Public consultation on Long-Term Strategy on Greenhouse Gas Emissions Reduction

Submission prepared by students on the
MSc in Climate Change: Policy, Media and Society
at Dublin City University

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Introduction

This submission was prepared by students on DCU's MSc in Climate Change: Policy, Media and Society. Students enrolled on the programme were invited to participate in the preparation of this submission, but there was no requirement on them to do so. As such, this submission does not necessarily represent the views of all students enrolled on the programme.

The process of formulating this submission was student-led. The process was facilitated by Dr. Diarmuid Torney who teaches modules on "Climate Change Policy and Governance" and "Environmental Change and World Politics" on the programme, but the content of the submission was formulated by students.

We welcome the opportunity to respond to this public consultation. Nonetheless, we are of the view that the timing and original length of the consultation represents a missed opportunity for a meaningful societal dialogue on the climate crisis and Ireland's response.

Pathway to 2050

1. What are the appropriate 2050 targets for Ireland to set in the context of supporting a net Zero target at EU level?

Ireland's stated national policy position is to reduce CO_2eq emissions by 2050 by 80% on 1990 levels across the Energy Generation, Built Environment and Transport sectors, with a goal of climate neutrality in the Agriculture and Land-Use sector.[1] This policy position and the Climate Action Plan 2019 need to be updated to reflect more appropriate and ambitious targets for 2030 and beyond.

Ireland needs to move from being a climate laggard and from talking about being a climate leader, to actually demonstrating leadership. The most effective and impactful way to 'support' a net zero target for 2050 is to achieve it in Ireland, or even better, achieve a net negative emissions target by then. In line with the recently published European Green Deal (December 2019), the targets for 2030 should be made consistent with the Commission's proposal to raise the EU's target of reducing greenhouse gas emissions (GHGs) by 50-55%.[2]

It is no longer appropriate to exclude agriculture from emissions reduction targets, while depending on forestry and other uncertain LULUCF measures to bridge the gap to "climate neutrality". The European Green Deal proposes a new approach to the Common Agricultural Policy, with 40% of it contributing to climate action. In line with the European Green Deal, Ireland needs to develop targets that tackle agriculture emissions, while also focusing on ensuring "the

[1] https://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/National-Policy-Position.aspx
[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1576150542719&uri=COM%3A2019%3A640%3AFIN

transition is fair and just for everyone working" in the agricultural and maritime sector.[3] The demand for meat is likely to continue to fall, while the demand for reduced emissions rises. A transition plan needs to be put in place for beef farmers who are dependent on subsidies to break even.

As a society, Ireland continues to be dependent on foreign direct investment (FDI), tourism and agriculture (see Climate Action Plan 2019), none of which we can take for granted for future economic growth. In addition to planning for transitions in agriculture, we need contingency plans that develop indigenous alternatives to FDI. We also need to restore and protect our environment to continue to attract tourism.

An appropriate target for 2050 would be a country that respects all members of society and values them and places an inherent value on our environment, a country with a social structure that supports the most vulnerable as our population grows and ages.

The state should stop measuring success solely in terms of GDP (fuelled by FDI) and economic growth, and instead explore the value of setting targets for well-being. Support should be provided for opportunities for citizens to work less and earn less but maintain a good quality of life where priorities centre around family, community and living sustainably, as has been promoted in Iceland, Scotland and New Zealand.[4]

2. What advanced technologies, across all sectors, could support a move to net-zero or negative emissions by 2050?

It will be important to continually stay abreast of emerging or advanced technologies. For example, as wave and tidal energy solutions evolve to become more cost effective, Ireland's coasts could provide significant opportunities.

However, advanced technologies may not be required if current proven technologies are used to their full potential – for example, onshore and offshore wind; methane digesters for farms; rewetting peatlands, microgrids, rooftop solar, and investments in the grid, for example.

In addition, supporting behaviour change at a sectoral, community and individual level could be more important than any new technology solutions. As outlined below, investing in public transport and cycling infrastructure to make our cities car-free would be one example. Bold and innovative approaches to public policy will be potentially more impactful than advanced technology solutions.

3. What financial instruments could complement a decarbonised economy by 2050?

The financial instruments of the European Commission's European Green Deal package should be leveraged by matching any investments. Funds could be raised through a corporate tax levy, for

[3] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1576150542719&uri=COM%3A2019%3A640%3AFIN
[4] https://www.bbc.com/news/world-europe-50650155

example. As set out in the Commission's Communication, there are three legs to the proposed €100bn instrument:[5]

- A just transition fund that will mobilise resources from the EU's regional policy budget;
- The "InvestEU" programme, with money coming from the European Investment Bank;
- EIB funding coming from the EU bank's own capital.

In particular, financial instruments could support regenerative farming through incentives for farmers to reduce methane emissions, protect carbon sinks, and explore new crops such as paludiculture.

Electricity

6. What should our fuel mix look like by 2050?

The Consultation Document suggests that Ireland's electricity system may need to be fully decarbonised by 2050. However, as has been pointed out in EirGrid's scenario planning, for the electricity sector to support Ireland equitably contributing to the Paris Agreement, it would need to be CO2 neutral by 2040.[6] Eirgrid has also indicated that by 2030 it can operate the grid with 95% of renewable power, compared to 65% at present. By 2050, grid operation with 100% renewable power should therefore be feasible.

Solar, offshore and onshore wind should be the main components of the 2050 electricity fuel mix. EirGrid scenario planning provides for 16,935 MW from renewables of a total of 21,035 MW generation mix summary for 2040. This percentage can and should be increased in the following 10 years. Ocean energy must be given particular focus, given that the CAP identifies Ireland's coast as one of the most productive in Europe, with a potential of 70GW of ocean energy opportunity (wind, tidal and wave) within 1000 km of the Irish coastline. Exploitation of this resource will require development of a new offshore grid, along with improvement in storage capacity. Security of supply will be assisted by interconnector development plus expansion of local microgrids. By 2050, Ireland must end dependence for electricity supply on imported liquid natural gas (LNG) from fracked sources. The gas supply, if used, must be 100% renewable. As proposed by EirGrid, this could involve an indigenous biomethane supply, further blended in the gas grid with hydrogen or storage of hydrogen on-site. Biomass (domestically sourced) could provide 10% of the 2050 fuel mix.

[5] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1576150542719&uri=COM%3A2019%3A640%3AFIN
[6] http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-TES-2019-Report.pdf

Enterprise

7. How can emissions from large industry, e.g. cement and alumina, be reduced, including options beyond fuel substitution?

Emissions in the enterprise sector fell dramatically (by almost a third) between 2005 and 2011 as a result of the economic recession but have since rebounded by over a quarter. This emissions growth is driven entirely by increasing economic activity. This demonstrates how highly correlated industry emissions still are with economic activity.

As Ireland moves to a more services-based economy, imported emissions from physical goods will become more prominent and enterprise has a role to ensure life cycle emissions are accounted for and minimized. Given there is no production boundary for GHG emissions, the reduction of GHG emissions while maintaining GDP growth is a global responsibility.

Therefore, it is necessary for the Irish government to continue to implement environmental policies such as carbon taxation, carbon pricing, and cap and trade, to ensure the economy grows sustainably. The Irish government must continue to review the ETS and include sections of Enterprise that are currently outside the scheme such as small SMEs. All emissions should be at the very least accounted for.

Decoupling occurs when the growth rate of environmental pressure (for example, CO2 emissions) is less than that of its economic driving force (for example, GDP per head) over a given period. Decoupling can be either absolute or relative. Absolute decoupling is said to occur when CO2 emissions is stable or decreasing while the GDP per head growth is growing. While, relative decoupling is when the growth rate of CO2 emissions is positive but less than the growth rate of GDP per head (Ruffing, 2007).

Some suggestions that should be considered to reduce emissions from large industry include:

- Minimum CO2 market prices must be set by government / EU. Ensure the price to emit CO2 is essentially high enough to encourage reduction and capture/ storage.
- Ensure just transition policies are in place as technology is improved to support job displacement due to new technology or reduce emissions targets.
- Support electricity generation opportunities for cement and alumina companies to produce energy from their waste heat. A large industry that creates a lot of energy/heat in the production of a product to create a closed-loop system where this energy/heat can be used to supply energy/heat back into the national or local system.
- Move towards more wood in construction.
- A green eco-cement could be made exclusively from municipal solid waste incineration residues, with the potential of sequestering CO2 and conserving energy and natural resources.

Instead of using conventional cement kiln, this eco-cement can be made at the incinerator, leading to a closed-loop and no-residue incineration operation. The process will contribute towards environmental sustainability by utilizing the MSW incineration residues, reducing the landfill of wastes, reducing the carbon emission from solid waste incineration, and converting wastes into value-added products.[7]

- Carbon capture and storage technology from cement and alumina production to be mandatory, with a target of zero co2 emissions in the life cycle production.

- Energy neutral kilns to produce cement and alumina. The source of energy must be renewable.

- Create an independent verified emissions league table with mandatory prominent company disclosure, to ensure that consumers and investors understand the true emissions cost per product.

8. Should enterprise lead the way in the transformation in the GHG impact of power, transport, buildings, waste and the circular economy? If so, how?

It is very clear that the state needs to lead the way, supported by experts from various sectors, including scientists, NGOs and industry. Enterprises and industries can provide leadership in their sectors. Product labelling should be used to give people information to make low-carbon decisions. Incentives should be provided for new commercial infrastructure to produce energy for sale back to the grid.

Enterprise should be held accountable or incentivised to make a contribution. A net zero emissions target can allow an enterprise to continue to produce emissions and not cut emissions from their production of a product or service.[8] Allowing a business to offset without real reduction is dangerous. Reduction and removal of emissions produced by enterprise should be at the centre of policy.

Full disclosure from all of enterprise lobbying activities with government policy decisions full disclosed. Loopholes in the current legislation around exempted communications should be closed. The definition of lobbying requires further transparency rules to be implemented.

When the market is given the opportunity to solve the problem, this must come with policy to independently review the performance of any market based solution, with timely review dates. Public Private partnerships to encourage investment in R&D carbon neutral industries and technology.

The government should create a green advertising policy with strict regulations on the type of language used when the advert is selling the environmental credentials of a product. As consumers become increasingly aware of the potential environmental impacts of their purchases, products

[7] https://www-sciencedirect-com.dcu.idm.oclc.org/science/article/pii/S0921344919302794#sec0090
[8] https://www.carbonbrief.org/guest-post-the-problem-with-net-zero-emissions-targets

labeled as “eco-friendly” or “sustainable” have become more popular than ever. In response to growing demand among consumers for environmentally friendly products, green advertising claims have become an important component of advertisements for many products.[9]

Built Environment

9. How can Ireland retrofit almost all buildings by 2050, including options for heating fuels and what buildings will be most challenging to decarbonise?

The built environment is an expression of our cultural identity and our capacity to innovate; its quality determines our emotional and physical health and wellbeing; the design and location of buildings can enable sustainable behaviour, and increase resilience to climate impacts. As such, the built environment offers significant opportunity to achieve the shift towards 2050 net zero carbon. However, decarbonisation measures need to be considered holistically and strategically in order to realise full potential benefits. Allied to this, built environment works are costly, complex, involve multiple stakeholders and take years to deliver. Mistakes are expensive and difficult to rectify. A further consideration is that a building’s carbon footprint extends beyond the building in use and includes the production and transportation of materials, the construction process, and the building’s demolition.

Is it necessary to retrofit every building in Ireland and to what level? It would be useful to compile data on building type, age, condition, and location in order to put a shape on the programme. This could build on existing OS data and targeted questions should be included in other information gathering platforms including the 2021 Census. In tandem, the projected half a million new homes, equivalent to 25% of existing stock could assist overall decarbonisation e.g. new developments could be designed to ‘energy-plus’ standard to act as a renewable energy source for surrounding existing buildings.

A One-Stop-Shop model (as per CAP action 47) should be introduced as a matter of priority. It should be ambitious in scope, should take the form of a centre of excellence, cover all building types (including protected structures and apartments), and should connect to other initiatives e.g. contractor upskilling (CAP action 50). Established models should be explored e.g. Flanders.[10]

Demonstration projects are essential to raise level of ambition and understanding for public, policy makers and practitioners. This could take the form of live ‘Building Exhibition’ incorporating key building typologies e.g. an apartment block, a red-brick terrace, an office building, a retail centre etc. in representative places e.g. a village, town and city. ‘FutureBuilt’ in Oslo is an interesting reference. This is a public-private collaboration involving 50 building projects, which is aiming to reduce transport, energy and material consumption emissions by 50%. Projects include new ‘plus-energy’ buildings and deep retrofit, with a particular focus on architectural quality.[11]

[9] https://www.tandfonline.com/doi/full/10.1080/00913367.2018.1452652
[10] https://www.energiesparen.be/bouwen-en-verbouwen
[11] https://www.futurebuilt.no/English

Life Cycle Assessment (LCA) should be required of every development proposal. A building's embodied carbon represents approximately a third of a building's carbon load. LCA creates an inventory of the environmental impacts associated with building materials, manufacture, transportation, use and disposal. The metrics or indicators, represent atmospheric impacts, fossil-fuel resource depletion and ecological effects. LCA is a useful modelling tool that informs decisions during the design process and it can be a way to validate sustainability strategies that are otherwise hard to assess. LCA aligns with CAP Action 65: *Develop and establish a climate-action toolkit and audit framework for Local Authority development planning to drive the adoption of stronger climate action policies in relation to the patterns and forms of future development.*

Decision making on funding public housing retrofit versus demolition and new-build should also include Life Cycle Assessment. This ties in with Action 64: *Introduce minimum BER standards in the Local Authority social housing stock as part of retrofit works being carried out on older stock or refurbishment of vacant dwellings.*

Require private rental accommodation to be advertised on a cost per m2 linked to energy and sustainability performance. This could build awareness and kick-start understanding of value for money in the private rental sector. This aligns with CAP Action 46: *Examine feasibility for commercial rates to be linked to BER.*

Historic buildings ('Protected Structures') and apartment developments in multiple ownership will be difficult to retrofit. Deep retrofitting is likely to damage a protected structure's architectural character and building fabric. Best practice guidance should be developed to inform building owners, and planning authorities as to the optimum acceptable level of retrofit. Apartment developments are a different and arguably more difficult problem. Apartment owners already struggle to finance repair of building defects. Now they will have to create a sinking fund to cover deep retrofit costs and commission appropriately skilled designers and contractors to undertake and certify the works. The proposed centre of excellence / one stop shop (CAP action 47) should focus on this.

Large commercial buildings and large hotels may be the most challenging buildings to decarbonise. There needs to be more incentives for commercial buildings to make energy saving upgrades.

There must be a financial incentive and pathway for homeowners to make energy upgrades to their homes in a way that is not punitive. If owners can provide a deposit e.g. 20%, this can be coupled with a grant incentive of 30% that can reduce over time as behaviour and attitudes change to the benefits of retrofitting long term, genuinely low interest loans must be made available; loans that are no more than 1% above base-rate. The current time lag between pricing home retrofitting and grant application and subsequent grant approval needs to be reduced to eliminate the problem of inflation raising costs over the wait period. This causes disillusionment and dissatisfaction for both home-owners and builders with the process resulting in disengagement.

This needs to be supported with an education and information programme demonstrating to homeowners how the reduction in costs of heating and electricity bills repay the investment over time.

11. How do we ensure that building and infrastructure development supports compact urban development, which is regionally balanced and sustainably designed to reduce GHG and enhance sustainable quality of life?

This is a contentious issue, as it requires compromise and acceptance of decisions that appear to favour one community and disadvantage another. A community engagement programme based on design thinking principles could help bring consensus. Several organisations have experience in this area including Dublin City Council, Limerick City Council, the RIAI, and the Irish Architecture Foundation. Collaboration with key community stakeholder groups such as the GAA, cultural organisations and youth groups would be critical for success.

Government deep retrofit grant funding should target villages and urban areas. Grant award criteria could be devised which consider wider benefits, e.g. addressing vacancy in village or town centres. This aligns with CAP Action 52: *Develop and optimise Government funding and grant schemes to drive demand for energy efficiency retrofits that deliver value for money.*

Consider incentivising the sub-division of single-family houses into two or more homes tied to deep retrofit. This could take the form of planning exemption (within prescribed guidelines and standards), tax relief and / or access to green finance. This could have additional benefit of enabling people to 'down-size' into their own home while making it more energy efficient and also providing more housing in areas of high demand.

Sustainable village models should be examined, with village microgrids where they can become energy independent using wind solar and then we would need to explore energy storage.

Planning for transport infrastructure should not be solely based on the population of an area. Spending more in areas of high density only adds to the density of that area. If you build it, they will come. Budget to develop small regional transport to encourage citizens to stay in their local region and not move to more densely populated areas because they have better transport infrastructure. Regional transport development should not be left solely to the market, as market actors will not see a profit in developing in regional less dense areas. Possible population targets should be set against areas that could be developed. Budgets should be set with these targets in mind.

Transport

12. Do you think modal shift will play a key role in decarbonisation by 2050? If so, what is needed to drive substantial modal shift?

Modal shift is essential to decarbonising our transport system by 2050, this will not be possible without significant infrastructure, investment and long term planning. A modal shift must take place, especially from the individual private car, but in order to do so the alternatives need to be as attractive as what they are replacing. The replacement must be comfortable, frequent, direct, accessible for all abilities and affordable. There will be no one size fits all solution; a multifaceted approach will be necessary. Joined up thinking across departments will also be necessary, especially with the built environment.

The expected population growth will be 1 million by 2040 to 5.7 million people. Therefore, it is essential that we not only plan for the current population, and how to move them out of a fossil fuel dependant mode of transport, but also we must plan ahead for the growing population and a population that is aging rapidly and build this in to any infrastructure plans.

High quality infrastructure will have to be supported by financial instruments to drive change, for example financial incentives to encourage the population to change modes; public investment in mass transport and financial disincentives to remain in a high carbon transport mode (embodied or ongoing) for example the electric car while it has fossil free at the point of use it carries a large proportion of embodied carbon. It is also important that all modes of transport are covered by any new carbon budgets.

Building permeability into any future transport infrastructure and importantly the built environment will incentivise modal change. If it is more convenient and cost efficient to go from A to B by bike or by public transport than by individual car through the use of high quality, enforced, bus-only lanes, safe, segregated, cycle lanes or cycle superhighways, and permeable bike and pedestrian pathways through the built environment, people will shift towards the most convenient option. Imposing financial instruments such as parking charges and congestion charges to disincentivise private car in the urban setting will drive behaviour change.

We need to consider why we are travelling and where we are working in relation to where we're living. The school and work commutes take up a large portion of our transport emissions. Currently, almost 3 million people are commuting to work or study every day (CSO 2016)[12]. The most popular means of travel for primary school children is by car with 6 out of 10 students being driven to school every day. Only 1 in 4 children are walked to school and 1 in 10 travel by bus (CSO 2016)[13].

[12] https://www.cso.ie/en/releasesandpublications/ep/p-cp6ci/p6cii/p6stp/
[13] https://www.cso.ie/en/releasesandpublications/ep/p-cp6ci/p6cii/p6stp/

We need to consider a 4-day work week. This would potentially reduce commutes and therefore emissions by 20%. There is also a potential to incentivise people with an 80% work week for example with 85% pro-rata pay. Companies and businesses should be incentivised to promote working from home where possible.

School commute options include car and stride facilities; car-free zones; stop and drop options; cycling and walking buses where groups of children cycle to school can be encouraged using good infrastructure and investment in a school bus system for mass transit of children to school to take cars out of the school run. Free public transport for children under 12 should also be considered and priced capped affordable or free public transport for the rest of the population. Electric bikes should also be financially incentivised through a greater grant or not capping the bike to work scheme.

Currently there are too many barriers to choosing alternatives to individual car travel in Ireland. These include lack of infrastructure, the high cost of travel and the extreme lack of safety on our roads for walkers or cyclists. This becomes a vicious circle of more people choosing to travel by car over alternative modes of transport because the current alternatives are neither safe, adequate or affordable.

A combination of high frequency, free or very low cost public transport, excellent cycling infrastructure and safe spaces for pedestrians, across the country should be provided. Cities should be as car free as possible, creating healthier air for all occupants. Within regional roads and motorways, lanes could be reduced with less cars on them, there would be segregated cycle and walkways. With changes in the agriculture and food producing sector and a heavier focus on local food there would be less heavy transport vehicles on the roads.

13. What should transport in our cities and rural areas look like by 2050?

Cities

Ireland's cities are small and relatively compact in comparison to other European cities. Despite this, research commissioned earlier this year by motor data company Inrix[14] showed that Dublin commuters spent almost 250 hours stuck in their cars travelling at less than 10km per hour last year. This is unsustainable for a modern city.

Our cities should be easily accessible with excellent, frequent, low-cost or free public transport links and importantly there should be a hierarchical structure with priority given to pedestrians, then cyclists, public transport, service vehicles and finally private motor vehicles (including taxis). Accessibility across all modes needs to focus on the requirements of our most vulnerable transport users with accessibility being critical as our population ages and becomes more frail.

Cities should be low emission spaces with an emphasis on keeping cars out of the city centre. The role of taxis as a form of public transport also needs to be assessed. Consideration should be given

[14] https://www.irishtimes.com/news/ireland/irish-news/dublin-one-of-worst-cities-in-world-for-traffic-congestion-1.3791651

to moving away from individual oriented public transport and towards mass public transport with round the clock service for high demand routes. The taxi fleet could be reduced if it was replaced with mass public transport.

The Climate Action Plan has a strong focus on rolling out infrastructure and incentives to more to BEVs and PHEVs. Consideration should also be given to the feasibility of individual car ownership in our future cities, with a smaller fleet of cars that can be used on a shared basis potentially like the 'Go Car' model. In light of this, the concept of the two-car family needs to be addressed in the urban setting. The resources for making batteries and EVs are not infinite and we may end up replacing one problem with another as we divert more and more resources towards manufacturing EVs, impacting on habitats and communities at the coalface of the raw material supply chain. We should encourage the urban population to move away from this private and individually owned modes of transport.

We need to increase focus on low/no carbon modes of transport such as walking, cycling (push and electric) and E-scooter type (or other future type) transport modes. These have the advantage of having both low levels of embodied carbon and zero or extremely low operating emission. These low carbon alternatives to EVs do not appear to be getting the same level of focus as EVs in the pathway to 2030. This may lock us in to a private individual transport modality to 2050. Directing our main focus on tweaking one of the biggest contributors to pollution, congestion, emissions and noise (i.e. the private car) may not be the best way forward. While EVs are quieter and are low emissions they have embodied carbon and use finite resources and they will not solve the problem of congestion. We need to embrace a new way of thinking. Investing in costly marginal efficiencies, non-sustainable infrastructure, or transport modes that are not scalable to deal with an almost 20% population rise by 2040 is not future proofing our transport system in the urban setting.

We must be ambitious with our cycle infrastructure; safe, segregated, cycle infrastructure is good but let's make our cycle infrastructure a world leader; cycle superhighways accommodate all abilities of cycle user and also wheelchair users, let's build cycle lanes that can accommodate all ages and abilities allowing slow and fast users, young and old to travel together in a low/ zero carbon way.

The Climate Action Plan is aiming, with An Post for example, to 'roll out electric vans across the city' but they are taking bikes out of the fleet to do so. While the replacement of light duty diesel cars/vans with electric vans is to be welcomed, is replacing a bicycle with an electric van a truly low carbon initiative?

Rural Transport

The commuter belt around Dublin needs to be better served with frequent high capacity rail services. Many of these areas have existing rail links but the timetable is not compatible with the workday commute meaning people eschew the train for the private car. Where rail links exist increase capacity and frequency. Where rail tracks exist look at areas of high population density and build train stations. Look at extending rail along areas of road congestion. Building the

commute into the work day should be explored, for example work carriages on trains with desk spaces where people can start and finish the work day while commuting.

The private electric car is to be encouraged in the rural setting, especially because of our low and widespread rural population. However, there may be an opportunity to look at car sharing options for the second car (which most families have) especially for those that live near a village or town setting. Ultra-fast charging points to replace fossil fuel stations across the country will encourage transition to the EV in the rural setting and reduce range concerns.

Bike lanes and footpaths should be installed around towns and villages for at least a 2 km radius to encourage people to move away from the car for short journeys. The school bus system should be opened up to everybody in rural Ireland using electric buses to take children out of the car for the school run, this may have a potential in the urban setting as well. Encourage cycle bus schemes for schools for children that live near town and village settings.

Create a new vision for transport investment, move away from investment based on density of population, this simply creates demand for people to move to already highly populated areas. If we only invest in big towns and cities this will create long term issues with overcrowding, consider investing in rural areas where excellent public transport links combined with remote working with could revitalise our rural towns and villages and provide an excellent quality of life to the inhabitants. Increase the rail network to serve the rural population especially in the North West and the South West of the country. Electrification of the rail network need to be progressed.

14. What are the most cost-effective solutions for reducing emissions from heavy duty and long-distance vehicles?

Cost effectiveness is very important for business but it cannot take priority over a target of zero emissions by, or preferably before 2050. The cost of not meeting our targets will ultimately be higher when fines, penalties and the impacts of global warming, and our part in contributing to it, are taken into account. The International Energy Agency estimates that road freight transportation accounts for around 7% of total world energy-related carbon dioxide emissions.

The most cost effective mechanism to reduce emissions from heavy duty goods vehicles would be to reduce the demand for freight transport, encourage companies to examine the supply chain and encourage more locally sourced product which may become better value when the price of carbon emissions is taken into account.

Reducing our consumption as a nation also needs to be examined and ties into uncoupling our well-being from GDP as mentioned in Appropriate Targets to 2050. This reduction in consumption should have the effect of reducing demand for freight transport.

Optimise vehicle use and loading, driver training to maximise fuel efficiency through driving speeds and reduction in engine idling time. Improve planning and coordination across fleets, empty runs (back hauling) should be avoided, engage in a 'barter' style or points system with other haulage companies to eliminate vehicles returning with empty loads from long distance journeys.

Rail is less carbon intensive than road as a freight transport mechanism, incentivise companies to switch from road to rail freight, as the rail network electrifies this will carry marked savings on carbon emissions versus road vehicles [15]. Companies could be incentivised towards rail through taxes or tariffs on goods being linked to the freight modality and its level of carbon emissions. Inland waterways are also less carbon intensive than road this may be worth examining as an infrastructure potential towards 2050. Companies that ship internationally must be made aware of the reduced carbon emissions of ocean shipping (when using large vessels) compared with road vehicles.

Biofuels may have a part to play (see notes on biofuels at the end of this section) but the technology to decarbonise road freight and heavy vehicles e.g. hydrogen has not yet been developed to an affordable or scalable degree.[16]

Create policy that states all public and private (over 20 seats) buses to be either on a minimum biofuel blend (see notes on biofuels at the end of this section), hybrid electric or fully electric by 2040 and by 2050 all fleets to be zero net carbon emitters. Ensure all modes of transport are covered by any new carbon budgets.

Incentivise road and rail transport organisations to decarbonise their fleets through low cost green loans or a carbon credit payment scheme or through VAT/tax incentives for companies that can prove they have reduced their emissions.

Building a compressed natural gas network as part of the 2030 CAP is locking us in to a carbon emitting fuel source for our transport system. This is not compatible with the EU's carbon budget of 10 years left before it exhausts the carbon budget required to keep global temperature rise below 2C [17] . Using CNG as a "bridge fuel" and building infrastructure to support it should not be part of our pathway to 2050, natural gas does not necessarily perform better than oil or gas in terms of emissions in fact, if the gas comes from hydraulic fracturing (fracking) it can actually have higher emissions.[18,19,20] Transitioning to biomethane from sustainable sources, such as waste, may not be a scalable replacement fuel for CNG.[21] Whether it can be generated in sufficient volume for wider public use to replace CNG needs to be examined before we lock into a CNG infrastructure, with a view to then transitioning to biomethane. It may well have a role as a niche fuel such as for – buses and delivery vehicles at local level.

Biofuels - have a role in reducing emissions but care needs to be taken with what is grown (must be a low input crop that is does not require large inputs or resources at the growing or refining

[15] https://friendsoftheearth.uk/sites/default/files/downloads/travelling_rail_better.pdf
[16] https://iopscience.iop.org/article/10.1088/1748-9326/aad56c/pdf
[17] http://www.foeeurope.org/sites/default/files/extractive_industries/2017/natural_gas_and_climate_change_anderson_broderick_october2017.pdf
[18] http://search.proquest.com/openview/2673c6d34e9d84142534330d9e6c4ded/1?pq-origsite=gscholar&cbl=3933166
[19] https://www.transportenvironment.org/press/transport-running-fossil-gas-bad-climate-diesel-petrol-and-marine-fuel-%E2%80%93-report
[20] https://www.biogeosciences.net/16/3033/2019/bg-16-3033-2019.pdf
[21] https://www.transportenvironment.org/sites/te/files/publications/2015_02_TE_briefing_natural_gas_road_transport_FINAL.pdf

state), where its grown i.e. not on food producing land or land that could be used as a carbon sink e.g. peatlands, how they are grown (what inputs of water, fertiliser etc. is needed).[22]

15. How can Ireland, as a small island economy, reduce emissions from aviation and navigation, including demand reduction and stimulating supply of sustainable fuels?

IATA projects a 3.5% compound annual growth rate in global aviation resulting in 8.2 billion passengers in 2032, almost double today's levels. International Aviation must be fully accountable for the emissions produced each year and contribute a reasonable share to achieve Paris temperature goals. Aspirational goals of 2% fuel efficiency per year and carbon neutral growth after 2020 are not in line with the Paris goal of staying well below 2 degrees of warming. A recent ICAO commissioned report states that aviation emissions are expected to increase by 2 to 4 times the 2015 level, under advanced aircraft technology scenario.[23] The Irish government must lobby ICAO to put in place emission reduction targets in line with Paris. A 50% reduction in real terms from 2005 levels by 2050.

Aviation is a vital sector to the Irish economy with over €5 billion spent by overseas tourists in Ireland in 2018. Long term public policy to support the creation of sustainable aviation fuel in line with the current CAP 2019, manufacturing and distribution is required in order to meet the current out of line ICAO goal of carbon neutral growth based on 2020 levels and the proposed targets mentioned above. Unfortunately, ICAO targets do not encourage reduction in emissions; they encourage offsetting. An EU report states that 85% of offsetting failed to reduce emissions.[24]

Government should advocate for the following measures at EU level:

- Tax aviation jet fuel with revenue going towards development of CCS and Sustainable Aviation Fuel (SAF)
- Create robust sustainability criteria (does not compete with food crops, diminish biodiversity)
- Promote public private partnerships in the development of SAF and CCS
- Ban below cost selling of airline tickets
- Tax the most frequent flyers
- All routes to be profitable within a defined period of time to remove loss leading routes to gain market share or keep historical airport take-off and landing slots

[22] https://iopscience.iop.org/article/10.1088/1748-9326/aad56c/pdf
[23] https://www.icao.int/environmental-protection/Documents/EnvironmentalReports/2019/ENVReport2019_pg17-23.pdf
[24] https://ec.europa.eu/clima/sites/clima/files/ets/docs/clean_dev_mechanism_en.pdf

- International aviation emissions to be accounted for 50 % departure country 50% arrival country
- Ensuring new landing and take-off slots are allocated to aircraft that use Sustainable Aviation Fuel and or SAF & hybrid aircraft
- All irish airports to be net zero emission airports with possible on site CCS facilities
- Green public transport to all airports from major cities and towns
- All irish aviation stakeholders to have a mandatory, robust biodiversity programme in place within their geographical location
- Increase annual leave of employees how elect to take a slower greenier modes of transport for their annual leave. Policy to encourage green travel with Ireland and EU
- Incentivise the use of Sustainable Aviation Fuel (no tax)
- Support stronger on going real emissions reductions targets

Agriculture, Forestry and Land Use

16. How do we secure viable family farms across our regions in an environment profoundly changed by the focus of climate change?

Through the EUs 'Farm to Fork' scheme, the use of pesticides is being reduced which is a positive both for consumers and biodiversity, as set out in the recent European Green Deal communication from the European Commission. Retaining and restoring natural vegetation and forest cover are key to reducing our greenhouse gas emissions from agriculture.[25]

As regards livestock farming, a business as usual approach would lead to world agriculture accounting for 49% of the overall emissions budget by 2030 and threatening to exceed the IPCC emissions limits for staying below 1.5 -2 degree limits.[26] Toensmeier talks about how regenerative farming can maintain family farms while offering a low carbon and sustainable future for years to come.[27] Examples of this have been seen in Cloughjordan and Moy Hill Farm, where local community growing rather than relying on imported food has lessened the carbon impact of goods and services while providing people with sustainable living.[28]

[25] https://www.thelancet.com/pdfs/journals/lanplh/PIIS2542-5196(19)30245-1.pdf
[26] Ibid.
[27] Toensmeier Eric (2016) 'The Carbon Farming Solution.' Chelsea Publishing, Vermont.
[28] Kirby Peader (2016) 'Cloughjordan Eco-Village; Modeling the Transition to a low carbon society.' Transitioning to a post carbon society, p.183-205.

A just transition will be paramount in order to bring farmers along with the process and to avoid alienation with the environmental shift.[29] Community Supported Agricultural schemes should be supported and incentivised to encourage community engagement, education and small local farms (CSAI, 2019).

Farmer participation may be influenced by economic factors and social capital promotion (Lastra-Bravo et al. 2015) and the factors surrounding Brexit will tie in with this.[30]

A move towards small farm holdings reduces the carbon footprint of the food we grow, as opposed to the current CAP model which incentivises large farm holdings that are more carbon intensive.[31]

Part of this just transition includes having realistic, scalable solutions that pay farmers to work the land as they have been doing for generations but also makes it worth their while. Magan interviews farmer Fergal Smith who says traditional farming doesn't pay enough to keep people in the sector especially when an annual income of 20,000 in conventional settings is considered a good year.[32] By turning to Community Supported Agriculture Fergal returned to farming growing organic crops. With CSA, the money is paid upfront which takes pressure off farmers due to responsibilities, risks and rewards being shared. More CSAs should be rolled out across the country.

17. How can the methods of evaluating agriculture and land use give more credit for the relative carbon efficiency of food production in different countries, and the potential large contribution from land use management and afforestation?

Permaculture, agroecology and plant based agriculture should be the cornerstone of our agriculture. We need to move away from the unsustainable current model of industrial agriculture which damages our ecology, uses 85% of our freshwater and has a big carbon impact in terms of food miles.[33] Agroecology, with permaculture being a major part of it, provides us with some answers in how to turn this around, particularly minimising water use, pesticides and waste recycling. It is a system focussed on ecological principles such as soil organic carbon retention, holistic ways of rearing livestock and growing crops. Perhaps its biggest benefit is that by paying attention to all of these factors, it not only benefits the planet and various ecosystems but it has the potential to boost production and farm incomes.[34] Against the backdrop of unrest in the dairy farming sector (Irish Farmers Journal, 2019) and with more strikes and protests looming, surely there must be alternatives for rural communities.

[29] Toensmeier Eric (2016) 'The Carbon Farming Solution.' Chelsea Publishing, Vermont; Tovey Hillary (2017) 'Agricultural Transformation – Food and the Environment.' Vol 1, Chap 6, Routledge.
[30] https://www.sciencedirect.com/science/article/abs/pii/S1462901115300058
[31] https://www.agrifood.se/Files/AgriFood_WP20183.pdf
[32] https://www.irishtimes.com/life-and-style/a-new-way-of-farming-community-schemes-changing-rural-ireland-1.2760464.
[33] Hathaway Mark D (2016) 'Agroecology and permaculture: addressing key ecological problems by rethinking and redesigning agricultural systems' Journal of Environmental Studies and Sciences 6(2), p.239-250.
[34] Ibid.

Relative carbon efficiency of our food has to be properly looked at in order to cut down our food miles and the associated carbon footprint. In Spain, a carbon border tax was investigated in terms of extended carbon footprint (ECF) which between 2000-2008 was 18.5 megatonnes CO2.[35] The study took into account both embodied emissions and international freight transport plus producer responsibility. It was found that 3.7% over imported agriculture products and 0.02% on Spanish domestic final demand which would not put unreasonable burden on the economy but, considering Chinese and East Indian imports being most affected, may lead to behavioural changes in the global trade industry. A similar tax here would be a step in the right direction.

Michail[36] refers to a study conducted by Camilleri et al. which finds that consumers underestimate food emissions but are aided by labels.[37] Carbon footprint labeling was found to be useful when it came to informing shoppers about reducing carbon emissions when buying goods. Again this would drive behavioural change and reduce the overall carbon emissions both nationally and across borders.

18. What type of nature-based solutions, including land use, land use change and management, could support emissions reduction and what is the associated emissions reduction potential of such solutions?

Anke et al (2019) put forward that rewetting of drained peatland reduces the effects of global warming, despite the release of methane initially. Restoration of peatlands may eventually return the areas to being carbon sinks.[38] This study was conducted over 3 years in Canadian drained and extracted bogland and was found to retain 90 Gt carbon annually. Integrating structures to increase water retention and attracting keystone species in the areas were also key to reverting the regions from carbon positive to carbon negative.[39]

Sonntag et al. highlight the potential for GHG emission reductions including NO and CH4 and this can be achieved by the Afforestation Grant and premium scheme as outlined.[40,41] Native Woodland Establishment and the grants available are also promoted by Teagasc.[42] Latest figures show our national forested area covers about 11% of our total land area and this is expected to increase by a further 7% by 2050 (Forest Policy Review, 2014).

Jane Shackleton, an organic beef farmer is leading the way in sustainable agriculture and nature focussed approach to farming, encouraging biodiversity, forestry and sustainable practices.

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[35] Lopez Luis-Antonio, Cadarso Maria-Angeles, Gomez Nuria, Tobarra Maria-Angeles (2015) 'Food miles, carbon footprint and global value chains for Spanish agriculture: assessing the impact of a carbon border tax.' Journal of Cleaner Production 103, p.423-436.

[36] https://www.foodnavigator.com/Article/2018/12/18/Carbon-labels-drive-more-sustainable-food-choices-scientists-confirm#

[37] https://go.nature.com/2PT0xoD

[38] Nugent Kelly A, Strachan Ian B, Strack Maria, Roulet Nigel T, Rochefort Line (2018) 'Multi-year net ecosystem carbon balance of a restored peatland reveals a return to carbon sink.' Global Change Biology 24(12).

[39] Ibid.

[40] https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2016GL068824

[41] https://www.agriculture.gov.ie/media/migration/forestry/grantandpremiumschemes/2016/1AfforestationScheme150319.pdf

[42] https://www.teagasc.ie/crops/forestry/grants/establishment-grants/native-woodland-establishment/

Leitrim Organic Farm is recognised by the Worldwide Opportunities on Organic Farms, people come from abroad to work on the farm and learn English. This provides benefits socially and economically.

19. What is the emissions reduction potential from GHG-efficient food production, including future production scenarios?

With an increasing population and agriculture playing a major part in Ireland's economy, securing sustainable practises and food production is vital. Transformative changes are required for large-scale impacts up to and proceeding 2050. In order to shift to GHG efficient food production we need to transition away from ruminant based agriculture and towards lower emission foods[43]. In order to achieve a successful transition, policy incentives are needed to stimulate an adequate response and a just transition. Improved cropland management can reduce GHG emissions associated with food production and improve the resilience of food crops and stimulate sustainable land management[44]. It could also increase food security and close yield gaps to increase food productivity while reducing agricultural emissions.

While a focus in Ireland's future food production should be transitioning to low carbon products it should also look to reducing the need of importing food, by promoting and investing in small-scale farming projects that could increase food security. By reintroducing local produce markets and community gardens to increase local purchases. Urban farming might only be able to provide for a small share of food demands, but it can also provide fresh crops that would have otherwise been shipped and sold at high prices.

Reviewing how Ireland markets food and its current exporting policies will play a major role in societal behaviour shifting to low carbon consumption goods. Current export policies, especially regarding the Sino-Irish trade agreements for beef and dairy powder, have seen an increase in ruminant agriculture at a time where a reduction is required. This shows the importance of reviewing such policies and Ireland's place in global food production

Agricultural diversification can play a part in reducing the need to both import and export food products. By diversifying Ireland's agricultural industry, we can shift from an agricultural system based on fewer commodities to one that is more diverse, composed of several higher value products. This practice could help secure GHG efficient food production as it could reduce pressure on land and prevent degradation. As an additional benefit the diversification of farm production could also produce small carbon sinks. Agricultural diversification can improve the resilience of farmers to climate variability and climate change while also mitigating further GHG emissions.

[43] https://www.sciencedirect.com/science/article/pii/S2211912415300262?via%3Dihub
[44] https://www.ipcc.ch/site/assets/uploads/2019/11/09_Chapter-6.pdf

20. Where can Ireland show global leadership in GHG-efficiency, e.g. developing 'next horizon' technologies?

As stated in the question, developing new technologies and implementing them on a large scale is key to GHG efficiency. We need to invest in the speeding up and scaling up of such technologies in order to not only use them post 2050 but also as soon as possible to mitigate further agricultural emissions. In addition to this, would be the introduction of renewable energy use on farms, including moving away from the combustion engine. Another potential GHG efficient process would be using biodigesters on farm animal effluent. Studies in China have shown that the combination of energy substitution and slurry management have reduced GHG emissions[45]. The purpose of biodigesters is the production of biogas, a renewable energy, and an odour free nutrient-rich fertilizer[46]. This emphasis the need and potential of developing further agricultural practises that are environmentally sustainable. The biodigesters can not only provide a way to utilise slurry and their GHG emissions but also provide a renewable energy that can be used on farms and as additional income.

Furthermore, as discussed in our response to question 19, by putting our nation's food security above that of exporting our goods we can show leadership in agricultural diversification, urban farming, and independent food production – all of which are GHG efficient compared to increased ruminant agriculture for exporting purposes, and importing goods that could otherwise be made internally.

Waste and the Circular Economy

22. How should Ireland target reduction in food waste?

The reduction in food waste could tie in with an overhaul in the agri sector. If there is more respect given to food generally through better agricultural practices and farmers and food producers being paid a fair wage for their product, there would naturally be less food waste. Education will have a part to play to target overconsumption and waste.

A revolution is also needed in food consumption culture and practices to improve diets and reduce waste, as around a third of food produced currently ends up being wasted (Gustavsson et al. 2011). Healthier diets can be promoted by removing subsidies for harmful production techniques, public awareness campaigns and careful management of land use, oceans and other environmental resources (UN emissions gap report 2019). The following measures should be prioritised:

- Incentive/regulation around food waste at the point of transfer between producer and supermarket to promote the sale of ugly vegetable/fruit at a discounted price to create demand.

[45] https://www.sciencedirect.com/science/article/abs/pii/S0960148107003850
[46] https://doi.org/10.3390/ijerph10094390

- Include healthy eating and food preparation into national educational curriculum along with financial literacy skills. This is to teach how to shop and cook meals to create a healthy and affordable diet and encourage the step away from processed foods.

- Review of international examples of retail units that sell food after sell by date but before use by date. This would reduce food waste overall, but would also reduce financial pressure of consumers under the poverty line.

- Review packaging practices to include more loose produce. Produce packaged in unit packaging, ie. 1kg bag, generate over consumption and in some cases food will be wasted. This is more pronounced in single person households.

Just Transition

24. What are the most important issues for the Government to consider in developing a long-term strategy to 2050 in order to ensure a just transition?

The most important Just Transition element is strong leadership from the Taoiseach in order to bring the people of Ireland together to deeply understand the requirement of *system change* in Ireland, Europe and globally across all aspects of society – strong and persistent visibility of the Taoiseach in this matter throughout the country is required, on a similar level to Brexit, up to 2050. Strong policy implementation away from fossil fuels must follow.

Following this, enhanced participatory and inclusive democracy, going further than town halls, will play a key role in bringing all people in society along on the zero-carbon pathway. Feelings of isolation and inequity must not be allowed to foster in the regions and populace most affected. Policies discussed above in transport, agriculture and elsewhere will help to guard against this.

Alongside the increasing carbon tax, significant and extensive public mobility must be in place now, not later, to back the modal shift required, discussed above, for example:

- comprehensive electric buses that link to a vastly increased public rail network in conjunction with cycle infrastructure;

- for-rent electric cars across the country (where only deemed necessary as a back-up to the above and in conjunction with a strong renewable electricity supply);

- mobility assessments for at-risk citizens should be undertaken. Jobs in rural and urban mobility i.e. providing an electrified transport service for people with disability/mobility issues or elderly citizens can have social and economic benefits. Citizens whose livelihoods have been affected by the transition to a zero-carbon economy can be targeted here.

Citizens who have high fuel costs at no fault of their own due to the prevailing economic development program must be compensated. Dividend schemes as prescribed by the ESRI to

people at highest risk may help to promote a just transition. Careful design and massive engagement campaigns will be critical to success.

A Just Transition to 2050 should also be aimed at the coming generations and is about strong leadership being shown. This can be achieved by rapidly closing fossil fuel electricity generation sites and transitioning agriculture now. Just Transition plans for all planned closure sites e.g. Moneypoint, need to be put in place now, not when the site is closed. Strong warnings are required ahead of time.

Empowerment of the people most affected is key. Under the Green New Deal (GND) for Europe, utilise the proposed €100bn for 2021-2027 for R&D and Innovation and the 100bn Just Transition Mechanism and create Centres of European Excellence for research and development of alternative energy solutions and training in these skillsets based in the regions affected by the closure of local fossil fuel based industry. Utilise these financial mechanisms to research and develop modern plant based and restorative agriculture practices and transition away from ruminant production for export that has to be subsidised to be effective (see above).

Identify new jobs consistent with climate action and roll these out now. For example:

- Wetland/peatland rewetting and restoration – this is a win-win situation to provide a global signal that Ireland will lead in this policy, which creates fully sustainable jobs and promotes Irish heritage, culture, and tourism. Access to the GND funds above can be linked to this.

- Citizen Engagement roles, community leaders and citizen assembly work: Employ people affected by the system change to monitor and report on local low carbon projects that have been created. Empower them to push the transition at the local level. This will prevent disengagement and volatility to climate policy.

Discussed above in the urban development section, collaboration with key community stakeholder groups such as the GAA, cultural organisations and youth groups can be utilised here to promote and drive the transition. Signal the intent by making every GAA club carbon neutral or carbon positive in the country, create a talking point in communities.

Sweden have extensive communication and advocacy policy for climate action.[47] Examples of this include:

- A majority of local authorities having "energy and climate advisors who support households and businesses" in making choices that support climate goals.

- The Fossil-Free Sweden Initiative highlights positive contributions from society and the private sector toward climate action that drives a move away from fossil fuels.

[47] https://www.government.se/49c920/contentassets/f947f4f4b7ac4af3baadfc827d97557a/swedens-seventh-national-communication-on-climate-change.pdf (p.17).

- Swedish agencies also communicate the effects of Swedish consumption on emissions abroad, the website *Hello Consumer* offers guidance on making the best environmental choice when purchasing.

Incorporating communications, DCCAE is in a fundamentally sound position to be a leader in communicating the requirements of a system change which weaves just transition principles through it.

To ensure buy in from local communities, make schemes, for example RESS, as easy to access as possible for citizens and communities. Create further micro-generation opportunities and support local enterprises such as Tipperary Energy Agency to continue their successful work with community groups.

The five year Just Transition Strategy must be reviewed yearly to ensure success and accountability. This will ensure that issues arising will not be allowed to foster.

Finally, Ireland must lead in Just Transition in the global context. Ireland's voice must be visible and accountable on the world stage in solidarity with the most affected nations, especially smaller island states who will be affected first by climate disaster. Ireland's role in a global Just Transition may be seen as rapidly increasing ambition to be a climate leader, not a climate follower, or worse.

25. What should the primary focus of adaptation policy be for 2050?

A clear focus on community resilience building is needed. Towns and villages should be assessed for adaptation needs, with cross community participation. Building relationships and remembering the intersectionality of climate related issues will be vital. If communities work together they will be better able to adapt in the future.

Natural adaptation measures should be prioritised, for example, rewetting of bogs, afforestation, urban greening including 'green walls', erosion prevention etc. Where artificial measures are unavoidable, for example, urban coastal flood defences, proposed solutions should be subject to Life Cycle Assessment to ensure that the selected approach minimises negative environmental impacts (see Built Environment section above).

26. Are there any other comments or observations that you wish to make?

Ireland is really in a prime position geographically to be true leaders on climate change. As a small nation there are many practical ways to reduce GHG emissions which would naturally have immediate co-benefits for human mental and physical health, and for biodiversity.