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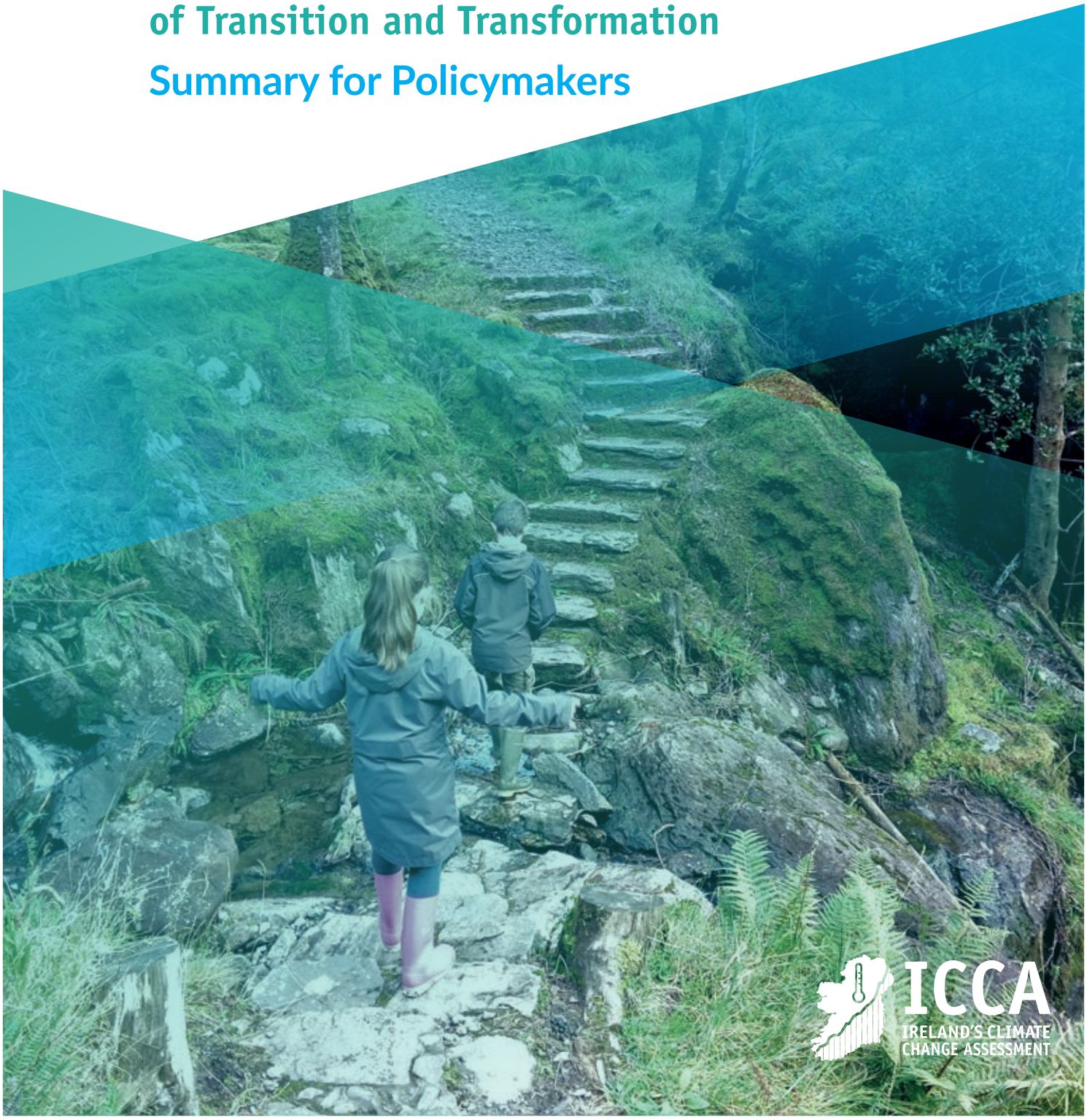
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IRELAND'S CLIMATE CHANGE ASSESSMENT

Volume 4: Realising the Benefits of Transition and Transformation

Summary for Policymakers



Ireland's Climate Change Assessment 2023

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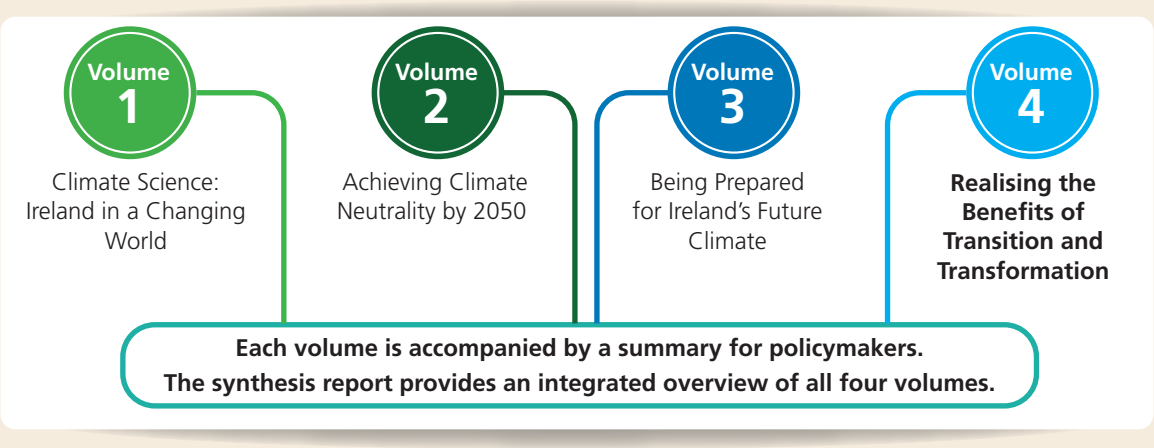
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Introduction

Ireland's Climate Change Assessment (ICCA) delivers a comprehensive, Ireland-focused, state of scientific knowledge report on our understanding of climate change, its impacts on Ireland, the options to respond to the challenges it poses, and the opportunities from transitions and transformations to a climate-neutral, climate-resilient and sustainable economy and society. This serves to complement and localise the global assessments undertaken by the Intergovernmental Panel on Climate Change (IPCC) reports (see www.ipcc.ch). The findings presented build upon these global assessments and add important national and local context.

The report is presented in a series of four thematic volumes accompanied by an overarching synthesis report. The volumes are as follows:



Volume 4

The Summary for Policymakers (SPM) provides key insights from Volume 4 of Ireland's Climate Change Assessment: Realising the Benefits of Transition and Transformation. Volume 4 provides an assessment of the national literature on the transition and transformation to a climate-neutral, climate-resilient, and sustainable future. The volume serves to highlight the benefits, opportunities and synergies that are associated with transformations, and how they can be achieved. The SPM is organised as follows: Section A sets out the imperative for transformative change; Section B considers the core issues of equity, social inclusion and just transition; Section C assesses the systems changes necessary for climate action; Section D identifies the synergies between climate action and sustainable development; Section E focuses on the enabling conditions needed to drive transformation forward; Section F highlights the role research can play in enabling transformative change.

Transformative change is a fundamental, system wide reorganisation across technological, economic and social factors, including paradigms and goals, and valuing the climate, the environment, equity and wellbeing within decision making.

A. The imperative for transformative change

Transformative change can unlock rapid and fair climate action with a myriad opportunities and benefits for people and nature in the near and long term

Transformative change can deliver rapid, deep and sustained emissions reduction (mitigation, see Volume 2), build resilience to impacts (adaptation, see Volume 3) and deliver a range of benefits and opportunities. Such an approach can realise benefits for the wellbeing of people and nature and achieve greater equity across society. Pursuing transformative change allows the realisation of opportunities that would be missed if such a holistic and systemic approach is not followed. Much greater efforts are needed to close the gap between ambition and action on climate change mitigation and adaptation. Realisation of transformative change can entail mobilising society to fundamentally reorganise the systems driving greenhouse gas emissions, biodiversity loss and vulnerability to the impacts of climate change. {Chapters 1 (1.1, 1.2, 1.3, Figure 1.2), 6 (6.2), 8 (8.3, 8.5, Box 8.3); Volume 2, Volume 3}

A.1 **Transformative change is essential to enable and manage rapid and fair climate action.** The declaration of a climate change and biodiversity loss emergency opens up opportunities to mobilise support and action for transformative change in order to address these inextricably linked crises that pose significant threats to human wellbeing and to nature.

Key components of transformative change include:

- adopting a comprehensive approach that combines structural shifts to sustainable development along with technological solutions, as technology alone is insufficient;
- mobilising a diverse range of stakeholders, including the political system, state institutions, private enterprises, communities, civil society organisations, educational institutions and citizens;
- re-evaluating the economic development paradigms and plans to prioritise climate, sustainability, wellbeing and equity;
- prioritising justice and equity within public policies (doing so can contribute to garnering societal support for change);
- mitigating potential disruptions through enabling policies and inclusive, participatory methods, with a particular focus on vulnerable groups;
- addressing the indirect drivers of climate change and biodiversity loss that hinder mitigation and adaptation efforts {Figure SPM.1};
- employing an integrated long-term strategy to tackle these crises to yield both immediate and long-term benefits for human wellbeing and nature.

{Chapters 1 (1.2, 1.3, 1.4, Box 1.1), 2 (2.1, 2.2, 2.3), 4 (4.2), 5 (5.3), 6 (6.2, 6.3), 7 (7.3), 8 (8.1, 8.2, 8.5)}

A.2 **Achieving transformative change that harnesses social, economic and environmental benefits requires national climate policy to be aligned with sustainable development.**

A transformative approach can:

- facilitate the transition to sustainable development;
- increase the likelihood of meeting decarbonisation commitments;
- reduce the costs associated with technological transitions;
- lower reliance on carbon dioxide removal and its associated uncertainties and risks;
- realise environmental, social and economic opportunities and benefits;
- strengthen community resilience and reduce vulnerability to climate impacts.

Ireland's current policy direction predominantly emphasises technology transitions, rather than wider systemic transformations and shifts in development pathways.

Taking action to address the direct drivers of emissions may challenge vested interests[1] that benefit from the current status quo.

To enact this transformation, it is essential to broaden the scope of measures aimed at accelerating emissions reduction. This includes addressing the indirect drivers of climate change and biodiversity loss. These indirect drivers stem from systemic aspects underpinning the national development trajectory, including institutions, economic models, technologies, governance, demographics and sociocultural factors.

Transformative responses to climate risks that address the indirect drivers of vulnerability may necessitate rapid, non-linear changes to social–ecological systems and the associated institutions. {Chapters 1 (1.2, 1.3, Figure 1.4, Box 1.4, Box 1.5), 2 (2.1, 2.2, 2.3), 4 (4.1), 5 (5.3), 6 (6.2, 6.3, 6.4), 7 (7.3, 7.4)}

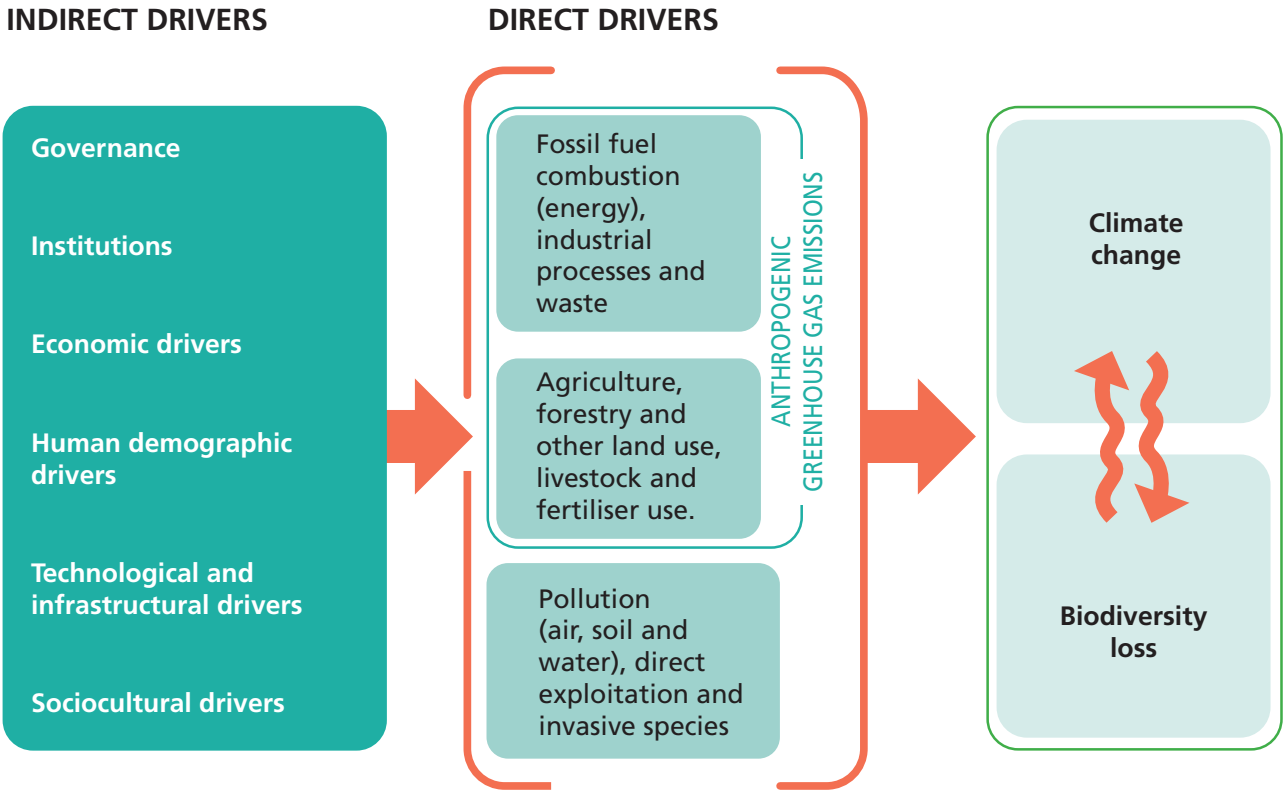


Figure SPM.1 Indirect and direct drivers of anthropogenic greenhouse gas emissions causing climate change and of human activities linked to biodiversity loss. Source: Adapted from figure 1.3 in Pörtner, H.-O. et al. (2021). *Scientific Outcome of the IPBES-IPCC Co-Sponsored Workshop on Biodiversity and Climate Change*. Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services.

[1] Vested interests are individuals and groups that have a strong interest in maintaining the status quo.

A.3	**Taking early action on climate mitigation and adaptation offers greater options and opportunities and minimises losses and damages to human and natural systems. The decisions made and actions taken this decade will have long-term consequences affecting many generations into the future.** Accelerating mitigation efforts this decade, in line with meeting carbon budgets, offers greater opportunities now and in the future. Proactive adaptation reduces the vulnerability of people and systems. Adaptation options that are feasible and effective today will become less so as the impacts of climate change intensify. {Chapters 1 (1.1, 1.2, 1.4.), 2 (2.1), 3 (3.4); Volume 1, Volume 2, Volume 3}
A.4	**Transformative outcomes can be realised through fundamental change that builds on visions of desirable futures and systems thinking that aligns immediate actions with long-term goals.** Transformation requires strong governance, capacity building, broad stakeholder involvement and continuous learning. Prioritising transformative actions over incremental changes can disrupt current development pathways and enable the deeper and more rapid change that is crucial for Ireland to achieve a climate-neutral, climate-resilient, biodiverse and sustainable future. Among important actions are the creation of national visions of desirable futures, and also adopting a long-term foresight approach to governance of change. Bolstering institutional frameworks for long-term planning and strategy, public policy, individual policies and policy packages, and deepening policy integration to shift pathways will be necessary. Alignment of immediate actions with long-term goals will enhance capacity to close the implementation gap and expand societal participation to ensure that all voices are heard. {Chapters 1 (1.3, 1.4), 2 (2.4), 7 (7.3, 7.4), 8 (8.2, 8.4)}



B. Equity, social inclusion and just transition

Equity, social inclusion and just transition are crucial considerations in climate policy

Equity and social inclusion are important public policy goals in themselves, and are also core to ensuring public support for transitions and transformations. Just transition and climate justice become increasingly important for ensuring equity as climate action measures are scaled up and as the impacts of climate change unfold. The just transition framework is a set of principles, processes and practices that seeks to ensure that no people, workers, places, sectors, countries or regions are left behind in the move from high-emissions to low-emissions development. {Chapters 1 (1.2), 4 (4.2, 4.3), 6 (6.2), 8 (8.1, 8.5)}

B.1 **Fairer and more equal societies are more resilient to impacts, and are more likely to adopt progressive transformative policies.** Social equity and equality matters to people and are necessary for successful and desirable policy outcomes. Ireland has considerable income inequality and material deprivation. Building increased resilience to risks, and targeting social support for transformation, could be facilitated by addressing social inequalities, poverty and deprivation and by just transition. Prioritisation of wellbeing and equity in development and climate policy could bolster the democratic social contract in support of transformation, including improved quality of life, decent work and the value of care. {Chapters 1 (1.2), 3 (3.2), 4 (4.2, 4.3), 5 (5.2), 6 (6.2), 8 (8.1)}

B.2 **The wealthiest generate far more emissions[2] than the average person and have the potential to significantly curtail these emissions without compromising their living standards.** There is a significant emissions inequality gap at the global level, with the wealthiest top 10% emitting nearly as much as the bottom 50%. An emissions inequality gap is also indicated by the data available for Ireland. Shifting consumption patterns and promoting sustainable practices among the affluent can result in notable emissions reductions and catalyse wider societal transformations. Regulatory measures can progressively target emissions-intensive activities and behaviours. These measures could be more effective than solely relying on environmental taxation and could lead to wider adoption and affordability of effective mitigation solutions. Focusing on such unsustainable consumption behaviour can generate revenue for just transition. {Chapters 1 (Box 1.1), 5 (5.2, 5.3)}

B.3 **Emissions-intensive activities are likely to face growing pressures to change or contract, which increases the need for just transition, and to enable opportunities for economic diversification.** While transformations offer significant opportunities, higher emitting activities are likely to face increasing pressures to restructure or contract, including livestock agriculture, transport services and fossil fuel-based activities. The effects of pressures are typically sector specific and localised, creating the need for public policy to support just transition. Just transition can involve proactive policy to harness economic opportunities, aligning investment in communities and addressing training and skills needs. Targeted social protection, income supports and inclusive policy processes can support change. Rural and urban transitions and transformations encompass uniquely different needs and opportunities. Resistance to change can be linked to vested interests and existing power dynamics, social inequality and public subsidies. {Chapters 1 (Box 1.1, Box 1.6), 2 (2.1), 3 (3.3), 4 (4.3, 4.4), 6 (6.2, 6.3, 6.4), 8 (8.1)}

[2] Emissions here refer to consumption-based emissions, directly tied to a household's activities and consumption, differing from production-based (or territorial) emissions.

B.4 **Climate justice focuses on the unequal impacts of climate change, across generations and borders, and on ensuring fairness in climate action.** A climate justice lens emphasises the urgency of reducing greenhouse gas emissions in order to reduce climate impacts on those most vulnerable to them. Rapidly reducing Ireland's greenhouse gas emissions would be an important contribution to climate justice.[3] A transformative approach to climate justice would also acknowledge the root causes of historical global inequalities and uneven distribution of power. Inclusive planning and decision making are important to ensuring climate justice, and social movements are increasingly attending to climate justice. Ireland's contribution to international climate finance is acknowledged as being primarily grant-based and mainly focused on adaptation. {Chapters 3 (3.2), 4 (4.3), 5 (5.3), 6 (6.4), 7 (7.3, 7.4), 8 (8.2, 8.5)}

B.5 **Harmful subsidies can be redirected to socially and environmentally enhancing activities.** Considerable public subsidies are provided to emissions-intensive activities, both globally and nationally. International frameworks include targets to phase out subsidies to harmful activities. Reducing subsidies to harmful and potentially harmful activities can provide space to invest in socially and environmentally enhancing activities. A focus on enhancing equity when designing emissions reduction supports can contribute to securing just transition. {Chapters 2 (2.1), 3 (3.3, Box 3.8), 4 (4.3, 4.4), 6 (6.2, 6.3, 6.4), 8 (8.1)}

[3] Per capita greenhouse gas emissions in Ireland are high compared with other EU Member States and significantly above the global mean.



C. Systems change for climate action

Many mitigation and adaptation options are available, feasible and cost-effective for delivering the rapid and accelerated action required across all sectors and systems to meet Ireland's climate commitments

An unprecedented rollout of a wide portfolio of mitigation and adaptation options is necessary across all systems. The state and its institutions have a critical role in bringing about sustainable transformations. Transformation across sectors entails the deployment of zero-emissions technologies; reducing and altering the structure of final demands through infrastructure, planning and social transformation; land-use change; and protecting and restoring ecosystems. Many options are already available, are cost-effective and bring wider co-benefits. Low-tech, low- and no-cost measures, and the potential for generation of net economic gains, have yet to be fully explored. {Chapters 2 (2.2), 3 (3.3, 3.4), 4 (4.1), 5 (5.3), 6 (6.2, 6.4), 7 (7.3, 7.4)}



Figure SPM.2 Transforming the future: mural. Source: Artwork by Kevin O'Brien (2021), photography by UCCTV, funded by University College Cork.

C.1 **Transforming energy**

Rapidly phasing out fossil fuels requires a transformation of the energy system towards renewable energy and efficiency. The state and its institutions have a critical role in creating a vision for Ireland's sustainable energy future. Replacing fossil fuels with zero-emissions energy sources – the energy transition – entails a replacement of energy sources, technologies and fuels throughout the energy system, from supply to end-use sectors, including transport, buildings and industry. The energy transition brings many benefits: lowering fossil fuel import dependence improves energy security; reducing combustion in vehicles and buildings increases air quality; renewables open up opportunities in the green economy, including for coastal communities and farmers; and distributed energy enables homeowners to be producers of energy, lowering energy bills. The transition requires paying attention to environmental, societal, economic and governance – along with technical – dimensions. Lowering final energy demands reduces the reliance on unproven mitigation technologies in the future. Renewable energy developed on land and at sea creates competition with other land uses, including biodiversity, food production and carbon sequestration, and may negatively impact biodiversity. An enhanced regulatory and planning framework is required to accelerate renewables deployment, realise co-benefits and manage trade-offs. Historical energy transitions, such as Bord na Móna's pivot from peat extraction to peatland rehabilitation and renewable energy, offer lessons for the future, particularly for just transitions. {Chapters 2 (2.2, Box 2.5, Box 2.6), 4 (4.3), 6 (6.2, 6.3), 7 (7.3), 8 (8.2); Volume 2}

C.2 **Transforming urban settlements**

An integrated spatial planning, built environment and transport strategy is required for a meaningful urban transformation that can create a better living environment while simultaneously reducing emissions. Co-design of placemaking interventions with local communities can empower diverse voices and offer practical solutions. Adopting compact urban development principles such as increased density, diverse land use, improved street connectivity, destination accessibility and shorter distances to public transport can cut transport emissions, lower urban energy use and enhance resilience in the long run.

Prioritising actions that can deliver transformative change, rooted in a shared vision within the transport and built environment sectors, is crucial.

In transport, these measures involve creating conditions where the need for motorised transport is minimised, for instance through proximity redesign and digitalisation ('avoid' actions), and then channelling the remaining travel demand towards sustainable options such as walking, cycling, shared mobility and public transport ('shift' actions). These approaches offer more substantial benefits than maintaining the current car-centred system, even with the integration of electric vehicles ('improve' measures). The shift to more sustainable mobility cannot be achieved immediately; a long-term strategic commitment is needed.

In the built environment, there is a need for a holistic strategy to reduce energy consumption that includes curbing the demand for energy and materials, optimising efficiency and shifting to low- and zero-carbon energy sources. Implementing building energy standards, greater use of timber, passive designs, district heating, retrofitting and heat pumps are effective solutions to achieving energy-efficient, resilient buildings. Well-informed management of buildings and places is needed over their life cycles.

While technological advancements are crucial for fully decarbonising the end-use sectors, an over-reliance on them could diminish the potential benefits of structural transformations and demand reduction. Infrastructure and solutions with an emphasis on wellbeing can lead to significant positive transformations. {Chapters 1 (1.2), 3 (3.1, 3.2, 3.3, 3.4, Box 3.3)}.

C.3 **Transforming food, land and nature**

Mitigation and adaptation options in agriculture, forestry and other land use can be scaled up over the next decade and beyond, providing opportunities for rural communities. Just transition is key to this transformation, and economic aspects and social, cultural and political dimensions need to be considered. The adoption of place-based and co-creation approaches would be beneficial. Conservation, management and restoration of ecosystems, including peatlands and native woodlands, alongside improved, climate-smart forest management and afforestation have potential to provide economic opportunities and improved livelihoods and to enhance the cultural and heritage value of landscapes. Sustainable diets, reducing food waste and rebalancing land use, including a managed reduction in the number of ruminants, can reduce methane and nitrous oxide emissions and make land available for forestry, wetland restoration and nature. Sustainable products (e.g. timber) can displace more emissions-intensive materials. Adaptation options include nature-based approaches. Conservation can have immediate benefits for mitigation and adaptation, including enhanced ecosystem resilience, while the benefits of restoration occur over longer time frames. There are opportunities to maintain and enhance the store of carbon in soils and biomass. Increased global warming brings greater risks of carbon loss from these terrestrial systems. Management will be necessary to adapt ecosystems to, and protect carbon stocks from, unavoidable impacts. {Chapters 2 (2.1, 2.2, 2.3), 4 (4.3, Box 4.1), 5 (Box 5.1)}

C.4 **Transforming economic development**

The transformative approach of shifting development paths offers extensive economic opportunities for Ireland. Internationally, the understanding of economic opportunities and related innovation policy have evolved and are known to be extensive. A pioneering suite of economic opportunities has been identified for Ireland, for sustainable development. These could assist in aligning economic development with achieving win–win outcomes, across the wide variety of priorities found in public policy, not least for climate neutrality and climate resilience. Opportunities exist in expanding the scope of policy efforts to include structural transformation to services and low-emissions industry. Opportunities also exist in widening and deepening the range of emissions-reducing and environmentally enhancing activities, with examples including renewable energy; afforestation and forest management; active and public transport; production of alternative proteins; and restoration of nature, biodiversity and ecosystems. Transitions and transformations can be viewed as a strategic opportunity. Further analysis, as a part of strategic foresight, of a more complete range of national transformative paths and options, and of the wider national portfolio of economic opportunities associated with transformations, is required to identify the magnitude of potential national economic gains. {Chapters 2 (2.1, 2.2), 4 (4.4), 6 (6.2, 6.3), 7 (7.3)}

C.5 **Transforming society**

Social and cultural transformation is required to create a sustainable society. More sustainable lifestyles can lead to improved wellbeing and can be enabled through incentives and infrastructure that make sustainable choices accessible, affordable and normalised. Fairness is critical for public acceptance of the change required, and public participation is essential to ensure that the voices of those affected are included in decisions relevant to them, particularly marginalised and vulnerable groups. Mindsets, including individual and collective values and beliefs, shape cultures and systems through influencing behaviour and decision-making processes. They can act as strong leverage points for systems transformation. Creating places and practices that nurture human capacity for change can support sociocultural transformation. Mindsets include how people think, feel, communicate and work together and are especially important in political and institutional landscapes where policy is developed. Culture, including art and storytelling, is essential to the success of transformations, as it can give hope and inspire action. {Chapters 1 (1.2, 1.3, 1.4), 5 (5.3), 8 (8.1, 8.2, 8.3, 8.4, 8.5, Box 8.3)}

D. Synergies between climate action and sustainable development

Implementing transformative measures to address climate change can deliver benefits and opportunities for people and for nature, thereby advancing sustainable development

Immediate and sustained transformative mitigation and adaptation actions are likely to yield substantial benefits for health, wellbeing and biodiversity in Ireland while reducing vulnerability to the adverse impacts of climate change. Transformative climate action can advance goals for sustainable development, such as prosperity and equity, by addressing the underlying causes of unsustainability. Global analysis shows that potential synergies between climate action and the UN Sustainable Development Goals significantly exceed potential trade-offs. The trade-offs can be managed through capacity building, strengthened governance, strategic investments and inclusive climate action. {Chapters 1 (1.1, Figure 1.5), 2 (2.1), 4 (4.3), 6 (6.2, 6.4), 7 (7.3), 8 (8.2)}

D.1 **Near-term action this decade brings many significant benefits, alongside enhancing resilience to climate impacts.** Early action can harness the available opportunities for prosperous and resilient livelihoods, improved public health, social equity and enhanced energy security, among other benefits. Early action can also reduce costs, prevent further fossil fuel lock-in and protect vulnerable communities from the disproportional burden of impacts, mitigation and adaptation actions and from the cost of those actions. Transformative initiatives demand near-term investments, such as in sustainable transport, but the long-term economic and societal returns surpass the initial investment. In addition, low-cost placemaking initiatives in urban areas, such as limiting car access and speed, can immediately enhance the local environment, improving safety and air quality, reducing noise, fostering community relations and boosting local businesses. Such initiatives can lead to long-term deepening of community engagement and a shift of perceptions away from car-centric values. {Chapters 1 (1.1, 1.4), 3 (3.2, 3.3, 3.4), 4 (4.4), 5 (5.2, 5.3)}

D.2 **Tackling climate change and biodiversity loss together enhances the many synergies that exist between actions to address these crises while minimising and managing any remaining trade-offs.** The systematic identification of synergies and trade-offs strengthens outcomes for climate and biodiversity actions. Mitigation actions related to land use can allow space for nature, although the potential for trade-offs is high. Adaptation actions can result in gains for nature and optimise synergies with mitigation, enhancing the resilience of carbon stored in ecosystems. The protection and restoration of nature promotes biodiversity-rich, resilient ecosystems, reducing the vulnerability of these systems and their carbon stores to climate impacts. Nature restoration is cost-effective and reduces vulnerability through strengthening the synergies that exist between mitigation and adaptation. Climate mitigation can improve air, soil and water quality. Nature-based approaches have the potential to tackle climate change and biodiversity loss while contributing to sustainable development, making them powerful and attractive actions. Wider benefits from optimising synergies include improved food security, nutrition, health, wellbeing, energy security, support for livelihoods and sustainability, and ensuring nature's contributions to people and economic benefits. Management strategies are required if conflicting land use objectives and the proactive management of potential trade-offs are to be avoided. {Chapters 1 (1.2), 2 (2.1, 2.2), 6 (6.2, 6.4); Volume 3 (2.4, Box 2.2)}

D.3 **There are co-benefits of climate action for health and wellbeing that are achievable and can enhance social equality.** The benefits span from individual wellbeing to community cohesion and resilience. Transitioning from fossil fuels to renewable energy sources can significantly reduce air pollution, leading to fewer respiratory illnesses and premature deaths. Transforming places through integrated spatial planning and compact urban redesign, and through placemaking, can boost liveability, stimulate the regeneration of urban and rural centres, improve rural connectivity, increase access to green and blue spaces, offer benefits to local businesses and build more cohesive and resilient communities. These transformations can lead to improved physical and mental health and wellbeing. Mobility solutions can promote healthy lifestyles by encouraging walking and cycling and can offer better accessibility. Improving the energy efficiency of buildings can bring improved indoor air quality, thermal comfort benefits and financial savings, and can build resilience to extreme events. Sustainable agriculture and reduced meat consumption can lead to more resilient food systems and healthier diets. {Chapters 2 (2.2), 3 (3.2, 3.3, 3.4, Box 3.2, Box 3.3), 5 (Box 5.1)}

D.4 **There is significant potential for Ireland to build prosperous livelihoods in the sustainable and resilient economy of the 21st century.** Ireland has demonstrated success in long-term structural transformation to low-emissions activity in services. Policy and analysis have tended to focus more narrowly on technological transition and management practices and on the circular economy and bioeconomy. Further economic opportunities exist in services sectors, both public and private, and in emissions-reducing and environmentally enhancing activities. Building such livelihoods requires alignment of enabling measures that can support growth in sustainable social and local enterprises in addition to sustainable industrial development. {SPM C.4, Chapters 2 (2.2), 4 (4.4), 6 (6.2, 6.3), 7 (7.3, 7.4)}

D.5 **A national vision and strategy on prosperous livelihoods is needed to take advantage of the multiple opportunities of transformation.** Elements of transitions and transformations to a low-emissions future are already under way, both globally and nationally, offering the potential for Ireland to build sustainable, prosperous and resilient livelihoods. Enabling measures related to livelihoods can include conventional education, training and social protection, and innovative frontier measures such as universal basic services, universal basic income and the shorter working week. Nationally, these opportunities have yet to be fully explored, requiring analysis and the building of long-term national visions for livelihoods to motivate progressive action. The design and implementation of long-term strategic policy for sustainable and resilient livelihoods will be needed to deliver on this potential. Possible routes to address the economic costs of policy change include the winding down of harmful subsidies, using environmental tax revenue and reform of general taxation and spending. {Chapters 2 (2.1, 2.2), 4 (4.1, 4.2, 4.3; 4.4), 6 (6.2)}



E. Strengthening the response: driving transformation forward

Better enabling conditions are needed to drive transformative change and unlock rapid and fair climate action across mitigation and adaptation

The status quo is a powerful constraint against transformative change. There are many potential enablers of transformative change, including those across economy, innovation, finance, policy, governance and society, that are currently insufficiently configured for climate action and sustainable development. Strengthening these can help to drive transformation forward. {Chapters 1 (1.3, Box 1.4), 3 (3.2, 3.3, 3.4), 4 (4.3), 5 (5.3), 6 (6.4), 7 (7.3, 7.4), 8 (8.1, 8.3, 8.4)}

E.1 **The seeds of transformative change have taken root in Ireland.** Ireland has declared a climate change and biodiversity loss emergency. The state has legislated to divest public funds from fossil fuel companies, halt new exploration for fossil fuels and ban hydraulic fracking. The state has taken initial steps towards incorporating a wellbeing framework in public policy. There is a growing recognition of nature's contributions to people, the necessity of working within the limits of natural systems, tackling climate change and biodiversity loss together, and the integration of these issues across all domains, and of the importance of a transformative approach in land use and food systems. A systemic approach to transport is starting to emerge. The electricity system is undergoing a transformation towards renewable energy. There is growing awareness of the need to manage and reduce demand across the whole energy system. Ireland has also led the way in innovations for citizen participation in environmental decision making, holding citizens' assemblies on climate change (2018) and biodiversity loss (2022–23), and a children's and young people's assembly on biodiversity loss (2022). Dingle Peninsula 2030/Corca Dhuibhne 2030 is a first-of-its-kind initiative that brings together the local community, schools, businesses and farmers to explore, support and enable the broader societal changes related to the energy transition. {Chapters 1 (1.1, 1.3, 1.4), 2 (Box 2.3, Box 2.6), 3 (3.1, 3.3), 5 (5.3), 6 (6.2), 8 (8.2, Box 8.1)}

E.2 **In order to deliver transformation, niche innovations need to be nurtured and scaled up.** The spaces where innovative ideas are developed and tested – protected niches – are the birthplaces of transformative change. These are driven by a range of entities from grassroots to state level. Niche innovations, for instance shared electric mobility hubs[4] within the expanding shared economy, hold potential for broad-scale change. Government-backed pilot projects serve as trial grounds for other infrastructural and demand management solutions. While these niche initiatives offer templates for wider application and foster societal readiness for change, achieving enduring impact requires large-scale interventions. This involves realigning processes, regulatory frameworks, institutions and infrastructure to support systemic change. {Chapters 1 (1.3), 3 (3.3), 7(7.3)}

E.3 **Adopting a holistic and systemic way of thinking is a necessary condition to identify and maximise win–win outcomes, across multiple social, environmental and economic development priorities.** This can be enabled by mainstreaming and prioritising sustainability, equity and wellbeing as fundamental values and goals of transformations, followed by reformulating policy and implementation directly towards achievement of these policy synergies. Systems change has the potential to improve human wellbeing in both the near and long terms. {Chapters 1 (1.3), 3 (3.3), 7 (7.3); Volume 3 (Box 9.1)}

E.4 **An integrated long-term vision can drive transformative change, providing clear pathways to low-emissions and resilient systems.** Governance that considers multiple futures is required, rather than predictive approaches that consider only one possible future. Visions of desirable futures can be a powerful motivator for long-term planning and strategy. Collaboration across sectors and stakeholder engagement are necessary for efficient policy implementation and building climate resilience. Focusing on only short-term actions can neglect crucial long-term projects, such as public transport infrastructure, thereby hindering genuine transformative progress. {Chapters 1 (1.4), 2 (2.4, Box 2.2), 3 (3.2), 7 (7.3), 8 (8.2, 8.2)}

[4] A hub is a location that provides a range of shared electric transport options, including e-cars, e-bikes, e-cargo bikes and traditional bicycles.

E.5	**The state has a central role to play in transformative change.** While broader governance can involve steering the market, mobilising investment and including and empowering society, the state has a central role as an enabler. This role can involve stimulating new policy, coordinating actors, mediating interests and shaping outcomes. Recent research on the role of the state has pointed to its potential through a mission-oriented approach to climate policy. The state can play a strong role in driving transformation, but to do so capacity needs to be increased, along with strengthening mandates and resourcing within state institutions and reworking policy and regulatory frameworks. Capacity and resourcing of local government in Ireland is particularly constrained by comparison to other European countries. Strengthening the role of local government would strengthen the overall capacity of the state to bring about transformative change. {Chapter 7 (7.3)}
E.6	**Fragmented governance constrains climate action, and stronger horizontal and vertical integration can better enable transformative change.** Ireland has already made significant progress in strengthening the legislative and governance basis for climate action. To move policy out of silos, horizontal integration requires deepened connections between inter-related policy functions among government departments and agencies. This involves strengthening mandates for climate action, and providing the institutional structures and forums that support both policy coordination and policy innovation. This can include feedback loops that facilitate continuous learning and the development of creative solutions. Vertical integration requires better coordinated policies at local, regional and national levels and can ensure effective policy design and implementation across levels. Deeper vertical and horizontal integration of policy can enable the state, markets and society to coordinate long-term systemic shifts to sustainable low-emissions development. {Chapters 2 (2.1), 7 (7.3, 7.4)}
E.7	**Integrated policy approaches can reorient development to enable transformative change.** Combined policy packages, rather than individual policies, can better support shifts in development pathways and sociotechnical transitions. Near-term action is critical to avoid deepening lock-in to high-emissions infrastructure and practices. Transformative public policy choices in the near term are required to fundamentally shift pathways. Systemic responses enable the achievement of synergies across multiple objectives, going beyond sector-focused siloed approaches. {Chapters 1 (1.4), 7 (7.4)}
E.8	**Finance is an important enabler of transitions and transformations. However, the financial system is also at risk from increasing climate impacts and delayed transitions.** Finance flows can be an important enabler of transitions and transformations to a low-emissions and climate-resilient future, as they are a key determinant of the national development path. Public policy can set the conditions to steer investment in socially agreed directions, e.g. to low-emissions climate development. Options to catalyse change include de-risking investment in infrastructure, acceleration of finance for nature-based approaches and phasing out perverse subsidies. While Ireland is at the forefront of developments in sustainable finance, the understanding of risk, and the alignment of climate and non-climate policy, remain at an early stage. The financial system is itself at risk from physical climate damage, the pressures of change on existing activities and assets, and delayed or no policy action, leading to stranded assets and forgone opportunities. {Chapter 6 (6.2, 6.4)}
E.9	**The collective actions of individuals can enable the required systems transformations.** Individual and collective action are two sides of the same coin. System change can be achieved through collective action and is one of the more effective ways for society to change policy. Personal choices can encourage new social norms to emerge. Social movements can frame climate issues in a way that brings the public on board, mobilising resources, human and financial, that can sustain collective action and increase internal and external pressures that enable political change. People organising together can apply political pressure and signal that there is a need and support for a change to sustainability. {Chapters 1 (1.3), 3 (3.3), 5 (5.3, Box 5.2), 8 (8.5)}



E.10	**Public perception is an important enabler of transformative change.** The Irish public demonstrates strong understanding of and support for climate action, but there is a gap between the desire for action and realising change. The Irish news media is a primary source of information on climate change but is struggling to cover climate change to the extent that would fulfil its traditional roles of informing the public, acting as a watchdog and holding authorities to account. Education can also be an enabler of change if it develops the values, attitudes and skills necessary to achieve sustainable development. {Chapter 8 (8.1, 8.3, 8.4)}
E.11	**Social movements, climate litigation and culture can catalyse change through overcoming inertia and motivating individuals and organisations to act.** They focus attention and augment decision making and the allocation of financial and social resources. Climate change litigation (e.g. Climate Case Ireland) is being used by individuals and organisations to drive the speed and scale of climate action and changing how companies behave. Culture can also be an important catalyst of change, by inspiring action. {Chapters 6 (6.2), 7 (7.3), 8 (8.1, 8.5, Box 8.2, Box 8.3)}

F. The role of research in enabling transformative change

The evolving understanding of transformative change opens a promising avenue for Ireland to explore and realise its potential benefits and maximise opportunities

Internationally, understanding of transformative change has advanced considerably in recent years, an evolution that is beginning to emerge in Ireland. Deepening national knowledge of, and capacity for, transformative change will require investment in research capacity and infrastructure.

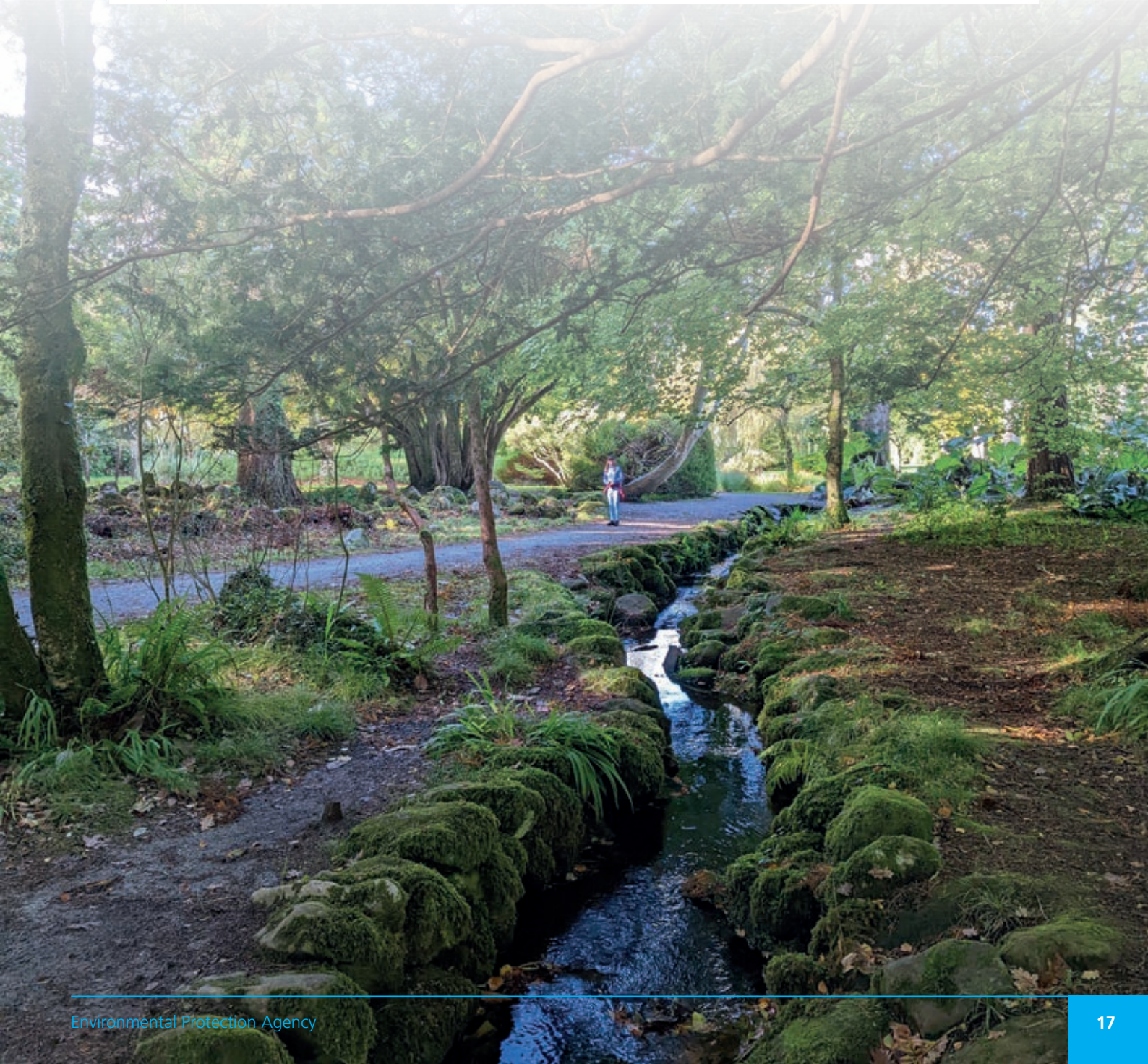
F.1 **Knowledge gaps and future research needs.** The scarcity of research focusing on how transformative change can affect efforts to address climate change issues in Ireland highlights a considerable gap in national knowledge in two critical areas: (1) the potential outcomes of implementing a transformative approach within the Irish context, and (2) strategies for actualising transformative change. Transformative change requires an evolution in topic framing, analysis and policy responses, as an integrated and holistic approach. This broadens the focus from mitigation, adaptation and achieving co-benefits to a wider shifting of pathways and achieving synergies across public policy goals. To support this evolution, enhanced knowledge of systems shifts is necessary through five distinct approaches: decision making under uncertainty; aggregated economic frameworks to evaluate system-level choices; ethical perspectives on values and equity; transition frameworks of processes and actors; and psychological/behavioural and political factors. Developing and integrating this knowledge can enable the design of holistic policy, for transformative climate action and related achievement of win–win outcomes. {Chapters 1 (1.5), 3 (3.5), 5 (5.4), 6 (6.2, 6.5), 7 (7.3, 7.5)} Detailed research gaps are included in Appendix A of the underlying volume.

F.2 **Robust research can play a central role in achieving climate commitments. Universities and research institutions need to undergo transformative changes to align academic practices with societal, environmental and future economic priorities.** A growing body of literature both internationally and in Ireland identifies the important role that universities and research institutions can play as agents of transformative change. But to play such a role, universities and research institutions must evolve and transform themselves. Universities are places of knowledge production, perpetuation and dissemination, and are anchor institutions in their communities and regions. Universities have potential to become both exemplars of social change and agents for change. {Chapters 6 (6.3), 8 (8.4), 9 (9.3)}

F.3 **Addressing the 'wicked problem' of climate change requires working across disciplines and across research institutions, understanding the problem from multiple angles and providing appropriate and long-term funding for research on transformative change.** The research environment is fragmented across institutions. Small-scale competitive research bids with time horizons often of 1–2 years or less militates against the development of strategic, transformative and interdisciplinary research to address our urgent societal challenges across climate and biodiversity. An overemphasis on industry co-funding can pose challenges to establishing public good research, a characteristic of much research on climate and biodiversity, particularly in the arts, humanities and social sciences, and fundamental science. {Chapters 3 (3.5), 6 (6.5), 7 (7.4), 8 (Box 8.2), 9 (9.3)}

F.4 **The structure of researcher contracts also serves to limit the potential for transformative research on climate, biodiversity and other grand societal challenges.** The prevailing norm of offering short-term contracts, e.g. 1–2 years, for highly skilled research staff, with no long-term career structure, has made it increasingly challenging to recruit and retain skilled researchers. This diminishes Ireland's human capacity and expertise in climate change across the public sector and higher education, as researchers move abroad or to the private sector in search of a career. {Chapter 9 (9.3)}

F.5	**Realising the transformative potential of research in addressing the climate crisis requires more focus on the coordination and synthesis of research and its translation into societal impacts, including the capacity of the policy system to use and apply the outcomes of research.** Relations between the scientific community and the policy system are often based on individual relationships between scientists and policymakers. It is recommended that a review of international models and practice on climate change and biodiversity research and its application to policy be undertaken, which could inform the development of measures to strengthen the research ecosystem and its links to policy and society in Ireland. {Chapters 7 (7.3), 9 (9.3)}
F.6	**Greater engagement with European and global research networks and funding opportunities can strengthen the role of Irish research on transformative change.** Many researchers and research groups in Ireland already engage with European and global counterparts. Further engagements with European networks and funding streams, such as Horizon Europe and JPI Climate, could strengthen the research base within Ireland. More Irish researchers could be encouraged to participate in global research and research assessment processes, such as the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services (IPBES). {Chapter 9 (9.3)}




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