from Climate Action Plan 2019 measures without additional uptake in Climate Action Plan 2021

Core measures included in Climate Action Plan 2021

Sector		Core measures	Technology	KPI 2030: Climate Action Plan 2019	KPI 2030: Climate Action Plan 2021
Electricity	E1	Build-out renewable generation capacity	Total RES in generation mix, %[1]	70	80
			Onshore wind, GW[1]	~8.2	Up to ~8
			Offshore wind, GW[1]	~3.5	~5
			Solar PV, GW[1]	~0.4	~1.5-2.5
Transport	T1	Electrify road transport	Share of passenger car kilometres by electric means, %	~35-40 (~0.84mn BEVs and PHEVs)	~40-45 (~0.84-1.0mn BEVs and PHEVs)
			Share of commercial vehicle kilometres by electric means, %	~25 (~98k electric LGVs and HGVs)	~35-40 (~140-150k electric LGVs and HGVs)
	T2	Increase biodiesel blend-rates	Bioethanol blend, Vol%	E10	E10
			Biodiesel blend, Vol%	B12	B20
	T3	Transition to zero emission goods and passenger mass transportation	Transport modes transitioned to low-carbon	Electrification of bus transport (~1.2k low-emission buses)	All replacements for bus, rail, marine and domestic aviation to be green before 2030
	T4	Shift towards transportation modes with lower energy consumption per kilometre	Demand shifts		Achieve abatement through mode shift and reduction in energy intensity per kilometre
Buildings		Retrofit residential dwellings	Retrofitted homes[2], # dwellings	← 500,000 (B2 BER /cost optimal equivalent or carbon equivalent) →	
		Deploy zero-emission heating in existing homes	Existing homes with zero-emission heating[1], # dwellings	← 400,000 →	
	B1	Continue to phase out fossil fuels in new homes	New homes with zero-emission heating, # dwellings	200,000	250,000-280,000
	B2	Ramp-up zero-emission heat in commercial buildings	Commercial buildings with zero-emission heating[1], # buildings	25,000	50,000-55,000
	B3	Increase targets for roll-out of district heating	District heating demand, TWh	~0.1	~2.7 TWh
	B4	Increase targets for public sector buildings	Emission abatement from public buildings, %	30	50

1. RESS competitive auctions will determine the final generation mix
2. Only additional installments, excluding existing building stock with applied technology

Source: Climate Action Plan 2019; Programme for Government 2020

1

NOT FOR FURTHER DISTRIBUTION

A set of Core Measures have been identified for inclusion in Climate Action Plan 2021 (2/2)

Measures from Climate Action Plan 2019 measures without additional uptake in Climate Action Plan 2021

Core measures included in Climate Action Plan 2021

Sector		Core measures	Technology	KPI 2030: Climate Action Plan 2019	KPI 2030: Climate Action Plan 2021
Industry		Switch to alternative fuels in cement	Share of energy mix from zero-emission fuels, %	80	80
	I1	Accelerate uptake of carbon-neutral heating in industry	Share of carbon neutral heating in total fuel demand, %	Food industry[1]: 80	All industries: ~50-60[2]
	I2	Phase-out high-GWP F-Gases	Emission reduction vs 2014, %	*No target*	80
	I3	Decrease embodied carbon in construction materials	Emissions from non-metallic mineral products by 2030	*No target*	N/A
	I4	Enable electrification of high-temperature heat generation	Emission reduction of non-ferrous metals manufacturing vs 2018	*No target*	N/A
Agriculture	A1	Increase adoption of GHG-efficient farming practices	Implementation of GHG-efficient farming practices	Deliver GHG-efficient farming practices	Increase adoption of GHG-efficient farming practices
	A2	Diversify farm activities (e.g., through forestry, bioenergy)	Area impacted by diversified farm activities, kha	*No target*	N/A
	A3	Create new biomethane business opportunities	Biomethane production, TWh	*No target*	~1.6
LULUCF	L1	Increase sequestration through forestry (afforestation, extended rotations, improved forest management)	Yearly planting rate, ha/yr	8,000	8,000
	L2	Limit deforestation trends	Yearly deforestation rate, ha/yr	*No target*	<900
	L3	Rewet peatlands and wetlands	Area of peatlands and wetlands rewetted, kha	*No target*	~44-77
	L4	Increase mineral grassland carbon sequestration	Area of grassland better managed, kha	~450	~900
	L5	Manage organic grasslands better (farmed peatlands)	Area of organic grassland soils rewetted, kha	~40	~80
	L6	Increase use of cover crops	Area of cover crops planted, kha	*No target*	~50
	L7	Incorporate excess straw into tillage	Share of cereal area directly incorporating straw into soil, %	*No target*	25

1. Food industry represents ~15% of total industry fuel demand (in TJ) in 2018
2. Excluding measures I3, I4 and I6

Source: Climate Action Plan 2019; Programme for Government 2020

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Appendix item 1: menu of potential decarbonisation levers in CAP19 and CAP21

METHODOLOGICAL NOTES

1. **Financing need**

   A pathway consistent with the draft CAP21 measures was developed in a decarbonisation scenario explorer (DSE hereafter) tool. This proprietary tool projects the capital and operational expenditure for individual technologies in USD over time. These were then aggregated for (a) the time period 2021-30 and (b) by sector. Finally a currency conversion was applied to convert USD to EUR of 1:0.82.

2. **Employment**

   To estimate the direct job needs impact of decarbonization, best-fit employment multipliers have been applied to activity levels for each good and service (e.g., GW of off-shore wind produced). The activity levels are defined as the additional supply (and the technologies of supplying) of different goods and services in a decarbonization scenario based on the draft CAP21 inputs relative to the no climate action scenario in a decarbonisation scenario explorer tool. Multipliers used have been sourced from academic literature in addition to observations from anonymised projects, and are specific to the decarbonisation activity in hand, and where possible that decarbonisation activity in Ireland, or otherwise a comparable peer.

   To calculate the indirect and induced employment impacts, the decarbonisation activity's spend has been decomposed in to major economic categories, and their historic multipliers, as provided by OECD, have been applied.

   To calculate the decline of job needs, appropriate proxies for the volume of work need have been used – for example, the peat industry has been scaled down based on the reduction in area of peat production pits in Ireland.

   Note that these estimates, based on draft CAP21 measures, may not be the same as net job creation because there is a possibility than workers filling these roles may transition from employments in other parts of the economy. We have looked at the effect of the net zero transition megatrend in isolation.

   This analysis has made assumptions about the degree of onshoring for different jobs, based on the historical precedent. For example, it has been assumed that EV or wind nacelle manufacturing activity is unlikely to be conducted in Ireland this decade.

3. **Competitiveness**

   A quantitative analysis was conducted to understand the possible cost increases of electricity to Irish bill payers. This considered the system cost of adding the new generation capacity implied by CAP21 and the changing generation volumes for Ireland, as well as comparable decarbonisation scenarios for several European peers. The typical power cost to an Irish business consumer was dissected as per European Union data, and the future implied wholesale power cost scaled up, while all other elements were kept constant. The impact of this cost was then translated in to changes in unit prices in different industries by using available industry benchmark data for spending on electricity and gas, and doing the appropriate conversions from today costs to implied future electricity price. The resulting totals are then expressed as a % of the original total.

A qualitative analysis was conducted to develop a shortlist of export opportunities that Ireland is assessed to be well positioned for. Initially a longlist of export opportunities associated with decarbonisation globally was developed. This was then filtered down using an assessment of the following criteria: existing adjacent industry, natural resources and existing relevant skills supply. The shortlist was iterated and refined with both internal and external experts.

4. Household bills

The household bills analysis model provides an overview of the potential impact of the DSE decarbonisation pathway based on draft CAP21 measures on the average Irish household bill in 2030. The main inputs for the model are:

- Relevant capital and operating expenditures from the DSE (i.e., those believed to translate through to increased household spending)
- Household spending for Ireland from Eurostat
- Categorization of car ownership, used to divide transport costs between cars and buses, from the European Environment Agency

This analysis compares relevant increases in total cost versus a “no climate action” scenario, and scales the relevant item bill line item. For example if Ireland’s private transport costs are 10% more expensive because of a petrol to EV transition, then the bill line item is scaled 10%.

The analysis does not take into account potential costs such as a result of policy interventions that either reduce (e.g., through subsidies) or increase (e.g., through carbon taxes) the impact of the household bill.

The qualitative analysis on the drivers of higher cost impacts was carried out to highlight that there will be an uneven distribution of household bill cost impacts. This was undertaken on the two spending buckets with the largest impact projected in section 2.4.1: energy & utilities and transport. Expert discussions were used to (a) shortlist and refine the circumstantial drivers of higher household bills impacts, (b) classify these impacts as “low”, “medium” or “high” and (c) refine rationales for the association with higher cost impact.